



Early 20th-Century Building Materials: Siding and Roofing

*Richa Wilson, Intermountain Regional Architectural Historian
Kathleen Snodgrass, Project Leader*



This tech tip is the fourth in a series about innovative building materials developed in the first half of the 20th century and commonly incorporated into Forest Service buildings. The series will help you identify materials by describing their histories, manufacture, and physical characteristics. This series also addresses common problems and provides guidance on maintenance, repair, and replacement.

As noted in the tech tip “Early 20th-Century Building Materials: Introduction” (<http://www.fs.fed.us/t-d/pubs/htmlpubs/htm06732314/> Username t-d, Password t-d), the Forest Service always has encouraged the use of wood-based products in its facilities. This policy, combined with local

availability of wood building materials, greatly influenced the exterior appearance of the agency’s first administrative and recreation facilities. Roofs were covered with wood shingles or shakes. Many early Forest Service buildings were constructed from logs. Wood siding with a variety of profiles was the usual cladding on buildings constructed with wood frames (figure 1).



Figure 1—Following national trends, the Forest Service often used wood siding with a variety of profiles on frame buildings in the early 20th century. The drop siding on this barn was one of the most popular choices. The barn was built in 1933 at the Salmon Ranger Station in Salmon, ID (Salmon-Challis National Forest, Intermountain Region).

Highlights...

- Some roofing and siding materials commonly used on early 20th-century Forest Service buildings are no longer used or have changed in form or composition.
- Using information in this tech tip, you can identify asphalt roofing, asbestos-cement roofing and siding, and metal siding. Maintenance and repair techniques also are included.

By the 1930s, other materials sometimes were used for facility exteriors. In the Pacific Southwest Region, asbestos shingles and composition shingles were specified for some standard building plans. In contrast, the Washington Office’s “Principles of Architectural Planning for Forest Service



Administrative Improvements” (1938) noted that composition roofing was acceptable only on temporary structures. After World War II, the Forest Service increasingly procured asphalt- and asbestos-based building materials. From a practical standpoint, these products were desirable for their affordability, ease of installation, and resistance to fire, rot, and insects. They reinforced a modern, progressive image as the Forest Service entered the second half of the 20th century.

This tech tip focuses on roofing and siding materials commonly used on early 20th-century Forest Service buildings—materials that are either no longer used or have changed significantly in form or composition. The tech tip supplements information in the tech tips “Overview of Roofing Materials for Forest Service Facilities” (<http://www.fs.fed.us/t-d/pubs/htmlpubs/htm00712314/> Username: t-d, Password: t-d) and “Overview of Siding Materials for Forest Service Facilities” (<http://www.fs.fed.us/t-d/pubs/htmlpubs/htm00712308/> Username: t-d, Password: t-d).

Asphalt Roofing

The American composition roofing industry emerged in the 1840s, and by the 1880s it was flourishing. Asphalt-impregnated fibers with or without aggregate (such as cinders) pressed into the exposed surface were packaged for roofing as long strips on rolls. A shift from roll roofing to hand-cut asphalt shingles began in 1903. The asphalt roofing industry grew during World War I because asphalt shingles were easy to transport and were made from materials that weren’t in short supply during the war.

The popularity of asphalt roofing grew in the 1920s, due in part to the National Board of Fire Underwriters’ campaign to eliminate wood-shingled roofs. The introduction of asbestos reinforcement further enhanced fire-resistance and strength. Consumers appreciated the variety of machine-cut shingle shapes and sizes.

The asphalt-saturated mats of early roofing were made of cotton or wool fibers known as rag felt. By the early 1940s, the roofing industry relied more on paper or wood fibers reinforced with asbestos fibers. Manufacturers switched to inorganic mats made of fiberglass in the late 1970s as concerns over asbestos increased.

Aggregate pressed into the mats increased durability. After 1900, stone granules replaced cinders as the aggregate of choice. Colors were limited to black and shades of red and green until the 1930s when manufacturers began using ceramic granules. These granules offered a wider range of colors that could be combined to create a variegated appearance.

Many homeowners chose to modernize their houses by covering existing wood-shingled roofs with asphalt shingles. The asphalt shingles, valued for their fire resistance and lower cost, came in numerous colors, patterns, and shapes. Often they were characterized by the method of installation: American method, French method, or interlocking.

- American method or "straight" shingles of the 1920s and 1930s were square or rectangular. The shingles were installed to overlap the course below. They could be straight laid, abutting adjacent shingles, or Dutch lap, overlapping adjacent shingles (figure 2).

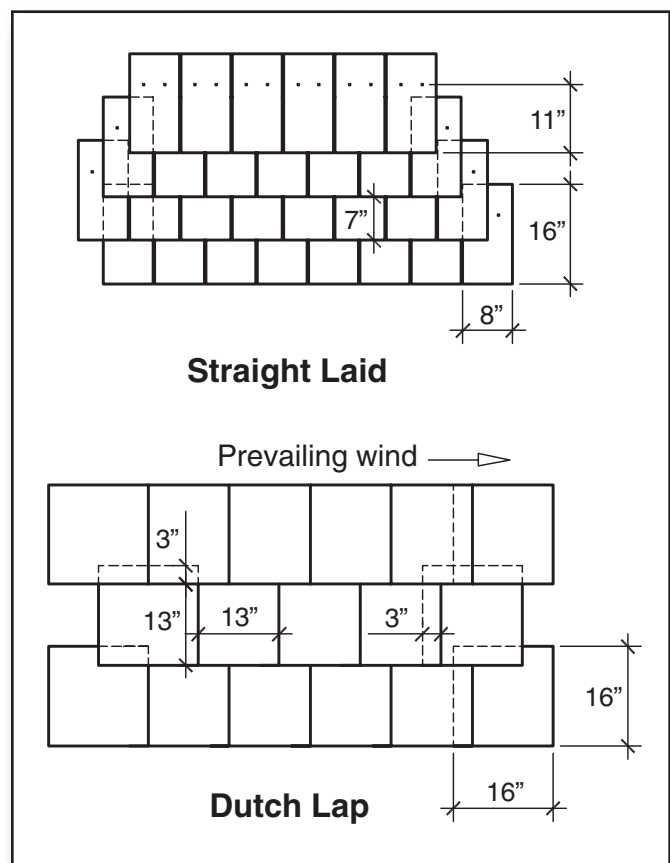


Figure 2—This drawing shows typical sizes, shapes, and installation for American method asphalt shingle roofing.

- French method shingles are shaped like diamonds or hexagons in an attempt to imitate slate roofs of French chateaux. Historically, they were so large (12 by 12 inches and 16 by 16 inches were standard sizes) that they required storm anchors (hooks to hold the edges down during high winds). Because they had little overlap on their edges, French method shingles provided only one layer of roofing. This was acceptable when they were installed over existing roofing, but not in new construction as the French method provided only minimal protection of the roof deck (figure 3).

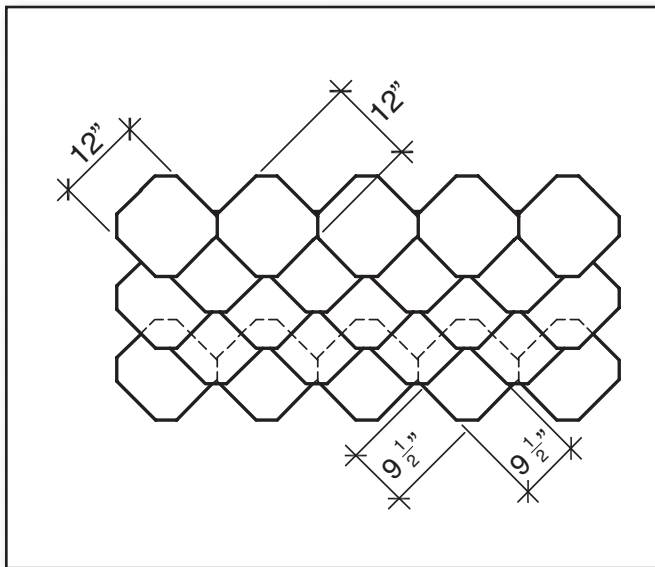


Figure 3—This drawing shows typical sizes, shapes, and installation for French method asphalt shingles.

- Interlocking shingles, whether installed in strips or as individual shingles, have high wind resistance and protect the roof decking better than other types. They were available by the late 1920s and were popular during the 1930s and 1940s. The complex shapes had ears, catches, and slits that interconnected with the shingle course below to create a basket weave pattern. Interlocking shingles worked well on the rolled eaves of cottage style houses (1930s and 1940s), where they evoked thatched roofs (figure 4).

Individual shingles fell out of favor as more companies produced strip shingles, with or without tabs. Tab shingles have cutouts that minimize buckling and mimic the appearance of individual shingles. By 1935, most major manufacturers were producing 12- by 36-inch tab shingles (figure 5) that looked similar to those manufactured today.

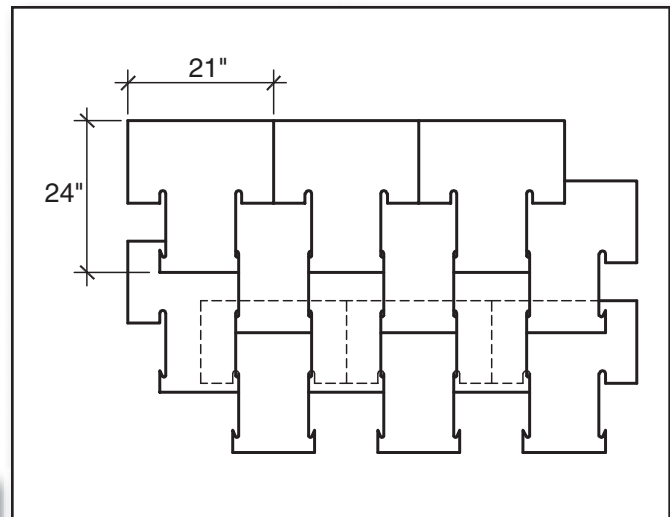


Figure 4—This drawing shows typical sizes, shapes, and installation for interlocking asphalt shingles.

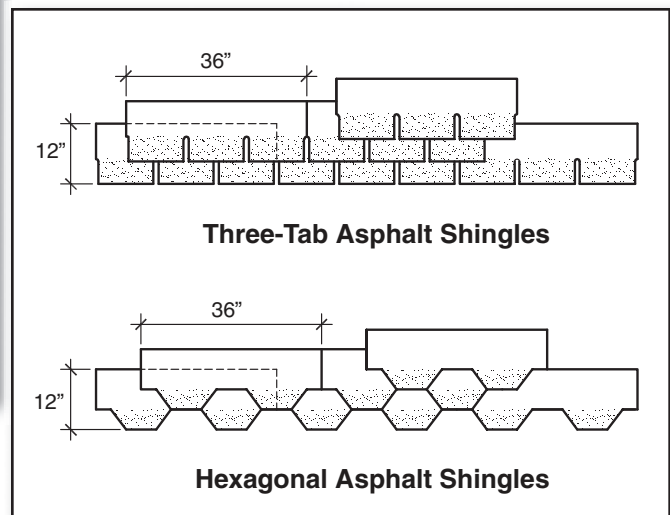


Figure 5—This drawing shows typical sizes, shapes, and installation for tab-style asphalt shingles.

Identification

Most people can identify asphalt roofing because of its distinctive black, asphalt-saturated backing and its granular surface. Organic mat (felt or cellulose) base shingles are heavier than the fiberglass base asphalt shingles that are more commonly used today and may include asbestos-containing materials (ACM). Check engineering records for ACM inspection reports, many of which were completed for Forest Service facilities in the 1990s. If no records exist, send a sample of the roof to a laboratory for inexpensive testing. Only properly trained employees or contractors may cut the sample.

Maintenance and Repair

Asphalt roofing has a relatively short life of 10 to 30 years. Cycles of dampness and dryness will break down the asphalt, which can lead to warping, buckling, blistering, and loss of granules. Asphalt shingles also deteriorate with oxidation and exposure to heat, ultraviolet rays, corrosive chemicals, and biological growth. Damage is usually most evident at roof valleys and changes in roof pitch. Foot traffic and falling branches can also harm the roofing, particularly when the granules fall off and expose the base.

Extend the life of asphalt roofing with regular maintenance and preventive measures. Clean gutters and downspouts. Trim overhanging branches so they do not scrape or fall onto the roof, and remove organic debris such as leaves. Make sure there is adequate attic ventilation to minimize heat and moisture buildup. Maintain the roof's flashing to prevent the roof from leaking.

Install a zinc strip near or at the roof ridge to minimize growth of moss or fungus. Rain will wash small quantities of the zinc, which acts as a fungicide, onto the roof. In certain coastal areas, airborne algae can cause dark streaks on asphalt shingles. These can be lightened with a solution of bleach and trisodium phosphate cleaner added to warm water in the proportions recommended by the manufacturer. If any of the solution gets on the structure's siding or trim, rinse it off immediately to avoid color changes or streaking.

Wear rubber gloves, eye protection, long-sleeve shirts, and long pants when mixing or using trisodium phosphate or bleach solutions. Follow safety precautions printed on cleaner and bleach labels. Avoid scrubbing or high-pressure washing, which would remove the granules.

Use roofing cement to patch small holes and cracks and to secure loose or curling shingles. Do not apply too much cement or the shingles will not lie flat and will be more vulnerable to wind damage.

If asphalt roofing has deteriorated beyond repair, it is time to install new roofing. New roofing can be placed over the existing roofing if the roof has only one layer of shingles, the decking is in good condition, and the roof structure is sound. Otherwise, remove the existing roofing and make any needed repairs before installing new roofing felt and shingles.

Replacement roofing that matches the historic appearance of American method shingle installation is relatively

easy to find. Manufacturers are increasingly offering specialty shapes and interlocking shingles. For unique shapes or sizes, new shingles can be cut from roll roofing or tabless shingles using a utility knife.

It is worthwhile to determine whether ACM is present, because doing so may save time and money in the long run. The Missoula Technology and Development Center (MTDC) "Facilities Toolbox" (<http://www.fs.fed.us/eng/toolbox/haz/haz02.htm>) provides information about ACM in Forest Service facilities. Under Forest Service regulations, employees are not allowed to work with friable asbestos. An exception is the Plumas National Forest's Asbestos Crew Services, an enterprise team certified to inspect and abate ACM. With proper training and equipment, Forest Service personnel can work with nonfriable ACM.

Asbestos-Cement Roofing and Siding

In the early 1900s, manufacturers reinforced Portland cement with asbestos fibers to create a fire-resistant and durable building material. The product, first made in 1905, served as a coating for boilers, steam pipes, and equipment that generated heat. Asbestos-cement coatings also were used to patch roofs and seal areas where pipes or other items penetrated the roof.

The production of asbestos-cement sheets became possible in 1907 when Austrian Ludwig Hatschek brought his patented process to the United States. Forming and curing processes were improved and it was not long before shingles and corrugated panels for roofs and walls were manufactured. A wide range of asbestos-cement products, such as pipes, faux ceramic tiles, and decorative moldings, became available. Successful manufacturers included Eternit, Johns-Manville, and the Asbestos Shingle Slate and Sheathing Co.

The National Board of Fire Underwriters, with its initiative to eliminate the fire hazards of wood shingles, was instrumental in the public's acceptance of asbestos-cement roofing. By the 1920s, large asbestos-cement roof shingles were available in a natural gray color, as well as red and blue-black colors that resembled tile and slate. Pigments, either added to the wet mixtures or rolled into surfaces, faded when they were exposed to the elements.

Like their asphalt counterparts, asbestos-cement shingles were characterized by a variety of shapes (square, rectangular, diamond, chamfered, scalloped, and ogee) and method of installation (American, French, or interlocking). Asbestos-cement roofing tiles shaped to imitate clay tiles found on French and Spanish-style buildings were also produced (figure 6).



Figure 6—Asbestos-cement roofing tiles were popular on period revival styles such as the Mission and Spanish Eclectic styles, which were most common in the Southwest and Florida.

Siding made of asbestos cement was another popular building material. Individual square, rectangular, and hexagonal shingles dominated, although long planks resembling clapboard were offered by the late 1930s. The surfaces of siding produced in the 1920s and early 1930s were smooth. Textured finishes, particularly wood-grain patterns, were available beginning in 1937 (figure 7). Sears, Roebuck and Co. was one of the first suppliers to introduce asbestos-cement siding with a wavy bottom edge.



Figure 7—The wood-grain pattern on these asbestos siding shingles makes them look similar to wood shingles when viewed from a distance.

White, gray-pink, and gray-green were the most common of the limited colors available for asbestos-cement siding. In the 1940s, speckled patterns were produced by pressing granules of pigment into the surface (figures 8 and 9). Manufacturers began offering deeper hues of brown, green, and coral during the booming 1950s housing market. Despite the available colors—or perhaps because of them—many structures with asbestos-cement siding were eventually painted.

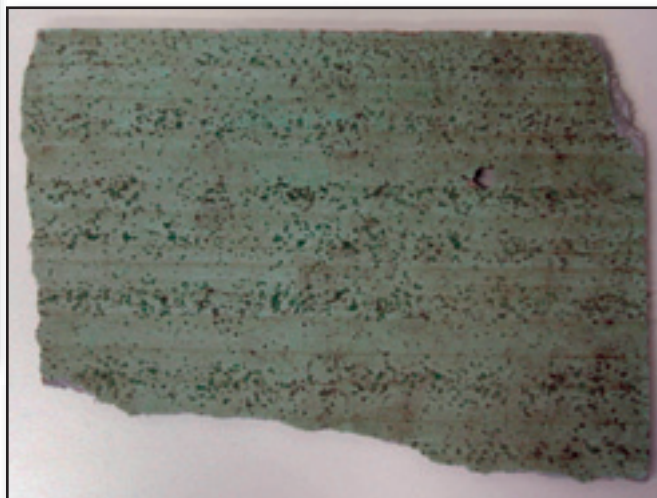


Figure 8—The pigment granules pressed into the surface during manufacturing are clearly visible on this broken piece of asbestos siding.



Figure 9—The broken piece of siding shown in figure 8 is from this 1957 house at the Shake Creek Guard Station on the Sawtooth National Forest, ID (Intermountain Region).

Installing asbestos-cement shingles, whether on roofs or walls, was relatively easy. Most shingles, typically 12 by 24 inches, were easy to handle and came drilled for nailing. Often, they were applied over existing materials using furring strips. Asbestos-cement products, once deemed a miracle material, remained popular until the 1970s when the U.S. Environmental Protection Agency (EPA) began regulating asbestos-containing materials.

Identification

For Forest Service facilities, check the 1990s asbestos surveys and other engineering records to see if asbestos-cement siding or roofing has been identified. If not, conduct a visual inspection. Asbestos-cement siding and roofing is subject to impact damage, so look for areas where the material has broken. You may be able to see the material's color in cross section if you look at the edge of a broken section. Siding or roofing that is gray inside usually is asbestos cement. When lightly tapped, asbestos-cement products usually sound harder than wood, almost like ceramic. Siding or roofing that is brown inside is probably wood-based hardboard. Siding or roofing that is red inside is probably clay tile.

Maintenance and Repair

The EPA does not consider asbestos-cement products to be friable (easily crumbled or reduced to powder) because the cement acts as a binder. However, these products can become friable if they are severely deteriorated or if they have been disturbed mechanically by drilling, sawing, sanding, or grinding. If you need to do any of these things during maintenance or repair, a certified asbestos worker and an abatement plan will be needed. Contact your regional environmental engineer or refer to the "Hazmat in Buildings" section in MTDC's "Facilities Toolbox" (<http://www.fs.fed.us/eng/toolbox/haz/haz02.htm>) for more information.

Use trisodium phosphate cleaner added to warm water in the proportions recommended by the manufacturer to remove dirt or light stains. Bleach may be added to the mixture to remove moss or other fungi. Start at the bottom, cleaning a small section at a time. Trisodium phosphate may change the paint color if it contacts the surface for more than a couple of minutes. To avoid streaking, rinse each section and any

drips, allowing drying time before cleaning the next section. Do not use strong trisodium phosphate solutions on surfaces that have been covered with latex paint unless you want to remove the paint. Wear rubber gloves, eye protection, long-sleeve shirts, and long pants when mixing or using trisodium phosphate or bleach solutions. Be sure to follow safety precautions printed on cleaner and bleach labels.

Asbestos cement is brittle and susceptible to cracking and chipping. Minimize damage by controlling the environment. For example, plant shrubs or flower beds around the foundation so siding will not be damaged by lawn equipment. Add a drip cap below the bottom row of siding to serve as a bumper. Trim branches that might fall on the roof.

Patch hairline cracks with clear epoxy. Larger gaps can be patched with a thin grout made of Portland cement and water. For cracks larger than $\frac{1}{8}$ inch, use grout with a thicker consistency or add sand to the grout. After patching, keep the grout damp for about a week to keep it from drying so quickly that it cracks.

If the siding or roofing must be replaced, contact a certified asbestos worker and prepare an abatement plan. Replace damaged siding or roofing with an alternative material, such as nonasbestos fiber-cement shingles or fiberboard. Match the original material in appearance as closely as possible. Consult with your heritage staff and State Historic Preservation Office to determine which substitutions are acceptable.

Steel and Aluminum Siding

Steel siding, formed and joined to resemble clapboard, was patented as early as 1903. It was used on a limited basis, mainly because it was susceptible to water penetration and rust. Indiana machinist Frank Hoess corrected this problem by creating interlocking flanges on the top and bottom of siding panels. Hoess patented his steel siding in 1939, using it on a small housing development in Chicago. The demands that World War II placed on the steel industry halted further development and use of steel siding.

The nation's housing shortage after World War II revived the metal siding industry. However, steel siding became less common until the late 1970s, when a process was developed

to manufacture seamless steel siding. Hoess collaborated with a company in 1946 to produce his interlocking siding from aluminum rather than steel. It was installed as an unfinished material, either left to weather or primed and painted with house paint.

In 1947, Jerome Kaufman invented a process to bake enamel coating onto aluminum siding and formed the Alside Co. Initially, colors were limited to white, gray, and cream. Later, additional pastel hues were introduced. Smooth or textured surfaces, with or without an insulated backing, were offered, as were aluminum accessories, such as soffits, corners, and trim.

The building sector responded to these innovations and by the late 1940s, aluminum siding was favored as an inexpensive material that could be installed easily and quickly. Manufacturers, such as Reynolds Metals Co., promoted the material as rot and fire resistant, offering it in panels, clapboards, and weatherboards. Widths of 4, 6, 8, and 10 inches were common. Lengths ranged from 6 to 16 feet. In 1948, Kaiser Aluminum Corp. began producing 7-inch-wide aluminum siding with a concave profile and a spring-tensioned joint. These features provided strength and dent resistance.

As the postwar demand for new houses diminished, manufacturers began promoting aluminum siding as the perfect material to cover old, outdated siding. Its use peaked in the 1970s due in part to the 1963 introduction of vinyl siding, which eventually overtook aluminum as the preferred low-cost, low-maintenance siding material.

Countless historic homes, originally clad with wood or masonry, were “modernized” with the installation of aluminum, vinyl, or steel siding. Aluminum, vinyl, or steel siding applied over historic siding materials should be removed in most cases. Consult your unit’s heritage staff and facilities engineer. If these materials are the original siding for the building, they should be cared for as explained in the “Maintenance and Repair” section below.

Identification

Vinyl and metal siding are similar in appearance, but sound very different when lightly tapped. Once you have identified the siding as metal, use a magnet to determine whether it is aluminum or steel. Aluminum siding is not magnetic. Steel siding (figure 10) is magnetic.



Figure 10—The corner of this house in Soda Springs, ID (Caribou-Targhee National Forest, Intermountain Region), is covered in steel siding that has been battered and bent over the years.

Maintenance and Repair

Maintain steel or aluminum siding by hosing it off every year or two. High-pressure washers should not be used. Such washers may dent aluminum siding and could force water behind the siding, allowing the building’s sheathing to mold and deteriorate. Ordinary laundry detergent mixed with water at a ratio of about 1 to 100 can be used to clean most dirt and grime. Remove any surface stains, such as grass stains, with a nonabrasive cleaner and a soft-bristled brush. Be sure to thoroughly rinse the detergent and cleaner off the siding.

Both aluminum and steel siding are relatively durable materials. Aluminum is more susceptible to dents than steel. Aluminum will not rust like steel, but it may oxidize in climates with high humidity or salty ocean winds, especially if the finish has been scratched or damaged. Aluminum oxidation just blemishes the surface—it won’t cause the siding to fail, but the oxidation can be unsightly. Paint scratches on steel or aluminum siding with a primer specifically designed for the material before rust or oxidation has a chance to form. Don’t use latex primer on aluminum, because the ammonia in latex paint will oxidize aluminum. Finish with two coats of high-quality acrylic house paint.

Patch small holes with a two-part epoxy filler such as the type used for auto repair. Sand, prime, and paint the area after the epoxy has cured. If rust or oxidation has already formed, remove it with fine steel wool, then prime and paint.

The paint on aluminum siding installed during the 1950s and 1960s tended to chalk and fade, so aluminum siding may have been repainted several times. If the original baked-on enamel or vinyl coating on steel or aluminum siding is intact but is chalky or faded, you may be able to use products such as EVERBRITE (http://www.everbrite.net/how_to_aluminum.html) to restore the siding's original color and appearance.

To repair dents, drill a few 1/8-inch holes in the dented area. Put a flat washer (to protect the siding) on a 3/16-inch diameter sheet metal screw and screw it part way into one of the holes. Use pliers to pull on the screw and pop out the dent. Remove the screw and use a putty knife to apply two-part epoxy filler behind the dent. Several applications may be needed. If so, let the epoxy cure between each application. Sand, prime, and paint the area after the epoxy has cured.

If the damaged area is large, consider patching it with new siding that matches the existing siding (figure 11). Mark vertical lines on either side of the damaged area. Cut across the center between these two lines and down the lines with a utility knife or tin snips. Remove and discard the lower half. Cut a patch panel from the new material so it will overlap the removed section by 2 inches on each side. Cut the nailing flange from the patch. Coat the overlapping area with polyurethane caulk or clear silicone sealant. Press the new panel over the damaged area so that it adheres to the caulk or sealant.

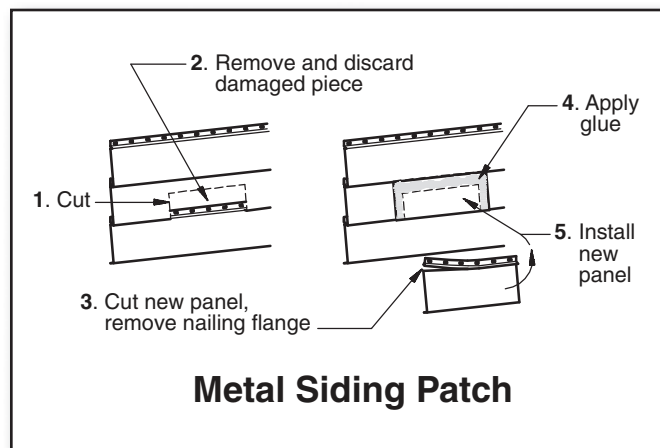


Figure 11—This drawing shows how to patch metal siding using polyurethane caulk or clear silicone sealant to glue the patch in place.

More Information

More information about siding and roofing, including maintenance and repair, is available from the following sources:

Books, Journals, and Web sites

Bock, Gordon. 2005. Amazing asphalt. *Old-House Journal*. (July–August): 66–69. History and types of asphalt shingles.

Bock, Gordon. 1990. Composition shingles of the 1920s and 1930s. *Old-House Journal*. 18 (3) (May–June): 28–31. Types of composition shingles; list of suppliers.

From asbestos to zinc: roofing for historic buildings. Web site: <http://www.nps.gov/history/hps/tps/roofingexhibit/introduction.htm>. Discusses the appearance, composition, manufacture, and application of roofing materials and systems.

Jackson, Mike. 1995. Asphalt shingles. In: *Twentieth-century building materials: history and conservation*.

Jester, Thomas C., ed. New York: McGraw-Hill Co.: 248–53. Manufacture, uses, installation, and types of asphalt shingles.

Lauber, John. 2000. And it never needs painting: The development of residential aluminum siding. *APT Bulletin*. 31 (2–3): 17–24. Historical overview; good illustrations.

Tobin, Erin M. 2000. When the imitation becomes real: attitudes toward asphalt and asbestos-cement roofing and siding. *APT Bulletin*. 31 (2–3): 34–37. Value of preserving imitation materials.

Woods, Amy Lamb. 2000. Keeping a lid on it: asbestos-cement building materials. At: <http://www.nps.gov/history/hps/tps/recentpast/asbestosarticle.htm>. Includes information about history, physical characteristics, asbestos regulations, and conservation.

Other Resources

Asphalt Roofing Manufacturers Association

1156 15th St., NW., Suite 900

Washington, DC 20005

202–207–0917

Web site: <http://www.asphaltroofing.org>

The Aluminum Association, Inc.

1525 Wilson Blvd., Suite 600

Arlington, VA 22209

703-358-2960

Web site: <http://www.aluminum.org>

National Roofing Contractors Association

10255 West Higgins Rd., Suite 600

Rosemont, IL 60018-5607

847-299-9070

Web site: <http://www.nrca.net>

The following is a partial list of suppliers, some of whom offer advice on maintenance and repair. This list is not an endorsement of specific manufacturers or products.

Aluminum siding and trim

Alcoa Building Products

P.O. Box 716

2615 Campbell Rd.

Sidney, OH 45365

800-962-6973

Web site: <http://www.aecinfor.com>

Steel siding and trim

Alside

P.O. Box 2010

Akron, OH 44309

800-922-6009

Web site: <http://www.alside.com/>

Fiber-cement siding, panels, and trim

Cemplank

26300 La Alameda, Suite 250

Mission Viejo, CA 92691

877-CEMPLANK

Web site: <http://www.cemplank.com>

Fiberglass-asphalt shingles (three-tab, strip); fiber-cement siding (lap, shaped shingles, vertical panels)

CertainTeed Corp.

P.O. Box 860

750 East Swedesford Rd.

Valley Forge, PA 19482

800-782-8777

Web site: <http://www.certainteed.com>

Fiberglass-asphalt shingles, WeatherSide fiber-reinforced siding (wavy, straight, and thatch-edged profiles to match historic shingles)

GAF Materials Corp.

1361 Alps Rd.

Wayne, NJ 07470

973-628-3000

Web site: <http://www.gaf.com>

Organic and fiberglass-asphalt shingles (three- and six-tab, interlocking, shaped)

IKO Wilmington

120 Hay Rd.

Wilmington, DE 19809

800-441-7296

Web site: <http://www.iko.com>

Fiber-cement siding (lap, shingles, vertical panels, planks) and trim

James Hardie USA/Canada

26300 La Alameda, Suite 250

Mission Viejo, CA 92691

888-542-7343

Web site: <http://www.jameshardie.com>

Aluminum siding, steel siding, fiber-cement siding

Norandex/Reynolds Distribution Co.

8450 South Bedford Rd.

Macedonia, OH 44056

800-528-0942

Web site: <http://www.norandexreynolds.com>

Fiberglass-asphalt shingles (three-tab, interlocking); asphalt roll roofing

Owens Corning

Toledo, OH

800-438-7465

Web site: <http://www.owenscorning.com>

About the Authors

Richa Wilson is the regional architectural historian for the Forest Service's Intermountain Region and vice chairman of the board of directors for the nonprofit Traditional Buildings Skills Institute. She has a bachelor's degree in architecture and a master's degree in historic preservation. As a Peace Corps volunteer, Richa served as head of the building inspection section in Blantyre, Malawi, and provided architectural services to Habitat for Humanity and Save the Children. Richa worked in private practice in Washington, DC, and Oregon before joining the Forest Service in 1998.

Kathleen Snodgrass came to MTDC as a project leader in 2001. She received a bachelor of science degree in architectural studies from Washington State University in 1974 and then spent 10 years in highway design and construction with the Idaho Division of Highways. She began her career with the Forest Service in 1984. Kathleen worked in facilities, landscape architecture, land line, and general engineering on the Nez Perce National Forest for 10 years, and was the forest's facilities architect for 7 years before coming to MTDC.

Library Card

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This is the fourth in a series of tech tips about innovative building materials developed in the first half of the 20th century that were commonly incorporated into Forest Service buildings. It provides practical information to help engineers, persons working in the heritage program, and others maintain and preserve asphalt roofing, asbestos-cement siding and roofing, and metal siding in historic facilities.

Keywords: American method, aluminum, asbestos, asphalt, cement, cleaning, composition, dents, facilities, fire resistance, felt, French method, friable, granules, historic, interlocking, maintenance, oxidation, patch, repairing, replacing, roof, rust, shingles, steel, tab, texture

Additional single copies of this document may be ordered from:

USDA Forest Service, Missoula Technology and
Development Center
5785 Hwy. 10 West
Missoula, MT 59808-9361
Phone: 406-329-3978
Fax: 406-329-3719
E-mail: wo_mtdc_pubs@fs.fed.us

Electronic copies of MTDC's documents are available on the Internet at:

<http://www.fs.fed.us/eng/t-d.php>

For additional information about early 20th-century building materials, contact Kathleen Snodgrass at MTDC:

Phone: 406-329-3922
Fax: 406-329-3719
E-mail: ksnodgrass@fs.fed.us

Forest Service and Bureau of Land Management employees can search a more complete collection of MTDC's documents, CDs, DVDs, and videos on their internal computer networks at:

<http://fsweb.mtdc.wo.fs.fed.us/search/>



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