

FEATURE

No Substitute

Inexpensive and maintenance free or short sighted and maintenance proof:
How do substitute materials stack up in the long run? *By John H. Cluver, AIA*

The pressure to replace historic materials with inexpensive substitutes is strong. There are arguments, however, to support keeping those original clapboards and roofs.

Marketers would have you believe that there are fundamental problems with historic materials that require their replacement. Rotten wood, peeling paint, cracks and loss of function, however, can be repaired and, more importantly, can be prevented. The real problems are aggressive marketing, a lack of knowledge about historic materials and a focus on short-term costs to the detriment of the long term. The unfortunate results are the five fables of modern replacement materials that contribute to the low-cost, low-maintenance mirage.

Fable #1: Replacement is cheaper than repair; substitutes are relatively cheap and traditional materials simply cannot compete on price. What people fail to consider, however, is that repairing what already exists may cost the same, or possibly even be cheaper. So why don't more people do repairs, if price is so important? In most cases, it is because they do not even think that repair is an option, either because they do not know where to find someone to do the job or because they assume it will cost more.

Fable #2: The best price is the best deal. When it comes to construction, it is very hard to comparison shop. Because people buy items like roofs only once or twice in their lifetime, and rarely own the product from start to finish, they are not educated consumers. Lacking proper knowledge and not wanting to get "sold up," the natural tendency is to simply buy the most affordable option out there. Marketing has successfully removed the question of quality from most buyers' minds by offering a "lifetime warranty" that frequently either the buyer or the seller are not around to cash-in on.

Fable #3: New looks better than old. Unless you are an old house aficionado, there is a great satisfaction in removing those old, peeling, ratty-looking materials and replacing them with something new. The problem is, today's new is tomorrow's old, and many contemporary materials simply do not age as gracefully as traditional materials.

Fable #4: Replacement is more energy efficient than repair. With increased environmental awareness and rising energy costs, people get great satisfaction in upgrading the energy efficiency of their house by replacing materials that are drafty and allow heat to escape. Unfortunately, they fail to take the steps, like increasing insulation or sealing cracks, which can have a bigger impact on heat loss. It may take decades for the replacement material to "pay for itself" in energy savings, but heat loss is only part of the equation: It takes energy to make, ship and install new materials, as well as to remove and dispose of the old materials.

Fable #5: No maintenance is the ultimate goal. Everybody wants more time and mundane house maintenance is never high on anybody's priority list. So why spend time and money repairing a material that will need constant maintenance, when that money can be spent on something that can be installed and never thought of again? Very often, periodic maintenance can prevent more expensive and disruptive major repairs later. Even paying someone to paint the house while you relax on the hammock will cost less than new siding.

Dispelling the Delusion

These fables all contribute to the idea that it is better to replace old, historic materials with new ones. Low maintenance, however, is a siren song



Faux wood graining, J-channels around windows and aligned and overlapping butt joints reveal this vinyl siding (top) to be a poor imitation of cedar siding (above). All photos courtesy of John Cluver, Voith & Mactavish Architects

for materials that cannot be maintained and, perversely, must be replaced instead of repaired.

So, what points of persuasion can be used to convince someone to repair instead of replace? There are three basic arguments that can be made.

The first, and the one that comes most naturally to preservationists and those who love old buildings, is aesthetic cost. Simply put, the new materials will not look as good as the old. It is very telling that all of these materials make concerted efforts to look like the old material. Unfortunately, quite often these faux elements fall short, especially as they age.

The second argument that can be made, a relatively new one, is environmental cost. People are increasingly concerned about the wise use of natural resources and of the importance of conservation. Restoration is an environmentally sustainable practice, as it not only saves landfill space, but also saves the energy related to the replacement material.

The third argument is the one most commonly used to justify replacing historic materials, namely economic cost. The true expense of



As vinyl siding ages (left), it becomes brittle and its color fades; this siding was installed 22 years ago. The weathering and re-painting of cedar siding (right) creates a patina that adds to the historic character of the house; this painted wood siding was installed more than 50 years ago.

replacement is rarely considered in the decision-making process, and when you look beyond the initial replacement costs, the results can be surprising. The material that offers the cheapest initial cost frequently ends up costing as much as, if not more than, the seemingly more expensive option.

As a way of further illustrating these three arguments, I will focus on two of the most commonly replaced materials on an old house: siding and roofing.

Siding

A typical traditional siding material is wood clapboard or shingles. Originally made of old-growth pine, cedar or other locally available wood that was milled nearby, painted or stained wood siding was a popular Colonial cladding material and has had a long and successful tradition of use in many parts of the country. It is easily worked into shapes that are tight against water and wind, is easily maintained, is capable of lasting many generations and is aesthetically very pleasing in profile, scale and finish. In fact, the aesthetic appeal of wood siding is attested to by unceasing efforts of new siding materials to replicate its character. So why are many homeowners in such a rush to replace their original wood siding with vinyl?

The answer typically is the lure of no maintenance. One of the characteristics of wood siding is that its appearance can be renewed and its weather resistance re-established, but this has become an undesirable chore that is to be avoided at all costs. But there are definite costs related to swapping old wood for new vinyl.

While it is hard to assign an exact dollar value to aesthetic cost, there is a definite value to having a beautiful house. While some will argue that a house newly sheathed in vinyl is beautiful, the discerning eye will realize that this beauty is shallow compared to that of wood siding.

Vinyl siding is plagued with non-historic details that are all too apparent when given a second look, such as the J-shaped channels that ring all of the house's openings, creating a recessed opening at windows and doors that is found at masonry buildings, but not those with wood siding. Another example are the overlapped seams where horizontal sections meet that create hundreds of random, vertical shadow lines that distract from the rhythm and shadow pattern of the siding. These shadows, unfortunately, also highlight the fact that each "board" in the typical vinyl siding is actually part of a taller strip, which creates a very non-historical effect of aligned joints (which any carpenter would tell you is absolutely to be avoided in exterior work).

Aged vinyl has even more problems. Colors, especially dark ones, fade with time due to exposure to ultraviolet rays and cannot be re-painted. As a plastic, vinyl has a slight electromagnetic charge that attracts dirt, which is increasingly difficult to remove. It also gets brittle with age, making it susceptible to cracking if struck by an object or from the constant stress of expansion and contraction from changes in temperature and sun exposure. Unfortunately, replacement pieces, even if done with pieces left over from the original installation, will never match due to color fading.

Wood siding, however, can be re-painted, so color changes and replacement boards can be easily accommodated with a fresh coat of paint. Critics will mention that paint peels over time, requiring painstaking scraping and results in a mottled look. This is true; however, paint peels only when it is not properly applied, regularly maintained or if there is a leak or other source of water penetration. In the last case, the peeling paint serves as an alert to a problem that, if not corrected, can lead to a big repair project in the future; vinyl would simply mask the problem until it was too late.

An aesthetic comparison of wood and vinyl is not complete, however, until the impact of new vinyl on an old house is considered. Some people say that since vinyl siding typically is installed without first removing the old siding, it is very easy to come back at a later date and

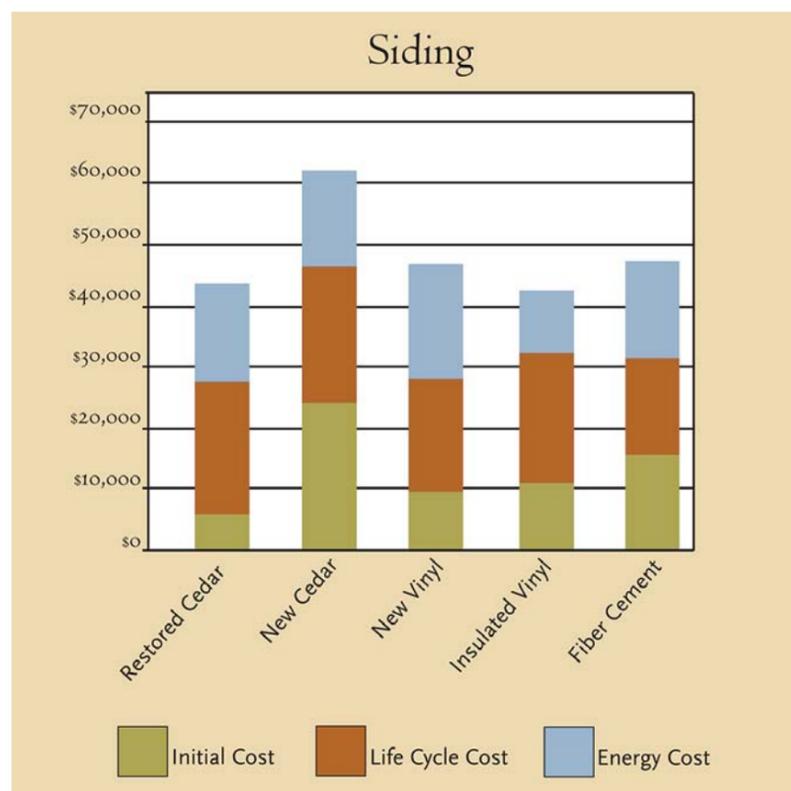
"reverse" the installation. This claim ignores the fact that profiled window trim and cornices need to be removed or cut back to accommodate the vinyl, and that the wood siding is damaged by the nails used to secure the vinyl. This installation approach also adds more than an inch of thickness to the wall, which is enough to extend the siding and J-shaped channels beyond the door and window trim, thereby inverting the shadow lines at the openings and changing the building's appearance, and making it impossible to re-install shutters without changing the hardware.

One of the more insidious characteristics of vinyl siding is the long-term damage it can do to the siding and framing behind it. The material is impervious to water vapor, meaning that any water that gets behind the siding or that migrates through the wall from the interior as water vapor is trapped behind the vinyl. This creates an environment for rot and mold that can do long-term damage to the house, all while the vinyl hides the damage being done. Finally, removing or covering the wood siding obscures part of the building's history, and contributes to changing it from an historic house to just another house.

There is also a definite environmental cost to replacing original wood siding with new vinyl. Sustainably harvested wood is a renewable resource, and the energy required to gather and mill it is significantly less than vinyl's production requirements. A chart in a 1998 report ("Life Cycle Analysis of a Residential Home in Michigan" by Steven Blanchard and Peter Reppe of the University of Michigan School of Natural Resources and Environment) indicates that, based on a 50-year life cycle, the embodied energy required to clad a house in vinyl is 93,210 MJ, as opposed to only 28,120 MJ for painted cedar, which is a reduction of 70%.

Of course, if wood siding already exists on the house and is maintained instead of replaced, there is no energy that must be expended to produce a new siding material. The environmental cost of a new coat of paint is a small percentage of that for an installation of vinyl siding. Thinking into the future, if the wood siding has to be removed for some reason, it is a recyclable material, or will at least decompose if thrown in a landfill. In contrast, vinyl is made from petroleum, which is a non-renewable resource with rising costs. This material is not readily recyclable, and will linger for a long time in a landfill. From an environmental perspective, maintaining an existing material simply cannot be beat.

While aesthetics and sustainability are important considerations, the issue that matters most to a majority of people is the economic cost.



While vinyl siding is the cheapest material to install new, the competitive cost of repairs and the ability to perform maintenance instead of wholesale replacement makes wood siding a more cost-effective product over the long term. All graphs courtesy of John Cluver, Voith and Mactavish Architects



Asphalt shingles (top) are not capable of emulating the thickness, texture and variegated color of slate (above).

cedar is almost the same as the new vinyl. How is that possible? The answer is that the time and money spent re-painting the wood siding is helping to protect it and extend its life, so that after 50 years, the only life-cycle costs that have been incurred are those related to the painting. If well maintained, there should be little need for more expensive repairs. The vinyl siding, in the meantime, will need to be replaced every 20 years or so, at a cost that is much greater than that of repainting. For those people who say they do not want to be bothered with the hassle or expense of painting, the annual cost of paying someone to paint every seven years comes to roughly \$500 per year, which is about the same as the annual cost of replacing the vinyl siding every 20 years.

The third point is that the energy lost through the different siding materials is roughly equal. Cedar has slightly less heat loss through it than vinyl, and insulated vinyl offers improvements over cedar. What is important to notice, however, is that the energy savings are not that substantial. The amount of insulation provided by insulated vinyl is enough to save roughly \$100 per year in fuel costs. During a 50-year period, the \$5,000 saved is not even enough to pay for the initial installation of the insulated vinyl, much less subsequent replacements. Greater energy savings can be achieved by adding insulation to the wall cavities (many old homes lack wall insulation); wall insulation in a 2x4 stud wall has more than double the insulative value of the typical insulated vinyl siding.

The last point to be made with this chart is that, should you be in a situation in which the old siding is in terrible condition and must be replaced, the cost of replacement with cedar siding is not as outrageously expensive compared to vinyl siding as you would think. The total ownership cost for the new cedar is roughly 33% more than that for new vinyl, as opposed to the 150% more when looking solely at installation cost. The \$16,000 difference between the two, when spread out throughout the 50-year period, amounts to a little more than \$300 per year, which is not that much of a premium to pay for a material that will maintain the historic character of the house.

Roofing

Roofing contributes greatly toward the character of the house. Historically, slate and tile were used to create roofs that were beautiful and long lasting, and even cedar was capable of lasting a half-century or more. While there are still many original slate and tile roofs, very often these old roofs have areas of slipped or broken units and frustrating leaks. The result is a roof that has visible gaps or random patches, and which frequently looks to be in worse

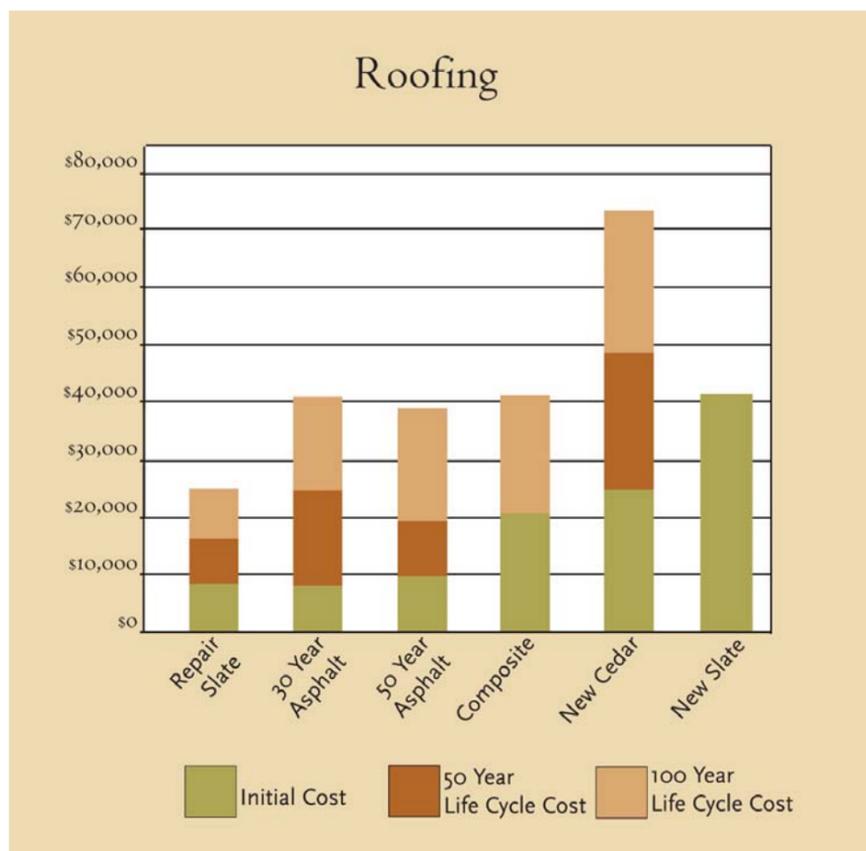
Economic cost has three variables: initial cost, life-cycle cost and usage cost, which for houses usually translates into the energy-usage cost. Vinyl siding is a popular material because it has a very low initial cost, and most people do not look beyond the purchase price and think about the cost of ownership. For those that do, vinyl siding offers the benefit of saving the expense of regular re-painting. It appears at first glance that vinyl is a very economical material, both to buy and to own. A more complete analysis, however, reveals that there are other considerations that cut into the economic argument.

The siding chart shows comparative costs of different siding materials for a case-study house with 1,300 sq.ft. of painted-wood clapboards that have peeling paint and are in need of partial replacement. The total ownership costs for each material are broken down into the initial costs, life-cycle costs and energy costs.

Looking at the initial costs, the first point to note is that the cheapest option is not new vinyl siding, but repairing the existing wood siding. Replacing 5% of the wood, scraping all loose paint, priming the bare wood and re-painting all of it with a coat of high-quality exterior paint costs less than tearing it all off and installing new vinyl.

The second is that when life-cycle costs are considered during a 50-year period, the cost of maintaining that repaired

Over a 50 year period, repairing an existing slate roof may be the least expensive option. Over a 100 year period, which is appropriate consideration for an historic home, the value of slate becomes apparent.



shape than it really is. Consequently, the temptation is to install a new, perfect asphalt shingle roof, especially when a conversation with the local roofer steers you in that direction. The reason for this is that fewer roofers know how to work with slate and fear giving a price for a repair project that is difficult to estimate. They would prefer to install the material they are more comfortable with and can quickly install. What is the cost of this decision?

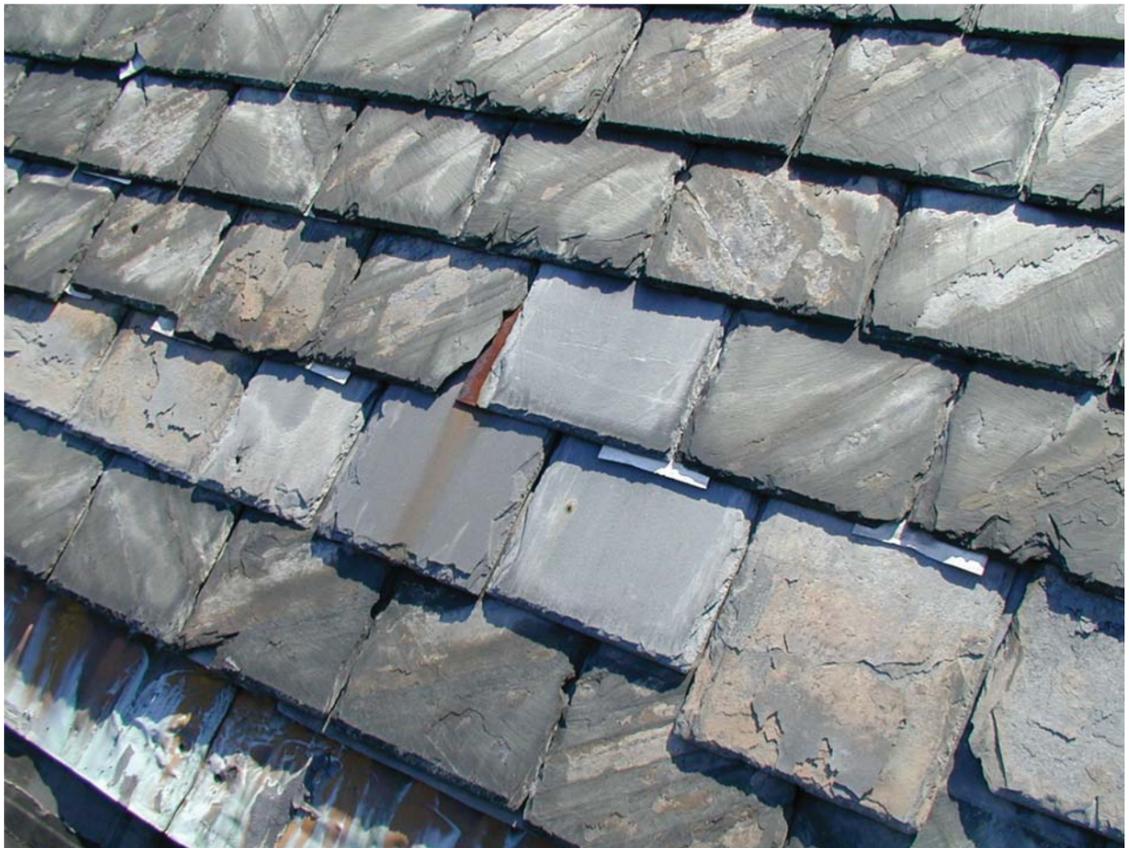
Aesthetically, asphalt shingles are a poor substitute for slate or cedar. There are many varieties of asphalt and laminated shingles on the market, many trying very hard to look like original roofing materials. Unfortunately, they all fail at this task. They simply cannot match the thickness of slate, emulate the texture of a cedar shingle or display the subtle, random color variations found in these natural materials. Perhaps the best looking asphalt shingles are those that simply look like themselves, but they will look thin and insubstantial on a traditional house.

The difference between these materials becomes even greater with age. While the tones in slate become a little deeper and the color of cedar weathers to a brownish gray, asphalt simply ages. Due to weather and foot traffic, the protective granules wear away, removing the color and leaving areas of black asphalt below. The thin shingles can lift and tear in a heavy windstorm. Extreme heat on the roof can cause an undulating buckling of the material. Black mildew streaks can appear on an untreated roof. Admittedly, some of the newer laminated shingles are made of a thicker and more durable material that minimizes some of these issues, but even these more expensive shingles will erode and fail more quickly than most traditional roofing materials. There are also newer composite shingle materials on the market, made of recycled or other materials that again are designed to emulate cedar or slate. These new materials achieve this simulation with varying degrees of success, but their general lack of natural variegation and lack of an extensive track record still make them a poor choice for use on an historic house.

Environmentally, it is hard to argue against slate or cedar. Both are natural materials that are relatively abundant and usable as roofing materials without undergoing a high-energy manufacturing process. Slate shingles take roughly only half the embodied energy of asphalt shingles to produce. Slate is an extremely durable material, capable of life spans well in excess of 100 years. Some varieties of slate are so durable that there are examples of the material being taken from one building for use on another building. Even cedar shingles, which have a reputation for early failure due to rotting, are capable of lasting more than 50 years. This durability makes for an environmentally friendly roof, since disposal of old material and fabrication of new does not need to happen that often.

When most people make the decision to replace an historic roof with asphalt shingles, however, they are looking primarily at issues of cost. Looking at our case study house with 1,400 sq. ft. of roofing material, the initial cost shows that it is very clear that asphalt shingles provide the cheapest installed price for new roofing. The cost of repairing traditional materials, however, may very well be competitive with that of an inexpensive asphalt roof, based in this case on roughly 10% of the slate and flashing needing repair. While it may be tempting to use the new material, thereby reducing the risk of unexpected costs that can arise during a repair, considering the 50-year life cycle shows the potential benefit of repairing the slate instead of replacing it with the less durable asphalt shingle.

Since 30-year shingles typically last 20 to 25 years, they will need to be replaced twice in the same period that the original slate may need perhaps one additional round of repairs. While the roofing chart shows that installing a new slate roof is not price competitive during a 50-year period, it becomes the most affordable new roof option during a 100-year period. While this obviously exceeds the lifespan of most individuals, institutions such as schools and churches can recognize these long-term benefits. This can be clearly seen in the number of historic religious and educational campuses that have a preponderance of 19th- and early-20th-century buildings with their original slate roofs.



This 15-year-old asphalt shingle roof (top) has torn and lost areas of protective granules. In contrast, it has taken more than 70 years for this slate roof (above) to reach this state. The gypsum bands visible in the slate reveal that it is Pennsylvania slate, which is the least durable type of roofing slate, yet still capable of lasting 100 years.

Conclusion

Those individuals and organizations that are responsible for overseeing the maintenance of the character of a historic building or district are constantly under pressure to replace time-worn historic materials with modern replacement products. Given the expenses that the typical homeowner faces, it is very tempting to use new products that “look like” or “are almost the same as” what is being replaced at a more affordable cost. But when the big picture is considered, which includes aesthetics, sustainability and long term costs, very frequently the right decision is to simply restore what is already there. ■

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