



# Job-Site Recycling:

## ASPHALT ROOFING SHINGLES

By Scott Gibson

Asphalt shingles are the roofing of choice for a majority of U.S. homes. And each year, in the process of manufacturing, installing, and eventually replacing them, the construction industry produces an estimated 11 million tons of shingle waste.

That's roughly the capacity of a quarter-million fully laden tractor-trailers, which, when lined up end to end, would stretch from New York to Los Angeles.

Most of the waste now goes to landfills. But unlike processed gypsum drywall, which often goes begging for markets, recycled asphalt shingles have inherent value because of their high petroleum content.

William Turley, executive director of the Construction Materials Recycling Association (CMRA), a trade group, estimates that one third of the waste is currently recycled, and he expects that to continue rising.

That's good news. As recently as 2007, a consultant to the CMRA reported asphalt shingling recycling was "rarely practiced in some states." It's still hampered by health and regulatory issues, but there's a good reason for Turley's optimism.

"Shingle recycling has grown tremendously in the past ten years," he says. "The reason is that it's very profitable. Shingles contain bitumen, the binding agent in asphalt pavement. It's oil-and oil is a little expensive right now."

However, as is the case with other forms of construction and demolition waste, shingle recycling is a hit-or-miss proposition that varies from state to state, goes up and

down with changing market conditions, and is not systematically tracked by any private or government agency. For a state-by-state list of shingle recyclers, check the map at the CMRA Web site ([shinglerecycling.org/content/find-recycler](http://shinglerecycling.org/content/find-recycler)).

### POTENTIAL USES FOR PROCESSED SHINGLES

Asphalt shingles, which account for two-thirds of the U.S. residential roofing market, are made from a fiberglass or organic backing; asphalt cement, a sand-like aggregate; and mineral fillers such as limestone, dolomite, and silica. These are the basic ingredients of hot-mix asphalt used in road construction, which helps explain why the paving industry is the number one end-user of reprocessed shingles. There is a variety of other potential uses, too:

- **Cold patch for repairing potholes.** The CMRA report notes that ground-up shingles mixed with aggregate and an emulsion can be used for patching roads. In fact, the mix actually improves performance because of the fiberglass or cellulose content of the shingles.
- **Aggregate in road construction.** Ground and screened shingles can be mixed with gravel and used to

cover unpaved roads, minimizing dust, reducing vehicle noise, and resulting in longer road life. Combined with ground asphalt and concrete, ground shingles also make a good road base for driveways (for a closer look at how one Connecticut business handles shingles for this use, check out this video on the Web: [finehomebuilding.com/how-to/video/from-roof-to-road-recycled-asphalt-shingles.aspx](http://finehomebuilding.com/how-to/video/from-roof-to-road-recycled-asphalt-shingles.aspx)).

- **Manufacturing new shingles.** Some shingle manufacturers have tried using factory scraps to make new shingles, with mixed success.
- **Energy recovery.** A shingle has an energy content of as much as 20,000 Btu, (a BTu is the amount of heat required to raise one pound of



Photo 1 – Tear-offs add up. Nearly all of the 11 million tons of asphalt shingle waste produced yearly in the U.S. comes from tear-offs. Recycling programs vary from state to state. (Photo, courtesy Dan Morrison.)



*Photo 2 – If necessity is the mother of invention, Ken Ouellette is the father of asphalt-shingle recycling in Connecticut. Ouellette’s company, Incorporated Industries, grinds up used roofing shingles. The ground-up shingles are mixed with ground concrete and asphalt to make a road-paving base. (Photo, courtesy Dan Morrison.)*

water (approximately a pint) one degree Fahrenheit in temperature—about the heat content of one wooden kitchen match. One Btu is equivalent to 0.293 watt-hours or 1,055 joules per pound, the CMRA reports, and the practice of using scrap as a fuel supplement is “an established market” in Europe. Air emission regulations in the U.S. appear to be one impediment for a wider use of scrap shingles as fuel, but Turley says he knows of some cement manufacturers that use old shingles as fuel.

Although all of these end uses are possible, the patchwork of state regulations and the lack of any reliable national reporting system make it impossible to say where any or all of them are actually put into practice.

#### **ROADBLOCKS FOR WIDER RECYCLING**

Two things stand in the way of higher recycling rates: 1) health concerns related to their asbestos content, and 2) a lack of

uniform state standards allowing them to be used in hot-mix asphalt for public road projects.

#### **Health Concerns**

Asbestos is a mineral fiber once commonly used in many building materials, including insulation, fireproof siding, and resilient flooring. Inhalation of invisible asbestos fibers can lead to chest and abdominal cancers as well as scarring of the lungs. The use of asbestos in some products has been banned by the Environmental Protection Agency (EPA) and the U.S. Consumer Products Safety Commission. Manufacturers also have adopted voluntary limitations on its use. When found in older buildings (most commonly in floor tiles, pipe and furnace insulation, or asbestos shingles), the product’s friability is a major determinant in how it must be handled during renovations. More information may be found at [www.epa.gov/iaq/asbestos.html](http://www.epa.gov/iaq/asbestos.html).

Asbestos is a naturally occurring mineral with a number of excellent working characteristics. Unfortunately, it’s also a known

human carcinogen. Asbestos bound up in roofing shingles or other roofing products isn’t a threat—unless it’s released as dust when shingles are ground during reprocessing. And that makes state health officials nervous.

It has been years since manufacturers used asbestos in roofing shingles. But it’s common practice to apply new shingles over old, so a contractor tearing off three layers of shingles might well run into some that contain asbestos. In addition, asbestos is still used in some roofing products, such as roof cements and mastics (the CMRA report notes that more than half of the 3,500 tons of asbestos imported into the U.S. in 2007 went into roofing products).

Some shingles manufactured into the late 1970s contained significant amounts of asbestos—some as much as 50%—so the threat that contaminated shingles will find their way into the waste stream is there.

In reality, asbestos turns up in an extremely low number of shingle samples. Massachusetts requires shingle recyclers to test each batch not once but twice. Any

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Scott Gibson, “Job-Site Recycling: Gypsum Wallboard,” GreenBuildingAdvisor.com updated 8/16/2011, <http://www.greenbuildingadvisor.com/blogs/dept/green-building-blog/job-site-recycling-gypsum-wallboard>.

Scott Gibson, “Job-Site Recycling: PVC,” GreenBuildingAdvisor.com, posted August 25, 2011, <http://www.greenbuildingadvisor.com/blogs/dept/green-building-blog/job-site-recycling-pvc>.

shingles that are found to contain asbestos must be landfilled where the asbestos is safely sequestered.

Sean Anestis, who owns a shingle recycling company called Roof Top Recycling Inc. in Boxborough, MA, tests every load that comes through his gates but says he “rarely” finds any containing asbestos. He handles up to 30,000 tons of shingles per year. In testing 40 samples per day, Anestis gets two or three hits a year. “You have a better chance of getting hit by a car on your way home from work than being exposed to asbestos,” he says.

In fact, one study available through the CMRA found asbestos showed up in only about 1.5% of more than 27,000 samples.

Other potential health threats are from polycyclic aromatic hydrocarbon (or PAH) shingles, which contain petroleum. The U.S. EPA has identified seven PAHs that are “probable human carcinogens,” according to the report written for the CMRA, while separate studies have linked an increased risk of certain cancers among roofers and asphalt workers because of their exposure.

Although there’s a potential for these compounds to get into the environment via shingle recycling, no conclusive studies seem to be available.

### Road Asphalt, State-by-State

If the best-known use for recycled roof shingles is in hot-mix asphalt, there’s no national standard regulating the practice in the U.S. Some states have adopted specifications for using old shingles in road asphalt, but others haven’t. And without this state “spec,” highway officials won’t permit ground-up shingles to be used in new asphalt. Even where it is permitted, some states limit it to nonpublic uses, such

as driveways and retail parking lots, rather than state highways.

The practice is spotty. California, for example, has no state spec, says Turley. In Illinois, the state highway department hasn’t developed one, while the Illinois Tollway Authority has.

A national map developed by CMRA shows roughly half the states in the country permit the practice in one form or another. The rest, including many western states, do not.

Overall, about one million tons of reclaimed asphalt shingles went into new hot-mix last year, according to the National Asphalt Paving Association. That’s less than

10% of the total waste stream but still a big jump over previous years.

Where it can be used, the upward limit of old shingles to hot-mix asphalt seems to be relatively small, 5%. At that level, it may actually improve the properties of the mix; beyond that, pavement gets too brittle.

A fact sheet distributed by the Northeast Recycling Council says that using hot-mix asphalt with a 5% recycled shingle content can shave as much as \$2.80 per ton off the cost of hot mix while improving the quality of the paving. With that in mind, wider adoption of state standards on using reclaimed shingles would not only mean more business for recyclers but also has the



*Photo 3 – A fine aggregate that contains ground asphalt shingles mixed with ground asphalt and concrete makes a great base for driveways. The mixture can be used as a temporary driveway during house construction; later, the finished driveway can be installed right on top. (Photo courtesy of Dan Morrison.)*

potential to lower highway construction and repair costs for taxpayers.

There also are potential problems with the practice. One North Carolina paving company this author spoke with said it has stopped using shingles in its hot mix for at least two reasons. First, the shingle manufacturer the company had been getting virgin scrap from for free began charging for it. Second, bits of fiberglass from ground shingles would stick up in the road when mixed with fresh asphalt. Ground shingles also can be dusty, and if they sat in the weather too long, they degraded. In all, the company found it more advantageous to scrape off the top layer of asphalt on existing roads and use that to supplement new asphalt rather than use old shingles.

But, says NAPA engineer Dave Newcomb, paving companies have a powerful incentive to use more reclaimed shingles because the practice allows them to replace as much as 20% of the asphalt cement they buy, a major savings.

Newcomb says grinding shingles to a fairly fine consistency, to  $\frac{3}{8}$  in. or less, eliminates the chunky texture of asphalt. The real problem with grinding up shingles is that the process involves a “fair amount of work” and is more successful in urban areas than rural areas because of economies of scale.

### Trying to Make a Buck

One of the chief incentives for making more of an effort to recycle construction debris is a better bottom line. Landfill tipping fees can be steep (this, too, varies by state), and culling out waste that can be recycled can pay dividends for builders.

Ron Anestis, for example, charges between \$60 and \$80 per ton for roofers and disposal contractors to drop off asphalt shingles. That’s a considerable savings over the \$70 to \$120 he says landfills around the state charge.

But the economics of recycling can be




Photo 4 – Many recyclers don’t accept tear-off shingles because of nails, flashing, and other debris. Ouellette’s custom grinding device removes metal with a magnet during the first stage of a two-stage grinding process. He then recycles the scrap metal. (Photo courtesy of Dan Morrison.)

complicated. In Massachusetts, Anestis has to pay to dispose of the shingles he processes because he doesn’t grind them himself. His operating margin is the difference between what he charges to take in shingles and what he pays to get rid of them.

In another state, he said, a processor might have a better market for ground shingles, allowing the processor to charge builders lower tipping fees.

In other words, shingle recycling in one

state might bear no resemblance to recycling in another. 

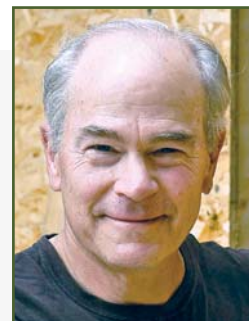
### EDITOR’S NOTE:

This article was originally printed in August 2011 at [www.greenbuildingadvisor.com](http://www.greenbuildingadvisor.com).

The 5th Annual Asphalt Shingle Recycling Forum was held in Dallas, TX, October 27-28, 2011.

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## ANSI/CRRC-1 Standard: Second Public Comment Period Is Open

The Cool Roof Rating Council (CRRC) is accepting public comments on the CRRC-1 Standard until January 10, 2012. The CRRC-1 Standard covers specimen preparation and test methods for measuring the initial and aged solar reflectance and thermal emittance of roofing products. All members of the public have the opportunity to propose changes to the CRRC-1 Standard. Please note that the Second Public Review is limited to those subjects that were addressed by the CRRC Consensus Committee in the First Public Review. Please go to [coolroofs.org/StandardReview.html](http://coolroofs.org/StandardReview.html) for more information and to download the Public Comment Form.