

**Recycling Roofing Materials:  
Developing Best Practices for Roofing Contractors**

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**Abstract**

Roofing contractors are taking more initiative with recycling programs and accepting larger roles in developing a clean supply of tear-off asphalt shingles. Private paving contractors, hot-mix asphalt (HMA) producers and shingle recycling companies have invested millions of dollars to purchase equipment and develop recycling facilities. These trends are growing because of the favorable environmental and economic benefits of using recycled asphalt shingles (RAS) as a supplement in HMA.

One of the greatest barriers to this technology's accelerated growth is the lack of adequate, clean supplies of tear-off asphalt shingles. According to the Construction

Materials Recycling Association (CMRA), more than 11 million tons of roofing material is placed in landfills every year.<sup>1</sup> New systems are being developed to help educate and train roofing companies of all sizes to become involved in these new shingle recycling programs. Asphalt shingles are currently the most commonly recycled materials. This paper summarizes selected case study roofing materials recycling programs in the United States. New initiatives and technologies also are influencing the recycling of other low-slope roofing materials from commercial and industrial buildings. This paper highlights the development of best practice recommendations for roofing material recycling. It is based on current recycling programs, processes and training systems available for roofing contractors.

One example shingle recycling program highlighted was developed with the help of David Coddington as part of the Roofs To Roads Colorado program. The Colorado training program provided a pathway for financial reward for roofing contractors, as well as a means to assure clean, high-quality asphalt shingles are recycled. Based on job-site sorting (also known as “source separation”) of tear-off shingles for recycling, the Colorado program is one of the viable methods for collecting roofing materials.

Roofing contractors, haulers and shingle recycling facility operators all need additional accurate up-to-date information regarding how to manage the minor risk of asbestos exposure in part to address state and local regulations. With proper pre-planning and ongoing quality control programs, the risk of asbestos exposure can be efficiently managed. Employee awareness and visual identification by trained personnel are two important tools in an overall quality control system within a modern shingle recycling program. Visual identification, combined with sampling and laboratory testing, should

be part of the overall risk management plan. This paper identifies two complimentary options: testing from samples taken “on the roof” before tear-off, and testing “at the recycling center” after loads are tipped. Both options are viable and the exact mix of testing systems will depend on local conditions.

The industry as a whole is rapidly moving into recycling systems for a wide variety of low-slope roofing materials, such as EPDM, PVC, and rigid insulation. With the help of leadership from manufacturers in the roofing industry, more opportunities will exist for commercial roofing contractors to plan and implement material reuse and recycling programs.

Roofing contractors - individually and collectively - can become a more powerful voice in development of new recycling systems. Design and implementation of new recycling programs will benefit from roofing contractors’ knowledge and materials experience.

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## **Introduction**

Recycling roofing materials is becoming a more common practice. Asphalt shingles currently are the most recycled roofing material in the marketplace. This paper is intended to summarize the current status of recycling roofing materials; including discussing recent trends and future developments needed for environmental stewardship in the roofing industry. One theme of this paper is to document how roofing contractors are becoming more involved in the recycling systems and encourage expanded leadership roles for roofing contractors in such sustainable practices. The authors believe roofing contractors should play a greater role in recycling systems because on-the-roof visual pre-inspections and job-site sorting can be the best first step

in a series of quality control steps. Although asphalt shingle recycling is the most dominant and largest recycled roofing material by volume, other commercial, low-slope roofing materials are also beginning to emerge.

Roofing contractors are taking more initiative in recycling programs and accepting larger roles in developing a clean supply of tear-off asphalt shingles. Eleven (11) state departments of transportation (DOTs) have adopted material specifications to allow the use of recycled asphalt shingles (RAS) derived from tear-off jobs in the production of hot mix asphalt (HMA). Many state environmental agencies have approved permits and programs for managing environmental and worker safety risks. Asbestos risk management has evolved to address the federal requirements and unique state regulations. Several programs throughout North America have emphasized the benefits of source separation at job sites. Other programs are based on taking samples at the recycling center as a means to improve convenience to the roofing contractors. Private paving contractors, HMA producers, and shingle recycling companies have invested millions of dollars to purchase equipment and develop recycling facilities. These trends are growing because of the favorable environmental and economic benefits of using RAS as a supplement in HMA pavements.

### **The Evolving Role of Roofing Contractors in Recycling Systems**

There are many stakeholders interested in recycling asphalt shingles and other roofing materials, especially in locations with more mature markets. For example, in Colorado, Kansas, and Washington, HMA producers, shingle recyclers, roofing contractors, several municipalities and other state agencies are encouraging their respective DOTs

to adopt permissive materials specifications that will allow the use of RAS in HMA pavement mix designs. These state initiatives are motivated largely by the potential for RAS to reduce the cost of producing HMA. The recycled asphalt oil, or “binder,” in RAS can be an effective supplement to virgin asphalt binder. There are also significant landfill diversion and carbon dioxide emission reductions opportunities.

Roofing contractors and haulers largely are motivated by the cost savings they enjoy when taking tear-off shingles to recycling centers instead of landfills. Although such recycling centers are not yet available or feasible in every location throughout the Country, most often, shingle recycling centers will charge half (or less) of tipping fees compared to competing landfills. Some recyclers will waive the tipping fee altogether (i.e., “free” service) if the shingles are clean and pre-sorted before unloading. There is also a marketing advantage for these participating contractors as they promote themselves as recyclers and environmental stewards invested in sustainability. This may include promotion of their use of other best practices in sustainable roofing and general building guidelines consistent with NRCA technical manuals<sup>2</sup> and the U.S. Environmental Protection Agency (EPA) ENERGY STAR® program<sup>3</sup>.

As the demand for RAS in HMA increases, more roofing contractors and haulers are expected to participate in collecting asphalt shingles. The RAS is becoming a useable commodity instead of a waste product. In many locations with shingle recycling programs, there is limited participation by roofing contractors and haulers. Often, roofing contractors are not aware a recycling program is being developed or exists until seeing some form of media coverage or advertising.

There are several notable examples of shingle recycling programs being started by

roofing contractors. Roofs to Roads Colorado is one such program that was launched by 3R Roofing in Boulder, Colorado, in 2009 with the help of associated partners and state and county grant funding. The program's primary focus was to implement a training program for roofing contractors. The program emphasized a recycling protocol starting on the rooftop and based on source separation at the job site and to provide a clean shingle load to the recycling center. Traditional disposal practices from re-roofing jobs would normally mix all roofing material together as commingled waste for landfilling.

Roofs to Roads Colorado allied with like-minded roofing contractors, including Denver-based contractors Brickey Construction, Colorado Exteriors and Academy Roofing. These contractors became the motivating force for creating a collection point and training center at the Brannan Sand and Gravel facility in the north Denver metro area. Similar promotions began to use the recycling concept to help local contractors increase sales and attain greater market share in the roofing industry. At the same time, the program helped participating roofing contractors lower their disposal costs through discounted tipping fees.

In the program's early stages, with the help of government grants, Roofs to Roads Colorado was able to subsidize the requirement for roofing contractors and haulers to take samples for asbestos from roof systems before the shingles were removed. The result of this data collection showed asbestos was present in a small fraction of samples (roughly less than one-third of 1 percent). This low incidence rate was consistent with other asphalt shingle testing programs throughout the United States.

As a spin-off of Roofs to Roads Colorado, RoofCycle USA, has continued ongoing

training seminars, including the use of the online training video.<sup>4</sup> These training programs have been helpful tools to promote source-separating of clean, debris-free shingle loads to recyclers. This video is produced in English and Spanish.

Shingle recycling services are now available to any and all roofing contractors in the Denver metropolitan area. At this time, more than 100 roofing contractors and haulers are recycling asphalt tear-off shingles in the Denver area. This rapid growth is connected to the increased sales opportunity and reduced tipping fees compared with waste landfills. There now are five (5) individual shingle recycling collection programs in Colorado. Collectively, these shingle recyclers and HMA contractors have more than 100,000 tons of whole shingles or finished RAS products stockpiled and ready to be used in HMA.

This type of growth in shingle recycling can happen anywhere in the United States, but is most feasible in the larger metropolitan areas where there are economies of scale for both the supply of recyclable material and the demand for end use products such as RAS modified HMA.

### **Source Separation Sorting Instructions**

As a part of modern training programs, roofing contractors are given clear instructions regarding how to separate clean tear-off shingles from the other nonshingle debris. The following guidelines are used in the current training program as produced by RoofCycle and represent one set of “best practices” sorting and hauling guides.

First, roofing contractors should place the tear-off shingles and underlayment in a roll-off box or trailer. Non-shingle debris can then be placed on top of the shingles or



deposited in a separate container. The non-shingle debris that must be separated includes items such as:

- Metal (from gutters, valleys, plumbing stacks, nail coils, etc.)
- Wood (from decking and fascia repairs, pallets, etc.)
- Plastic (shingle bundle wrap, gutter/valley slips, other stretch wrap, plastic plumbing stacks, etc.)
- Other trash or waste scrap (lunch waste, empty caulk tubes, etc.)

Most recycling centers are also reclaiming the metal, wood and, in some cases, plastic to further reduce disposal costs and create additional revenue streams.

Loads should be fully segregated with only shingles on the bottom. When unloading at the tipping area, only clean asphalt shingles should remain. Each load should be re-inspected by personnel at the recycling center to ensure it contains only clean separated shingles. Loads that are co-mingled with other debris or are too contaminated with prohibited items should be rejected by the recycler and reloaded for landfill disposal at the roofing contractor's cost.

Contractors and haulers are now exploring the use of separated compartments in roll-off boxes and trailers. Some contractors may use a second trailer or small roll-off box to contain the non-shingle debris. A few of the recyclers are helping their roofing contractors by supplying trash bags or separated boxes as part of their recycling service package. There are many more creative ways roofing contractors and recyclers will invent to efficiently and effectively keep the shingles separated from the other debris.

Depending on the efficiency of tear-off crews and their separation methods, the added cost of source separation should be negligible. Initially, the extra work involved for

recycling can sometimes lead to a greater hourly or per piece cost for the roofing contractor when paying the installers. The cost is small - anywhere from \$50 to \$100 per job, depending on the crew's recycling experience. Proper tools (separated roll offs, trailers, tarps), employee training and modification of the roof system removal process by the crew and foreman are key to avoiding any additional cost resulting from recycling. The net cost can be reduced to zero, or even become a profit, as experience and volume grows.

### **Costs and Benefits**

The primary economic and environmental driver for using RAS in HMA is the savings and conservation of virgin resources. RAS typically contains 20 to 30 percent asphalt binder ("recycled oil"). This RAS binder is quite valuable to HMA producers who can replace a significant portion of the virgin binder needed in the mix. Plus, the recycled aggregates and fiber in the RAS also are valuable materials in HMA pavements.

Asphalt Specialties, one of the major collectors of shingles in Denver, increased its tipping fee from \$0 to \$35 per axle in late 2010 because of high levels of debris in the shingle loads. This highlights the need for improved source separation at job sites and continued training for roofing contractors. It is likely shingle recyclers will continue to seek cleaner, separated loads of shingles as a means to remain competitive and better comply with new environmental and DOT requirements.

The end-use market for recycling asphalt shingles and other roofing materials requires continued growth. The primary strategy is to increase the number of state DOTs that adopt permissive materials specifications to allow use of tear-off RAS in HMA.

Expanded demand for the finished RAS product will help increase the value of asphalt shingles and thereby help expand roofing contractors' roles in developing clean, affordable supplies. The authors believe source separation at the roofing job site will help produce a cleaner, more competitive finished product.

Conveniently located shingle drop-off centers for recycling of shingles and other roofing materials also will help save on costs and fuel consumption compared with transporting waste to distant landfills. The investment of some additional time and labor on the job site to source separate the shingles will reduce costs and engine emissions at the recycling center because of a reduction in additional sorting requirements.

The greenhouse gas reductions for asphalt shingles recycling can be significant, as much as 0.3 pounds of carbon dioxide equivalents per ton of RAS used in HMA.<sup>5</sup>

### **Asbestos Risk Management**

Because of the evolution and modification of the various asbestos regulations, many companies and individuals have a fear and misconception of the requirements when asbestos is identified in a building material. Whether it is in a building where they operate their businesses or on a job site, most people react negatively when asbestos is mentioned. Although the Federal Rules—Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency's National Emissions Standards for Hazardous Air Pollutants (NESHAP)—that address asbestos regulations are quite clear regarding their purpose and the associated requirements necessary for compliance, the rules' interpretation is often lost in translation.

## **Asbestos Regulations and Practices Today**

The primary asbestos regulations referenced for shingle recycling involve the Federal EPA Rule 40 CFR Part 61 NESHAP. The NESHAP regulates renovation and demolition projects on public and commercial facilities, as well as residential units with more than four dwelling units. This rule was designed to identify asbestos concerns, minimize the potential for uncontrolled release of fibers and specify disposal methods. A main requirement of the NESHAP involves the need to conduct an asbestos material inspection as part of renovation or demolition activities.

Another common rule that affects roofing contractors is the Federal OSHA Construction Rule 1926.1001 – “Asbestos”. All employers are obligated to inform their employees when suspect asbestos is present or can be reasonably expected on a job site. Additionally, employers must provide training for employees if they are likely to disturb the asbestos-containing material (ACM). OSHA requires that suspect materials should have asbestos sampling completed before the start of project work or be assumed to be ACM. This rule was designed to protect employees from possible exposure in completion of their work activities.

The incidence and real exposure risk of asbestos on today’s residential asphalt shingle re-roofing jobs is minimal to non-existent. Nonetheless, roofing contractors need to be cognizant of the federal and state rules and offer their employees the safest conditions possible. Also, roofing contractors are integral to the overall recycling system as they provide the first quality control step and well informed crews is one of the best practices to avoiding asbestos containing materials in loads of shingles destined for recycling.

A key variable in asbestos management is individual state regulations. Each state is

required to adopt the federal rules or implement its own asbestos regulations for asbestos-related work. State rules generally mirror the federal rule but are often more stringent. The differences in the state applications of rules can vary greatly by state. This causes confusion for companies who perform work in multiple states. Some of the most evident differences involve who can sample for asbestos, the level of training employees must have to perform asbestos-related work on roof and the amounts or types of material that can make the rules more or less stringent.

One of the most confusing elements of a shingle recycling program is testing for asbestos. This confusion originates with the exclusion statement in the NESHAP where dwellings with four or less units do not require inspections before a roof renovation. This exclusion allows shingles to be removed from a residence and be transported to a transfer station and co-mingled with multiple other loads of residential waste. Many states then require the sampling be completed before grinding the shingles. This sampling strategy varies somewhat but generally is a random sample selection process. Some states require as many as one sample per layer, per load while others require sampling once every 50 or 100 tons of incoming whole, tear-off shingles.

### **Shingle Sample Collection and Asbestos Testing**

A very simple and cost-effective system for providing job-site inspection and sampling of residential roofing materials for asbestos can easily be established. First, the roofing contractor declares himself a participating shingle recycler and obtains permission from the homeowner to take three small samples of roofing materials. These are small square samples about 1/2-inch by 1/2-inch cut from each layer (if there are multiple layers

of asphalt shingles on the job). Each sample is placed into an individual zip-close bag with a unique label. Each sample is then recorded individually on the laboratory's chain of custody form. In the Colorado program, the contractors then submitted the forms and samples to the designated testing lab. Most often, the roofing contractors use an overnight delivery service. Within 24 to 48 hours after the test lab receives the sample, the roofing contractor can receive the asbestos lab testing results by e-mail. Once cleared as free of ACM, the shingles can be removed for recycling. The contractor can then submit a hard copy of the lab sample results to the shingle recycler to document the load is asbestos-free.

None of the shingle recycling programs in the Denver metro area require presampling from the roof and asbestos test results as a prerequisite. Most shingle recyclers typically are doing their own random testing at their central facilities after the shingles have been unloaded. A common frequency for testing is once every 50 or 100 tons of incoming shingles. Some states require this sampling be conducted by a building inspector licensed by a program accredited according to the Asbestos Hazard Emergency Response Act (AHERA). Other states are allowing the recycling facility personnel to collect their own samples without the aid of an independent contractor. The samples must still be sent to an accredited lab for testing.

The system for sampling from every roof system before tear-off is a more thorough means of testing for ACM compared to random sampling at a recycling facility or transfer station. Nonetheless, this system of upfront sampling and testing in the Denver area has been replaced almost entirely by random sampling and testing at the centralized facilities. Roofing contractors and haulers are relieved to have this sampling

and testing step eliminated from the recycling process. The primary burden of documenting that the recyclable material is now free of ACM is carried mostly by shingle recyclers. This, together with the related practice of accepting co-mingled loads, has increased the costs of the recycling operations so the tipping fees have increased.

### **Inspection and Sampling Concerns**

There are various concerns when sampling is completed at the shingle recycling site instead of on the rooftop. The inspectors collecting samples from a pile of whole shingles may only see one type of shingle when, in fact, there could be multiple layers of different shingles on a single residence. The older the shingles, the more likely (albeit still a negligible chance) the shingles and associated plastic roof cements may contain potential ACM.

As a part of this discussion, it is important to distinguish between the asbestos exposure risks of roofing materials manufacturing/installation/removal from the risks of roofing materials recycling which involves grinding and other processing steps. The authors recognize the minimal chance of ACM presence in today's products, but recommend prudent management of asbestos risk through careful planning and quality control.

It now is known through manufacturing data and laboratory testing from shingle recycling programs that the vast majority of three-tab asphalt shingles did not contain asbestos. Nonetheless, Environmental Property Audits Inc. (EPA Inc.) has found some distinct tendencies where asbestos was used in shingles, including in the black adhesive strips and metric shingles that were used during the late 1970's and early

1980's. Some producers of plastic roof cement and roof caulk used asbestos additive in their product well into the late 1990's.

There are two major factors leading to the conclusion that visual inspections on a roof system and pre-sampling and testing before tear-off may be a cost-effective approach. First, the current training requirements for asbestos inspectors include a three-day course that was designed to meet the needs of AHERA. This rule was established for schools and addresses interior building materials excluding all roofing materials. Few, if any, training programs include information about roofing materials, how to identify potential ACM roofing items, general roofing materials use and applications, or other roofing specific items. In addition, there are few asbestos building inspectors that have adequate background in roofing as a specialty type of construction material. This combination results in licensed asbestos inspectors with little, if any, knowledge about shingles, recycling or the relative risks of potential ACM items that could be found in other roofing materials. Second, the current sampling rules for most states do not cover private residential or other commercial roof renovations.

It would be beneficial if the inspector conducting the visual survey on the roof before tear-off had a background in roof renovation work. For example, if a roofing contractor were bidding to replace the existing roof system(s), they should be aware of the number of layers, previous repairs, patching materials used and/or other common variables that exist on the roof system.

As stated earlier in this section, most of the asbestos material will be found in some select types of shingles or in the plastic roof cement materials used along wall or chimney flashings or for spot repairs. Because of the specific type of asbestos material



that was used in roofing products, there are some inherent signs that can be visually identified. More than 95 percent of the asbestos used in roofing materials was the Chrysotile fiber, also known as the “white asbestos.” Some of the reasons asbestos was added to roofing products were that it weathered well and was a good binder. In review of aged roofing materials (shingles, felt underlayment and plastic roof cement) that are at least 10 years old, the authors have found that the asphalt tends to age and deteriorate. Exposed roofing materials with Chrysotile asbestos tend to show a light gray or white appearance. In some instances, the fibers also may become visible. This appearance can be mistaken as fiberglass or vice versa. Generally, if this visual review is used and a suspect material is identified in small quantities, the roofing contractors or sorters could segregate the material, sample and test for the items identified as potential ACM and allow the remaining shingle waste to be recycled as normal. This visual identification system also can assist employers in training their staffs who work on shingle-sorting lanes pulling out other undesirable contaminants (metal, plastics, wood, etc.).

It should be clearly stated that visual inspection alone is not foolproof. Nor is visual inspection intended to minimize the importance of actual material sampling and laboratory analysis. Rather, the intent is to find an efficient field evaluation method that enhances the level of safety for all the parties involved in the shingle recycling process.

The timeframe for how long asbestos may be found in shingles and related mastics is unknown. It is reasonable to state that the passing of each year does reduce the potential for finding any ACM in asphalt shingles as older roof systems are replaced. As the industry grows and the process gets more streamlined, the issue of asbestos

inspections and sampling will need to be addressed. Proper training of employees in visual identification would be a big step in improving the overall effectiveness of a shingle recycling program. This may include the modification of the existing inspector training, or training for roofing contractors and/or recycle line sorters.

### **Other Recyclable Roofing Materials and Programs**

In addition to shingles, there is a variety of low-slope roofing materials currently being recycled. This trend toward more reuse, recycling and recycled content in roofing materials is being spurred and guided in part by the new, proposed “RoofPoint”™ program initiated by the Center for Environmental Innovations in Roofing (CEIR) which is currently in an internal pilot stage of development.<sup>6</sup>

Nationwide Foam Inc. (NFI) is one of the leaders in recycling commercial roofing material and has completed successful and numerous projects throughout North America. NFI defines recyclable materials from low slope to include EPDM, TPO and PVC membranes. The roofing membranes must be mechanically fastened or used with ballast (i.e., no adhesive or mastic such as in built up roofing or bituminous coatings). Over the past four years, NFI recycling projects have totaled over 5 million square feet of membrane. Currently EPDM is one of the most commonly recycled single-ply roofing materials.

Two case studies are of special importance. NFI recently completed a series of projects for the City of Denver which included LEED® requirements for recycling. In North Carolina, Sara Lee Corporation recently completed a re-roofing project that kept over 30,000 pounds of re-roofing waste out of a local landfill. NFI also recycles

polyisocyanurate, extruded polystyrene, and expanded polystyrene roofing insulation. Since 2008, NFI has kept over 9,300,000 pounds of roofing waste material out of landfills.

Other innovations in recycling single-ply roofing materials are noted including in Ohio (EPDM), Massachusetts (PVC), Owens Corning's efforts, and GAF. GAF has a directory of sustainability that lists many of these single-ply recycling initiatives.

There is much opportunity and need for the creation of greater infrastructure to process these materials because of the large volume of commercial roofing construction and demolition waste. It is hoped and expected such recycling programs will be a significant advancement in the long-term sustainability in the commercial roofing industry.

Built-up roof (BUR) systems currently cover more low-slope roofs in the United States than any other product.<sup>7</sup> The asphalt and aggregates used in BUR applications should have significant value. This material potentially may be used for new roofing material and a variety of other applications, including road paving, bike paths and playgrounds.

Derbigum (Brussels, Belgium and Kansas City, MO) has initiated a recycling program to recapture various types of modified bitumen, including cold-applied, styrene butadiene styrene and torch-applied, atactic polypropylene material. Though this market has yet not been developed, there is great potential for reusing these recycled materials in new roofing products as the value per ton for this product is relatively high by comparison to other recycled roofing products

Single-ply, PVC membranes now are being recycled by various companies, including Duro-Last and SIKA Sarnafil, where it can be recycled for new roofing products and other products in vinyl manufacturing. This will be a high-value material as it can be

reused in a number of different consumer products.

There are ample other examples of recycling initiatives for commercial, flat-roof materials. The list mentioned in this paper is not exhaustive and is intended to serve as examples only.

Architectural steel, stone-coated steel and cold-rolled steel roofing products typically consist of anywhere from 35 to 85 percent recycled content material. The corresponding reduction in carbon dioxide emissions when using recycled steel in place of virgin material is among the highest for construction material manufacturing. Steel products continue to be one of the most recycled products in the roofing market.

## **Conclusion**

As the roofing industry moves ahead in the 21st century, it is important we understand not only the limitations of natural resources but also the opportunities of the built environment.

The old methods of use, remove and landfill must transition to a process of use, remove, reuse and recycle. This transition will require action by all roofing industry partners, including manufacturers, roofing contractors, building owners and others.

This paper focuses on the emerging market of shingle recycling; highlighting hurdles and benefits in developing a new sustainability program. Asphalt shingles will continue to grow as the most recycled roofing material. Its value as a petroleum-based product with valuable mineral aggregate and fiber will continue to gain popularity for use in HMA mix designs in part because of the huge volume available.

This paper also introduces the large potential for recycling low-slope products from commercial buildings. The basic collection, processing and end-use infrastructure is being developed to recycle these other commercial roofing products. It is fitting that CEIR is putting forth its new RoofPoint program at this time. The framework for new, sustainable roofing materials recycling systems is in place. There is a need to use the protocols of the shingle program to help launch an industry-wide strategy that includes all roof systems.

## Endnotes

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- <sup>1</sup> The Construction Materials Recycling Association (CMRA) maintains the web site [www.ShingleRecycling.org](http://www.ShingleRecycling.org) with a wide variety of information and data about asphalt shingle recycling.
- <sup>2</sup> The National Roofing Contractors Association (NRCA) publishes a series of [technical manuals](#) for the selection and installation of various roofing materials. One of these manuals is [The NRCA Roofing Manual: Steep-slope Roof Systems—2009](#) and was released in January 2009.
- <sup>3</sup> The U.S. Environmental Protection Agency (EPA) and Department of Energy (DOE) have initiated a joint program, “ENERGY STAR”, for identifying materials and practices that are energy efficient. One line of materials is specific to [roofing products](#).
- <sup>4</sup> RoofCycle USA’s video, “[Recycled Asphalt Tear Off Shingle Training Video](#)”, was produced with funding assistance from the [Boulder County Resource Conservation Division](#). The video and other training program information can be inked from the RoofCycle Blog at <http://roofcycle.blogspot.com/>. [Boulder County’s “Sustainable Buildings” program](#) promotes sustainable building practices, including recycling and reuse of roofing materials.
- <sup>5</sup> Dr. Kimberly Cochran (U.S. EPA) conducted a preliminary analysis of reductions in green house gas emissions due to recycling tear-off shingles in HMA (personal communication, December 2007).
- <sup>6</sup> The [Center for Environmental Innovation in Roofing \(CEIR\)](#) is dedicated to promoting the development and use of environmentally responsible, high performance roof systems. CEIR’s “[RoofPoint™](#)” program is an environmentally innovative guideline for roofing systems. RoofPoint is the first comprehensive roof rating system for the assessment and selection of sustainable roof systems. Three of the 24 elements of the draft [RoofPoint Guideline for Environmentally Innovative Commercial Roofing](#) address the recycled content (M1), reuse (M2) and recycling (M3) standards for roofing materials. Note that James Hoff (CEIR) is also presenting on RoofPoint at the NRCA International Roofing Symposium.
- <sup>7</sup> Kelly, Mark, 2010 [American Roofing: Roofing in America](#). See: <http://roofinginamerica.com/default.aspx>