



## ASPHALT SHINGLES MANUFACTURING & WASTE MANAGEMENT IN THE NORTHEAST FACT SHEET

Revised March 2012

### ASPHALT SHINGLE MANUFACTURING

Asphalt shingles make up a large percentage of materials used in residential roofing. Estimates range from two-thirds of the market<sup>1</sup> to four-fifths of the homes in the United States.<sup>2</sup> Shingles are constructed of layers of granular aggregate, asphalt (a by-product of petroleum refining), base of organic or fiberglass material, and a filler/stabilizer which includes limestone and silica.

Approximately 12.5 billion square feet of shingles are manufactured each year in the United States.<sup>3</sup> Currently, there are 11 asphalt shingle manufacturers in North America. Table I provides a list of shingle manufacturers and facility locations in the northeast U.S.

**Table I. Shingle Manufacturers & Facility Locations in the Northeast U.S.<sup>4</sup>**

MANUFACTURER	CORPORATE HEADQUARTERS	FACILITY LOCATIONS IN NORTHEAST
Atlas Roofing Corporation	Atlanta, Georgia	None
Building Products of Canada	La Salle, Quebec	None
CertainTeed Corporation	Valley Forge, Pennsylvania	Norwood, Massachusetts
EMCO	Quebec, Canada	None
GAF/ELK Materials Corporation	Wayne, New Jersey	<ul style="list-style-type: none"><li>• Baltimore, Maryland</li><li>• Millis, Massachusetts,</li><li>• Quakertown, Pennsylvania</li><li>• Erie, Pennsylvania</li></ul>
IKO Production, Inc	Toronto, Canada	Wilmington, Delaware
Malarkey Roofing Products	Portland, Oregon	None
Owens Corning	Toledo, Ohio	Kearney, New Jersey
Pacific Coast Building Products, Inc.	Rancho Cordova, California	None
W.R. Grace and Co.	Cambridge, Massachusetts	None
TAMKO Building Products, Inc.	Joplin, Missouri	Frederick, Maryland

### ASPHALT SHINGLE WASTE

Approximately 11 million tons of asphalt shingle waste is generated in the U.S. each year.<sup>5</sup> This waste is comprised of approximately one million tons of scraps from asphalt shingle manufacturers, and ten million tons of construction scraps from installations and tear-offs from re-roofing. Asphalt

<sup>1</sup> National Association of Home Builders (<http://www.nahbrc.com/bookstore/cw0703w.aspx>) "From Roofs to Roads"

<sup>2</sup> Asphalt Roofing Manufacturers Association (ARMA) (<http://www.asphaltroofing.org/>)

<sup>3</sup> Ibid. The Liability Insurance Research Board (<http://www.lirb.org/education/PTR/Roofing/RF0060.htm>) provides weights for 100 square feet of shingles ranging from 200 lbs – 360 lbs, depending on the type of shingles.

<sup>4</sup> Source: Asphalt Roofing Manufacturers Association (ARMA)

<sup>5</sup> U.S. EPA Office of Solid Waste and Emergency Response, "[Tear-off Asphalt Shingles Recycling](http://www.epa.gov/oswer/iwg/pilots/docs/2005_0520_asphalt_formatted_final.pdf)." ([http://www.epa.gov/oswer/iwg/pilots/docs/2005\\_0520\\_asphalt\\_formatted\\_final.pdf](http://www.epa.gov/oswer/iwg/pilots/docs/2005_0520_asphalt_formatted_final.pdf))

shingle waste makes up 8% of the total building-related waste stream and up to 10% of construction and demolition debris.<sup>6</sup> It has been estimated that recycling one ton of shingles is equivalent to avoiding the use of one barrel of oil.<sup>7</sup>

Recycled asphalt shingles can be used in paving applications, aggregate for road construction, dust control on gravel roads, cold patch asphalt, and as feedstock/fuel for cement kilns and coal-fired boilers. The primary use of recycled shingles has been in hot mix asphalt.<sup>8</sup>

Recycling asphalt shingles can be a cost-savings to both roofing and paving contractors as well as to the individuals and organizations that use their services. The cost to dispose of asphalt shingles at recycling plants is generally less than at landfills, and asphalt shingles used in paving have been shown to reduce paving costs.<sup>9</sup> In addition, adding shingles to hot-mix and cold-patch asphalt has been shown to increase pavement's resistance to wear and moisture, as well as decreased deformation and rutting; and thermal and fatigue cracking.<sup>10</sup>

## WASTE MANAGEMENT STRATEGIES FOR CONTRACTORS & HOMEOWNERS

### Source Reduction & Reuse:

- Careful purchasing (measuring accurately, buying only what is needed) will help to reduce waste.
- Donation of unused materials to Habitat for Humanity® or other charitable organizations is one solution
- Posting on a Materials Exchange Website is another solution. Materials Exchanges provide residents and businesses with the opportunity to list and search through unwanted but usable items. A list of the Northeast Materials Exchanges can be found on the Web at [http://www.nerc.org/documents/material\\_exchanges\\_in\\_the\\_northeast.html](http://www.nerc.org/documents/material_exchanges_in_the_northeast.html).

### Recycling:

- A homeowner who is re-roofing an entire dwelling or re-modeling a portion of a roof can ask contractors to provide a plan/price for separating the discarded asphalt shingles for recycling. The Website <http://www.shinglerecycling.org> has a comprehensive state-by-state listing of shingle recycling opportunities and regulations. See also the links and tables at the end of this fact sheet.

## MANUFACTURING NEW PRODUCTS FROM RECYCLED ASPHALT SHINGLES

Using recycled asphalt shingles (RAS) as feedstock in new products is important for reducing the negative environmental impacts and other costs associated with the extraction, transportation, and processing of virgin materials. It also conserves landfill space. The use of recycled asphalt shingles reduces the amount of virgin resources used in production and reduces costs for manufacturers and consumers. By recycling used asphalt shingles, roofing and contracting companies are able to reduce their disposal fees and enhance their public image. Recycling asphalt shingles is known to

<sup>6</sup> BioCycle, "Analyzing What's Recyclable in C & D Debris," November 2003, p. 53 (<http://www.igpress.com>)

<sup>7</sup> Owens Corning announcement- shingle recycling program with Earth911 (<http://owenscorning.mediaroom.com/index.php?s=2370&item=66527>)

<sup>8</sup> Construction Materials Recycling Association, *Recycling Tear-Off Asphalt Shingles: Best Practices Guide*, October 11, 2007, p.28. See [Shingle Recycling Organization](http://shinglerecycling.org/) (<http://shinglerecycling.org/>) for link to document.

<sup>9</sup> Dale Rand, P.E. Recycled Asphalt Shingles in Texas, Texas Department of Transportation. See [Shingle Recycling Organization](http://shinglerecycling.org/) (<http://shinglerecycling.org/>) for link to Webinar: Recycled Asphalt Shingles in Hot Mix Asphalt, 2011

<sup>10</sup> National Association of Home Builders, *From Roofs to Roads*

reduce greenhouse gas emissions.<sup>11</sup> The U.S. Department of Transportation Federal Highway Administration has published guidelines for using roofing shingle scrap in pavement construction.<sup>12</sup>

## STATUS OF ASPHALT SHINGLE RECYCLING NATIONALLY

Across the country, shingle recycling is taking off. Importantly, several states have authorized the use of shingles in paving mixes. For example:

- **Georgia Department of Transportation** has an approved specification for the use of both manufacturers' shingle scrap and tear-off (post-consumer) shingle scrap in pavement. RAS in the recycled mixture are limited to no more than 5% of the total weight of the hot-mix asphalt mixture. Shingle recyclers using post-consumer RAS are required to provide test results for bulk sample analysis (Polarized Light Microscopy) to certify the RAS material is asbestos free.<sup>13</sup>
- **Indiana** currently has a standard specification allowing the use of recycled asphalt shingles in their hot mix asphalt (HMA) mixtures. The 2012 Standard Specifications were revised to allow tear-off shingle scrap. RAS materials shall not contribute more than 25% by weight (mass) of the total binder content for any HMA mixture.<sup>14</sup>
- Metro Waste Authority in Des Moines, **Iowa**, supports shingle recycling by offering a discounted disposal and rebate program for shingles.<sup>15</sup>
- In New England, **Maine, Massachusetts, and New Hampshire** allow for the use of asphalt shingles in road construction materials (see next section for more details.)
- **Maryland** Department of Transportation has specifications that allow the use of up to 5% manufacturers' shingle scrap into pavement.<sup>16</sup>
- **Minnesota Department of Transportation** recently adopted new specifications that allow the use of post-consumer reclaimed asphalt shingles in pavement. Pre and post-consumer RAS in the recycled mixture are limited to no more than 5% of the total weight of the hot-mix asphalt mixture.<sup>17</sup>
- **Missouri Department of Transportation** has specifications that allows the use of up to 7% recycled asphalt shingles, manufacturers' or tear-off, in hot-mix asphalt.<sup>18</sup>
- **North Carolina Department of Transportation**, in collaboration with asphalt pavers, tested the performance of asphalt-containing, post-consumer reclaimed asphalt shingles (PRAS) on

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<sup>11</sup> U.S. EPA Solid Waste Management and Greenhouse Gases; Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model (WARM). [Asphalt Shingle Chapter](http://www.epa.gov/climatechange/wycd/waste/downloads/Asphalt%20Shingles.pdf) (<http://www.epa.gov/climatechange/wycd/waste/downloads/Asphalt%20Shingles.pdf>)

<sup>12</sup> U.S. DOT, Federal Highway Administration, *User Guidelines for Waste and Byproduct Materials in Pavement Construction*, FHWA-RD-97-148

<sup>13</sup> Georgia Department of Transportation. Standard Specifications Construction of Transportation Systems. Section 402 – Hot Mix Recycled Asphalt Concrete. June 2001.

(<http://www.dot.state.ga.us/doingbusiness/TheSource/Pages/specifications.aspx>)

<sup>14</sup> Indiana Department of Transportation. 2012 Standard Specifications. Section 400 - Asphalt Pavements.

(<http://www.in.gov/dot/div/contracts/standards/book/sep11/sep.htm> or specifically:

<http://www.in.gov/dot/div/contracts/standards/book/sep11/4-2012.pdf>)

<sup>15</sup> Des Moines, [Metro Waste Authority](http://mwatoday.com/business/shingle_recycling.aspx) ([http://mwatoday.com/business/shingle\\_recycling.aspx](http://mwatoday.com/business/shingle_recycling.aspx))

<sup>16</sup> Maryland Department of Transportation. Standard Specifications for Construction and Materials. Category 900-Materials. July 2008. (<http://www.sha.maryland.gov/OHD/FrontPage.pdf>)

<sup>17</sup> Minnesota Department of Transportation. Bituminous Engineering. February 2011.

(<http://www.dot.state.mn.us/materials/bituminous.html>). More specifically:

[http://www.dot.state.mn.us/materials/bituminousdocs/Specifications/2010/Shingle\\_MWSS\\_2010\\_02-22-2010.pdf](http://www.dot.state.mn.us/materials/bituminousdocs/Specifications/2010/Shingle_MWSS_2010_02-22-2010.pdf) and

[http://www.dot.state.mn.us/materials/bituminousdocs/Specifications/2010/Shingle\\_TOSS\\_2010\\_02-22-2010.pdf](http://www.dot.state.mn.us/materials/bituminousdocs/Specifications/2010/Shingle_TOSS_2010_02-22-2010.pdf))

<sup>18</sup> Missouri Department of Transportation. Missouri Standard Specifications for Highway Construction. 2011.

([http://www.modot.mo.gov/business/standards\\_and\\_specs/highwayspecs.htm](http://www.modot.mo.gov/business/standards_and_specs/highwayspecs.htm))

DOT-funded road projects. The positive application results and the fiscal cost savings prompted DOT to issue a new specification for post-consumer RAS effective in October, 2011.<sup>19</sup>

- **Ohio Department of Transportation** has an approved specification for the use of both manufacturers' shingle scrap and tear-off (post-consumer) shingle scrap in pavement. Allows the use of no more than 5.0% RAS by dry weight of mix.<sup>20</sup>
- **Oregon** has investigated the use of shingles in hot mix asphalt, and has approved recycled asphalt in road paving mix. The cost of shingle disposal at the recycler is \$20 less than the tip fee at a transfer station.<sup>21</sup>
- **Centre County (Pennsylvania) Solid Waste Authority** has begun accepting asphalt shingles, nails, and tar paper. These materials are shipped to a processor that re-grinds them for use in asphalt operations. The tip fee at the Authority is \$35, or one half of what it would be if the material were disposed in the trash.<sup>22</sup>
- **Texas Department of Transportation** has developed state specifications and procedures to allow the use of both pre-and post-consumer asphalt shingles in paving projects.<sup>23</sup>
- In **Wisconsin**, the recycling of asphalt roofing shingles has increased during the past five years.<sup>24</sup>

One barrier to recycling asphalt shingles has been a concern about asbestos. Asbestos was used in the production of the shingle fiber mat in the 1960's and 1970's, and it has been feared that asbestos might be found in shingle waste. However, studies done for the Chelsea Center in Massachusetts in 2000, found only very small amounts of asbestos. Most states, although believing the potential for the presence of asbestos to be minimal, have developed testing protocols for asbestos identification.

## SHINGLE RECYCLING IN THE NORTHEAST

- **Connecticut** has a General Permit for the Storage and Processing of Asphalt Roofing Shingle Waste.<sup>25</sup> Currently, there are four shingle recycling operators registered under the general permit to recycle asphalt shingles. Connecticut requires shingle recycling facilities to test quarterly for asbestos.
- **Delaware** has a Beneficial Use Determination Policy that allows the use of manufacturers' recycled asphalt shingles in hot-mix asphalt. There is currently one shingle recycling operator in the state.<sup>26</sup>

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<sup>19</sup> <http://www.ncdot.org/doh/preconstruct/ps/word/SP6R01.doc>

<sup>20</sup> State of Ohio Department of Transportation. Supplemental Specification 800 Revisions to the 2010 Construction & Material Specifications. January 2011.

([http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/CMS800-2010\\_1212011.pdf](http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/CMS800-2010_1212011.pdf))

<sup>21</sup> See [Preliminary Investigation of RAP and RAS in HMAC](#)

([http://www.oregon.gov/ODOT/TD/TP\\_RES/docs/Reports/2010/RAP\\_and\\_RAS\\_inHMAC.pdf?ga=t](http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2010/RAP_and_RAS_inHMAC.pdf?ga=t)) for Oregon Department of Transportation; [Oregon DOT Specification Section 00745](#) (<http://www.apao.org/documents/SP745-05232011.pdf>) for Hot Mixed Asphalt Concrete; and [the article](#) ([http://blog.oregonlive.com/pdxgreen/2011/04/portlands\\_northwest\\_shingle\\_re.html](http://blog.oregonlive.com/pdxgreen/2011/04/portlands_northwest_shingle_re.html)) *Portland's Northwest Shingle Recyclers Grind Oil From Shingles For Reuse As Asphalt For Roads.*

<sup>22</sup> [Pennsylvania State University Extension](#) (<http://extension.psu.edu/centre/news/2011/recycling-programs-you-may-not-know-about>)

<sup>23</sup> Rand, 2011. See Footnote 9 above for link.

<sup>24</sup> [University of Wisconsin Extension](#) (<http://fyi.uwex.edu/shwec/2011/06/09/shingle-recycling-increases-in-wisconsin/>)

<sup>25</sup> Connecticut Department of Energy and Environmental Protection, [General Permit](#) ([http://ct.gov/dep/cwp/view.asp?a=2709&q=324192&depNav\\_GID=1643](http://ct.gov/dep/cwp/view.asp?a=2709&q=324192&depNav_GID=1643))

<sup>26</sup> Matheu J. Carter, P.E. T2 Engineer *Shingles-Use in Hot Mix Asphalt Pavement*, Delaware T2 Center Technical Brief, ([http://www.ce.udel.edu/dct/T2/T2TechnicalBriefs/Recycled\\_Shingles\\_in\\_HMA.pdf](http://www.ce.udel.edu/dct/T2/T2TechnicalBriefs/Recycled_Shingles_in_HMA.pdf))



- **Maine** has a Beneficial Use Determination Policy (Chapter 418 of its Solid Waste Rules) and one shingle recycling facility. This facility accepts shingles from all New England states. Shingles are accepted, inspected, and processed into appropriate sizes, and then may become road products such as hot-mix or cold-patch asphalt, meeting Maine Department of Transportation specifications.<sup>27</sup>
- **Massachusetts** currently allows manufacturers' scrap shingles in hot-mix asphalt pavement.<sup>28</sup> MassDOT is researching the use of post-consumer scrap, and evaluating price and performance in comparison to virgin asphalt.<sup>29</sup> The Massachusetts Department of Environmental Protection (MADEP) has issued Beneficial Use Determination permits for facilities that recycle asphalt shingles. There are currently three in the Commonwealth. MADEP has developed a post-consumer asphalt shingles work group, and is working with transportation agencies to develop specifications for post-consumer asphalt shingles in road applications. A waste ban for asphalt shingles is under discussion.
- **New Hampshire's Department of Transportation**, in its 2010 Annual Report, states that it "is the first state in the Northeast to specifically allow recycled asphalt shingles (RAS) in the NHDOT's asphalt mixes."<sup>30</sup> In 2010, the state published a document laying out the specifications for RAS in hot mix asphalt, and developed an asbestos management plan for approved asphalt shingles facilities<sup>31</sup> New Hampshire currently has approved two facilities.
- **New Jersey's Department of Environmental Protection** has a Beneficial Use Determination Policy.<sup>32</sup> The New Jersey Department of Transportation, in its paving specifications (901.05.06 and 902.02.02), allows for Ground Bituminous Shingle Scrap.<sup>33</sup>
- **New York's Department of Environmental Conservation** has Beneficial Use Regulations (BUD.)<sup>34</sup> There are four permits approved for use of asphalt shingles in a paving application. New York has two shingle recycling facilities.
- **Pennsylvania's Department of Environmental Protection** uses a General Permit system for beneficial use of various wastes, including shingles. Currently there are two General Permits, WMGR079 and WMGR039, for use of manufacturer's scrap and tear-offs or post-consumer shingles for hot-mix and cold patch asphalt, a component of sub-base material, as dust control on rural roads when applied with a binder, or as a component or ingredient in fuel used in cement or manufacturing or in the generation of electricity or steam. General Permit WMGR116 allows for waste asphalt shingles as alternative fuels.<sup>35</sup> The Pennsylvania Department of Transportation currently has a specification allowing only for the use of

<sup>27</sup> [State of Maine, \(http://www.maine.gov/spo/recycle/docs/final%20plan%20Wastecover01-26-09.pdf\)](http://www.maine.gov/spo/recycle/docs/final%20plan%20Wastecover01-26-09.pdf) Waste Management and Recycling Plan, *Waste or Resource? Rethinking Solid Waste Policy* January, 2009, p. 51

<sup>28</sup> Massachusetts Highway Department, 2005 Quality Assurance Specifications for Hot Mix Asphalt Pavement, Section 450. ([http://www.smoothpavements.com/files/MA\\_HMA\\_1\\_1.PDF](http://www.smoothpavements.com/files/MA_HMA_1_1.PDF))

<sup>29</sup> [Meeting Notes \(http://www.mass.gov/dep/public/committee/market2.doc\)](http://www.mass.gov/dep/public/committee/market2.doc) from Solid Waste Master Plan Workgroup on Market Development/State Procurement, March 30, 2009

<sup>30</sup> New Hampshire Department of Transportation, [Annual Report \(http://www.nh.gov/dot/media/documents/2010AnnualReport.pdf\)](http://www.nh.gov/dot/media/documents/2010AnnualReport.pdf) Fiscal Year 2010, p. 20

<sup>31</sup> New Hampshire Department of Transportation, *Qualification of Recycled Asphalt Shingle (RAS) Product Suppliers for use in Hot Mix Asphalt.* (<http://www.nh.gov/dot/org/projectdevelopment/materials/documents/RAS-qualcriteria.pdf>)

<sup>32</sup> [Guidance Document for the Beneficial Use Project \(BUD\) Approval Process, \(http://www.nj.gov/dep/dshw/rtrp/bud.htm\)](http://www.nj.gov/dep/dshw/rtrp/bud.htm) Revised 8/12/2009

<sup>33</sup> New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2007, (<http://www.state.nj.us/transportation/eng/specs/2007/spec900.shtm#s901>)

<sup>34</sup> NYS Solid Waste Regulations Chapter IV, Part 360-1.15.

<sup>35</sup> [Pennsylvania Department of Environmental Protection \(http://www.portal.state.pa.us/portal/server.pt/community/permitting2/14095/list\\_of\\_residual\\_waste\\_beneficial\\_use\\_permits/589685\)](http://www.portal.state.pa.us/portal/server.pt/community/permitting2/14095/list_of_residual_waste_beneficial_use_permits/589685)

manufacturer's scrap in certain road projects. PennDOT states in a fact sheet that they will continue to experiment with post-consumer shingles.<sup>36</sup>

- **Rhode Island** has a permitting process for Construction and Demolition processors requiring a permit for those processing greater than 50 tons per day.<sup>37</sup>
- **Vermont** has been studying the use of recycled asphalt shingles in road applications. A report published in 2002 evaluated its use in several paving uses. Currently a committee of industry representatives, solid waste district representatives, the Agency of Natural Resources, and the Agency of Transportation are reviewing the issue, and developing specifications allowing for the use of shingles in pavement.<sup>38</sup>

**Table II. Shingle Recycling Companies in the Northeast United States<sup>39</sup>**

STATE	COMPANIES	LOCATION
Connecticut	Asphalt Roofing Recycling Center	Stratford
	United Recycling of Shelton	Shelton
	Incorporated Industries	Bloomfield
	Babylon Recycling Center	Suffield
Delaware	Tilcon Delaware, Inc.	Dover
Maine	Commercial Paving & Recycling Corporation (CPRC)	Scarborough
	Aggregate Recycling Corporation	Eliot
Massachusetts	Asphalt Reclamation, Inc.	Fitchburg
	P.J. Keating, Co.	Lunenburg
	Recycle America Enterprise	Fitchburg
	Roof Top Recycling, Inc.	Boxborough
New Hampshire	Recycled Asphalt Shingles-Technology	Brentwood
New Jersey	Bayshore Recycling Corporation	Keasbey
	County Conservation Co.	Sewell
New York	Island Shingle Recycling Corporation	Calverton
	Triad Recycle and Energy Corporation	Tonawanda
Pennsylvania	Accurate Recycling Corp.	Lansdowne & other locations
	Richard S. Burns and Co.	Philadelphia
	Crushcrete, Inc.	Bethlehem
	Frank Casilio and Sons	Bethlehem
	Pennsy Supply	Harrisburg
Rhode Island	ASR Systems	Barrington

<sup>36</sup> Pennsylvania Department of Transportation, [Engineering and Construction Management System \(http://www.dot14.state.pa.us/ECMS/?\)](http://www.dot14.state.pa.us/ECMS/) (ECMS) and Strategic Recycling Program [Fact Sheet \(ftp://ftp.dot.state.pa.us/public/Bureaus/design/SEMP/FACTS/Used%20Shingles.pdf\)](ftp://ftp.dot.state.pa.us/public/Bureaus/design/SEMP/FACTS/Used%20Shingles.pdf)

<sup>37</sup> State of Rhode Island and Providence Plantations, Department of Environmental Management, Office of Waste Management, Solid Waste Regulation # 7, April 2001.

<sup>38</sup> Grodinsky, Plunkett, and Surwilo, [Performance of Recycled Asphalt Shingles for Road Applications, \(http://www.anr.state.vt.us/dec/wastediv/recycling/pubs/Asphalt%20Shingle%20Final%20Report.pdf\)](http://www.anr.state.vt.us/dec/wastediv/recycling/pubs/Asphalt%20Shingle%20Final%20Report.pdf) Final Report, September 2002. Email from Mark Wolaver, Vermont Agency of Transportation.

<sup>39</sup> Sources: [shinglerecycling.org](http://shinglerecycling.org) and state Websites listed above.

## FOR MORE INFORMATION

For more information, refer to the footnotes for citations and links to specific documents. The following sources provide useful additional information:

### Websites

<http://www.calrecycle.ca.gov/ConDemo/Shingles/default.htm>

California Integrated Waste Management Board's webpage provides an introduction to the topic of asphalt roofing shingles recycling.

[www.shinglerecycling.org](http://www.shinglerecycling.org)

An extensive and detailed Website devoted to the issues and practices of shingle recycling. There is a link for the Construction Materials Recycling Association (CMRA) publication "*Recycling Tear-Off Asphalt Shingles: Best Practices Guide*".

<http://www.arra.org/>

Asphalt Recycling Reclaiming Association's website. ARRA is an organization of businesses involved in asphalt recovery, primarily from road paving projects.

<http://www.asphaltpavement.org/>

National Asphalt Pavement Association's website

[www.epa.gov/wastes/conserves/rrr/imr/cdm/pubs/roof\\_br.pdf](http://www.epa.gov/wastes/conserves/rrr/imr/cdm/pubs/roof_br.pdf)

This will take you to the National Association of Homebuilders Pamphlet, "*From Roofs to Roads*."

[www.epa.gov/climatechange/wycd/waste/downloads/asphalt-shingles10-28-10.pdf](http://www.epa.gov/climatechange/wycd/waste/downloads/asphalt-shingles10-28-10.pdf)

EPA developed a waste reduction model (WARM) to estimate greenhouse gas emissions from several materials management practices. This is the report on shingles.

[www.cdrecycling.org](http://www.cdrecycling.org)

The Construction Materials Recycling Association has information about recycling many materials. See also the 2007 Report and 2009 Webinar on *Environmental Issues of Recycling Tear-Off Roofing Shingles*.

### Publications

- [Best Practices Guide for Post-Consumer Reclaimed Asphalt Shingles in Asphalt Pavement](http://portal.ncdenr.org/c/document_library/get_file?uuid=79a33b8b-f2c1-468f-a5cf-ad8995b6b96c&groupId=38361) ([http://portal.ncdenr.org/c/document\\_library/get\\_file?uuid=79a33b8b-f2c1-468f-a5cf-ad8995b6b96c&groupId=38361](http://portal.ncdenr.org/c/document_library/get_file?uuid=79a33b8b-f2c1-468f-a5cf-ad8995b6b96c&groupId=38361)) Carolina Asphalt Pavement Association, September 2011.
- Scholz, Todd V., [Preliminary Investigation of RAP and RAS in HMAC](http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2010/RAP_and_RAS_in_HMAC.pdf) ([http://www.oregon.gov/ODOT/TD/TP\\_RES/docs/Reports/2010/RAP\\_and\\_RAS\\_in\\_HMAC.pdf](http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2010/RAP_and_RAS_in_HMAC.pdf)) Final Report SR 500-291 for Oregon Department of Transportation Research Section, Salem, Oregon, February, 2010.
- Schroer, Joe, [Missouri's Use of Recycled Asphalt Shingles \(RAS\) in Hot Mix Asphalt](http://www.intrans.iastate.edu/pubs/midcon2009/SchroerShingles.pdf). (<http://www.intrans.iastate.edu/pubs/midcon2009/SchroerShingles.pdf>), Iowa State University, 2009.
- Lee, P.E., Robert, [From Roofs to Roads](ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/txapa_shingles_article_092509.pdf) ([ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/txapa\\_shingles\\_article\\_092509.pdf](ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/txapa_shingles_article_092509.pdf)), Texas Department of Transportation, April 2009.
- Carter, Matheu J., [Shingles-Use in Hot Mix Asphalt Pavement](http://www.ce.udel.edu/dct/T2/T2TechnicalBriefs/Recycled%20Shingles%20in%20HMA.pdf) (<http://www.ce.udel.edu/dct/T2/T2TechnicalBriefs/Recycled%20Shingles%20in%20HMA.pdf>) Delaware T<sup>2</sup> Center Technical Brief, November 2008.
- Bauman, Amy, [Asphalt Shingle Recycling in Massachusetts](http://www.greengoat.org/pdf/asphalt.pdf), (<http://www.greengoat.org/pdf/asphalt.pdf>), Green Goat, March 2005.

- Grodinsky, Carolyn, Plunkett, Nancy, and Surwilo, James; [Performance of Recycled Asphalt Shingles for Road Applications](http://www.anr.state.vt.us/dec/wastediv/recycling/pubs/Asphalt%20Shingle%20Final%20Report.pdf), (<http://www.anr.state.vt.us/dec/wastediv/recycling/pubs/Asphalt%20Shingle%20Final%20Report.pdf>) Final Report, Vermont Agency of Natural Resources, September, 2002.