

**A “Greener” New Hampshire
through Sustainability**

From Roofs To Roads

**NH Asphalt Shingle Specification and
Producer Qualification Criteria**

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Outline

- Asphalt terminology
- Concerns with using recycled binder
- Shingles in the NH Paving Industry
- Asphalt shingle components
- NHDOT shingle specification development
- NHDOT recycled shingle supplier qualification

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Asphalt Terminology

- Hot Mixed Asphalt (**HMA**): Hot mixture of asphalt binder (liquid) and stone aggregate used to make asphalt pavements.
- Recycled Asphalt Shingles (**RAS**) : Roof shingles from either post-consumer (tear-off) or manufacturing waste sources.

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Asphalt Terminology

- Recycled Asphalt Pavement (**RAP**): Old asphalt pavement that is incorporated into new asphalt mix.
- **Replacement Binder** – recycled asphalt binder from RAS or RAP that is replacing some of the virgin binder in HMA.
- **Performance Grade Asphalt Binder** is specified based on performance within a temperature range.

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Concerns with Using Recycled Binder:

- Oxidation hardens binder as it ages, causing it to be more prone to cracking in cold temperatures.

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- Asphalt from shingles is much harder than HMA binder grades used in New England.

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Concerns with Using Recycled Binder:

- Oxidation hardens binder as it ages, causing it to be more prone to cracking in cold temperatures.
- Asphalt from shingles is much harder than HMA binder grades used in New England.
- Adding large percentages of age-hardened recycled binder to new mix requires selection of softer virgin binders to compensate for the harder recycled binders.

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Shingles in the NH Paving Industry:

- A NH shingle manufacturer has worked with NHDOT to develop a marketable recycled product since 2007.
- Paving contractors have used shingles in the private sector for 3-4 years.
- NHDOT has approached the use of shingles cautiously. A single failure of a new technology can mean the end of its use for many years.

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Shingles in the NH Paving Industry:

- New Hampshire is the first state in the Northeast to have a specification allowing the use of both manufacturing waste and post-consumer roof shingles in its HMA.
- NHDOT qualifies RAS Product suppliers to ensure consistent, quality materials, while protecting public safety.

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The National Annual Shingle Waste Stream

(why it is worthwhile)

- 1 Million Tons of manufacturing waste.
- 10 Million Tons of tear-offs (post-consumer waste).

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What is Manufacturing Waste?

- Sheet end and tab trimmings from the manufacture of new shingles, containing:
 - 25-30% asphalt binder; stiffer grade than in HMA.
 - 40-60% fine aggregate (retained on No. 30 and No. 60 sieves).
 - 3-12% asbestos-free fiber. No contaminants.

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Is it possible to use too much?

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Probably...
This is 100% RAS Pavement.



Parking Lot in Savannah, Georgia

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What Are Tear-offs?

Old Shingles from single and multi-layered roofs



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What's In Tear-off Shingles?

Similar to Manufacturing Waste, But:

- Asphalt binder is additionally hardened from 30+/- years of exposure.
- Nails, wood, metal and other debris must be removed before use.
- Many pre-1980s shingles contain asbestos.

Separation and Preliminary Processing



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What's In Tear-off Shingles?

The final product may contain up to 24% dust, a factor affecting HMA mix designs.

Final Grinding Process



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HMA – RAS Specification Development

- NH specification approved Spring 2009.
- RAS is measured as % reused asphalt binder from shingles; max. 0.6% of the mix (~10% of binder). It can be used alone or combined with RAP binder.
- Specification is blind to RAS source; post-consumer or manufacturing waste. Composite binder must meet specified grade.

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RAS Supplier Qualification

- Development began summer 2009; completed in January 2010.
- NH was invited to join MA Asphalt Shingles Work Group, consisting of MASS DOT, MASS DEP and several recycled shingle suppliers.
- Solicited Work Group's input on crushed shingle gradation and asbestos management plan.

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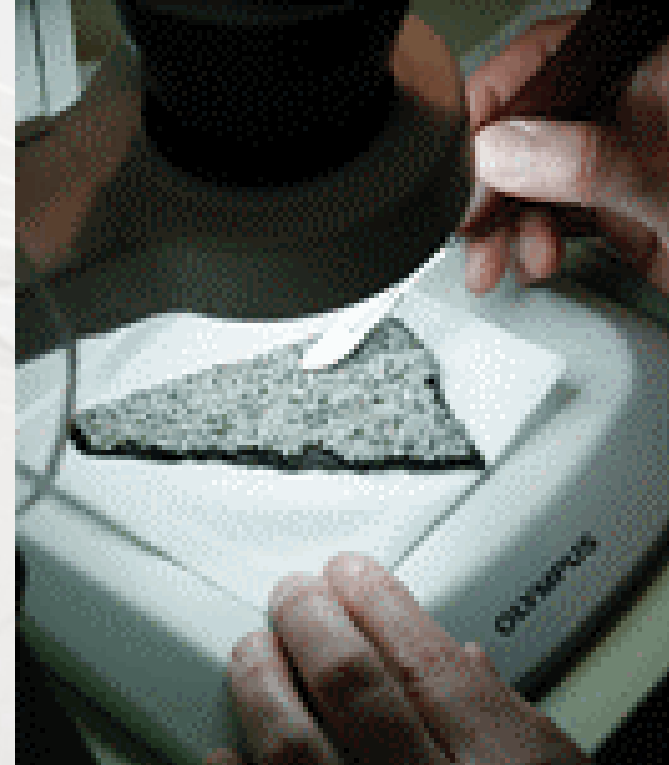
RAS Supplier Qualification

- MA & NH worked closely to develop what could be a regional model qualification for RAS suppliers.
- Broad use of the same qualification process would allow the same RAS product to be used in multiple states.
- NH has qualified 2 RAS product suppliers; 1 in MA and 1 in NH.

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Elements of RAS Product Supplier Qualification

1. Asbestos management plan; a certified asbestos inspector must check every incoming load.



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Elements of RAS Supplier Qualification

2. Supplier must have appropriate environmental permits from its resident State.
3. Must meet requirements of AASHTO MP 15, guiding max. particle size (1/2"), addition rates to HMA and deleterious substances.
4. RAS product meets specific gradation requirements.

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RAS product ready for use in HMA



TRB Mix Design Criteria

Max. % RAP Binder	Max % RAS Product Binder	Max Combined % TRB	Application Requirements
1.5*	0.6	1.0-1.5*	a. Composite binder must meet specified PG grade. Split sample testing to verify compliance of design.
			b. Test RAP & RAS product for gradation and AC% every 1,000 & 500 tons, respectively.
			c. Only allowed for binder & base courses.
			d. Cover RAP stockpiles.
			e. Only allowed in a drum mixer.
			f. Run split samples at start of production, and every 10,000 tons for composite binder testing.

* Equivalent to 37.5% RAP at 4% AC.

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RAS Hot Mix Asphalt Mix Design

- AASHTO PP 53 used as a guideline.
- Contractor develops mix design and submits to NHDOT for approval prior to Jan. 1.
- Only 1 contractor has worked on a RAS mix design.
- No RAS HMA has been approved or placed for NHDOT to date.

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RAS Supplier Qualification:
<http://www.nh.gov/dot/org/projectdevelopment/materials/documents.htm>



Questions?