



Shingles in Paving Demonstration Project

King County, Washington

4th Asphalt Shingle Recycling Forum

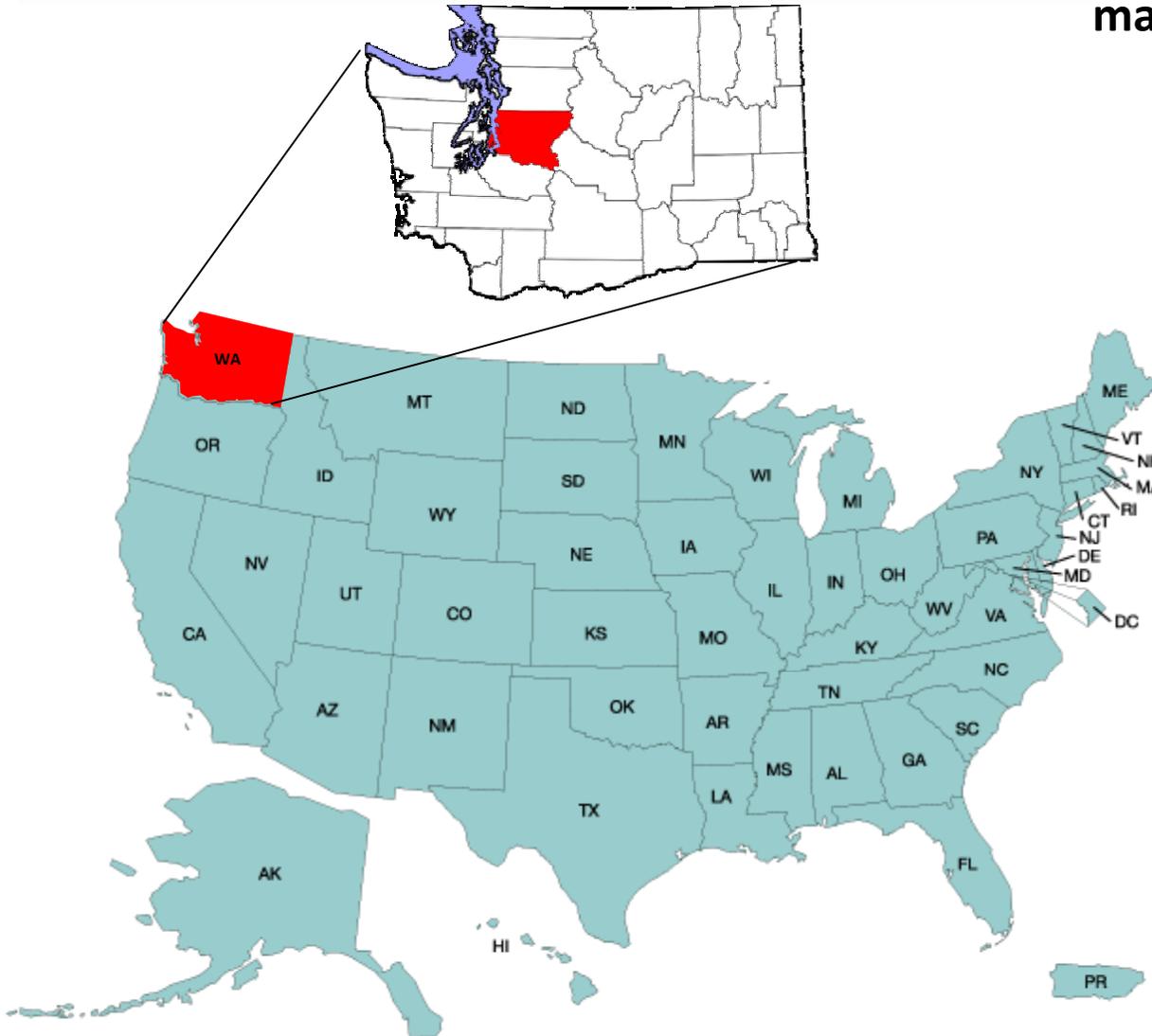
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Building partnerships to expand markets for recycled materials



- Market development through reliable suppliers
- Evaluating technologies and markets
- Providing resources and information
- Assisting with material and product testing
- Marketing and communications assistance
- 2009 focus on **asphalt shingles**, polystyrene, and mattresses.

Market Development Opportunity



Valuable resource sent to landfill

- 17,000 tons generated annually in King County
- Only 1,000 tons are recycled

Limited recycling markets

- Road base
- Fuel
- Hot-mix asphalt (HMA)
- Cold Patch



Shingles in Paving Demonstration

Two year effort to demonstrate the use of tear-off RAS in HMA

- Exclusive focus on HMA
- Partner with KCDOT
- Identify a major road
- Pave the wear course
- Test RAS with RAP

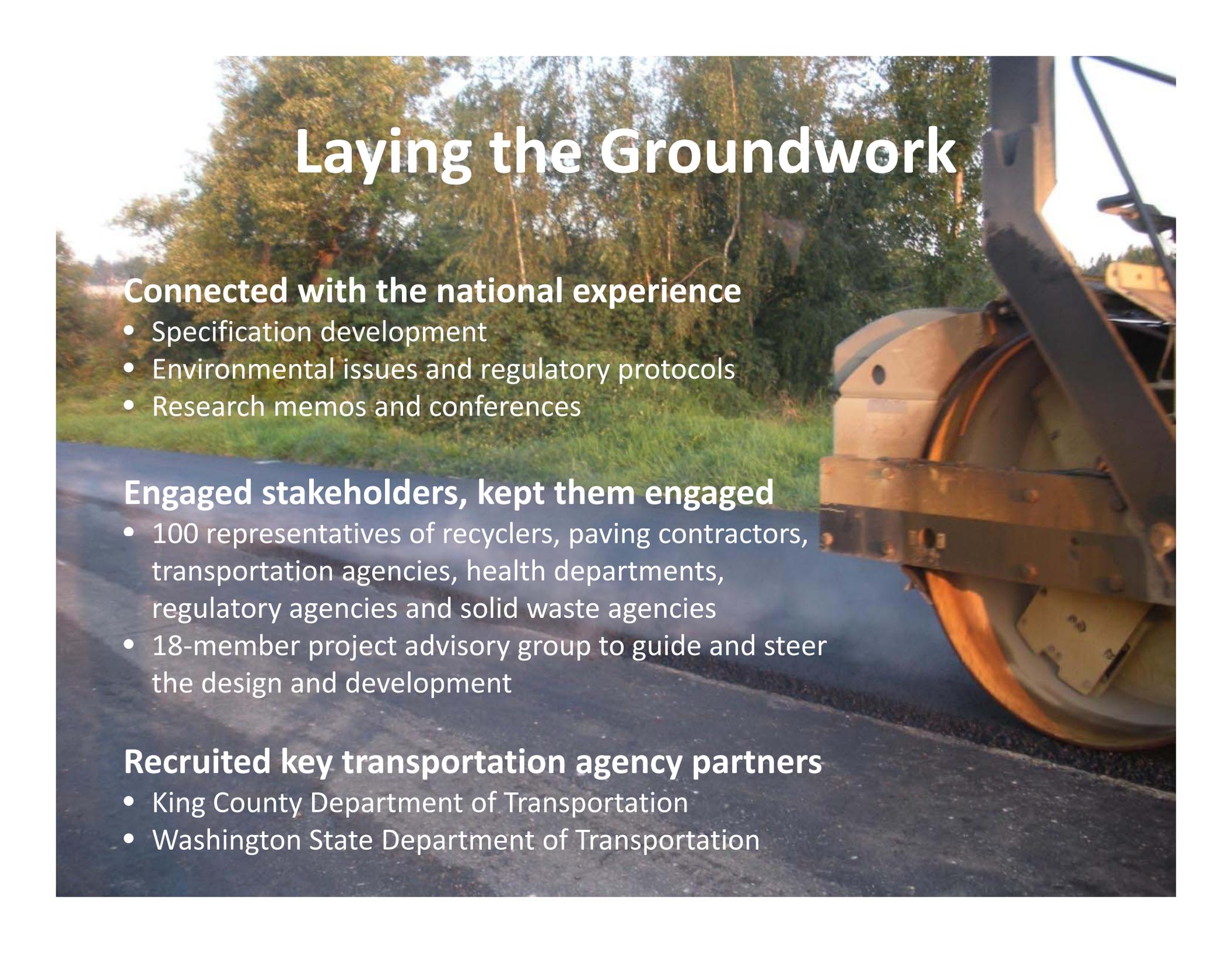
Cost-effective product that:

- Meets specifications
- Performs over time
- Minimizes risk
- Diverts significant tonnages from landfills

Design considerations:

- Minimize risk
- Performance over time
- Health, environmental and safety standards
- Recognition by industry and public agencies
- Broad application of results

Laying the Groundwork

A large yellow steamroller is shown in the process of paving a road. The machine is positioned on the right side of the frame, with its large, heavy-duty rollers visible. The road surface is dark and appears to be freshly laid asphalt. In the background, there is a dense forest of tall, thin trees, likely birches, under a clear sky. The overall scene is set outdoors during the day.

Connected with the national experience

- Specification development
- Environmental issues and regulatory protocols
- Research memos and conferences

Engaged stakeholders, kept them engaged

- 100 representatives of recyclers, paving contractors, transportation agencies, health departments, regulatory agencies and solid waste agencies
- 18-member project advisory group to guide and steer the design and development

Recruited key transportation agency partners

- King County Department of Transportation
- Washington State Department of Transportation



Kris Beatty
KCSWD

Joe Karahuta and Kevin Kelsey
KC Materials Lab

Frank Overton
KC Roads

Tim Shearer and John Grisham
Woodworth & Company

Paul Moore
KC Roads

Joe DeVol
WSDOT Materials Lab

Core Project Team

Road Selection and Test Design

Road selection criteria

- Overlay paving contract
- Two miles in length
- Consistent pavement and subsurface conditions
- Two-lane, relatively straight with limited variable surface conditions

	Test Section #1	Test Section #2	Test Section #3	Test Section #4
1000 tons/day	½ mile	½ mile	½ mile	½ mile
Lane 1	HMA Mix with 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 15% RAP
Lane 2	HMA Mix with 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 3% RAS and 15% RAP	HMA Mix with 15% RAP

Specifications and Testing

Designed to ensure a **high quality product that performs** and meets health, safety, and environmental standards

- Stiffness, cracking – asphalt content
- Extraneous materials
- Asbestos
- Other regulatory (stormwater, air quality, safety, solid waste handling)

Collaborative process with leading transportation and regulatory agencies

Involvement of private industry to ground requirements in reality

- Product samples
- Specification review
- Outcome-oriented approach

Clear responsibilities for KCDOT, WSDOT, and contractor

RAS SPECIFICATIONS

- Asphalt shingles only
- Extraneous waste up to 3%
- Moisture content up to 5%
- Gradation 100% ½", 95% 3/8"
- Sampling per AASHTO
- Asbestos testing

Environmental, Health, and Safety Standards

Key agencies, regulations and rules

- **Washington State Department of Ecology** – solid waste handling and storage
- **Washington State Department of Labor & Industries** – workplace safety rules
- **Puget Sound Clean Air Agency** – asbestos testing and handling
- **Local Health Department(s)** – general compliance, notification of grinding

Took asbestos issue seriously

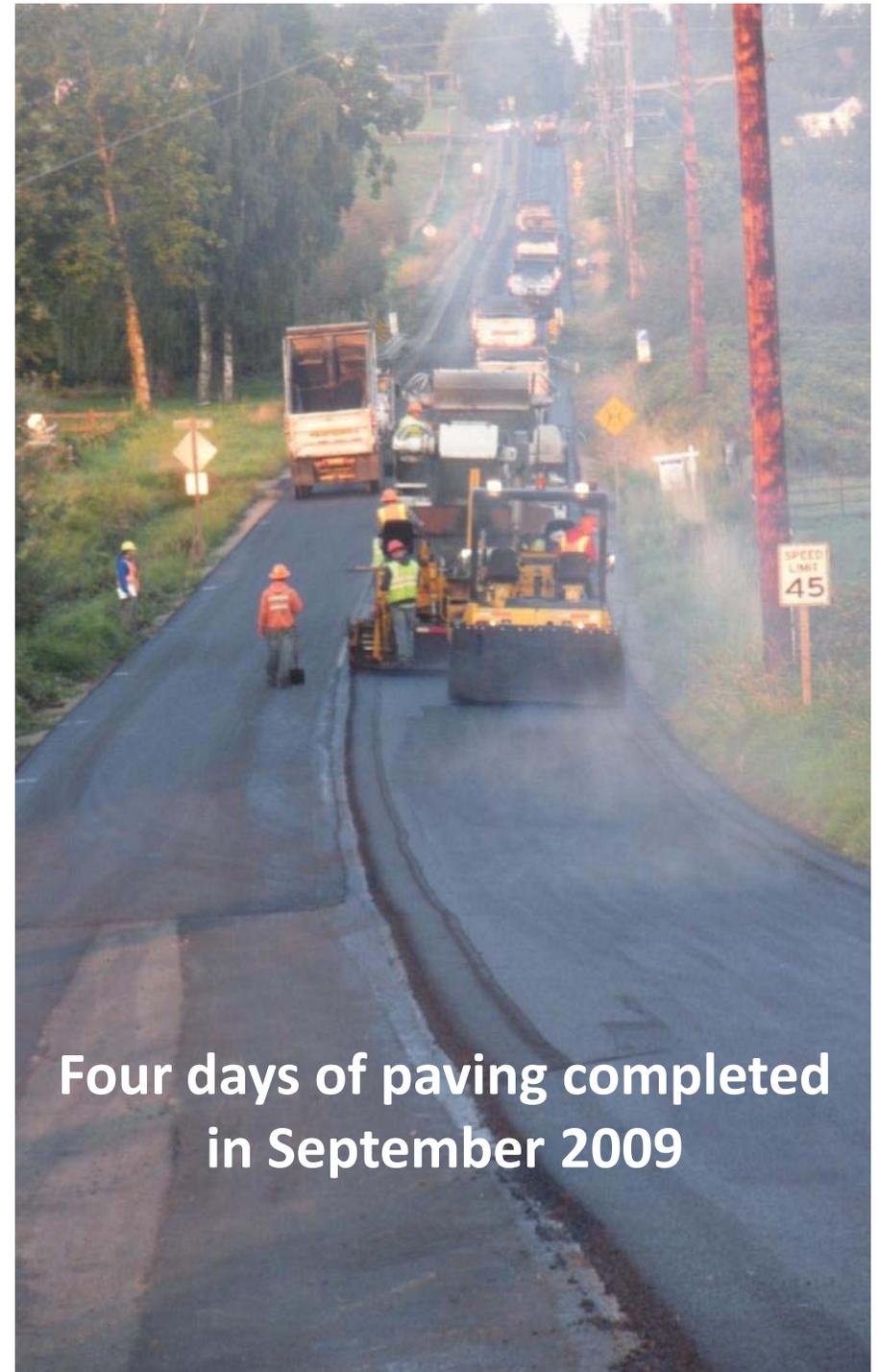
- Restricted supply to asphalt shingles only
- Inspections of incoming loads
- Rigorous sampling and testing standards – we had hits with TEM testing
- Presorted to remove suspect materials such as felt paper, mastic, built up roofing, and shingles with patching or aluminum coating



PAVING AT LAST!

Two-mile stretch of SE 416th Street in South King County

- King County Department of Transportation is the sponsor
- Washington State Department of Transportation provided mix design and laboratory testing
- **3% RAS and 15% RAP**; 4 test sections; 2 control sections
- Woodworth & Company processed RAS and paved the road



Materials and Performance Testing

Current roadway conditions

- Visual inspections by walking
- Paving profile with survey van
- Cores and borings – surface and subsurface conditions
- Deflectometer for structural testing

Materials testing & paving QA/QC

- Joe DeVol to discuss

Post-construction testing

- Paving profile with survey van
- Deflectometer for structural testing
- Skid resistance
- Full report on initial performance data

Three year monitoring

- Annual pavement condition rating
- Paving profile with survey van (year 3)
- Skid resistance (year 3)
- Report and long-term predicted performance (year 3)



A King County road paved with RAS!

High level of commitment by KC Roads, WSDOT, Woodworth & Company

- Survived budget cuts
- Survived asbestos hits (TEM)
- Survived contracting and procurement

Demonstrated trust and adaptability

- Modified procurement process
- Changed asbestos protocol midstream
- Adjusted HMA mix design on the fly
- Contractor willingness to open up their operations; go above and beyond for project success

KC Roads committed to long-term testing and monitoring

Expressed interest in a future RAS specification



Lessons Learned, Further Questions

- **Partnerships** take time, but pay off
- **Everything takes longer than you think** – except paving!
- The **art of balancing rigor with realities in the field** – focus on outcomes
- Importance of **upstream visual inspections and pre-sorting** for acceptable and suspect material
- **Need for additional research and guidance on asbestos sampling and testing**
 - Testing on the roof, incoming loads, before the grind, after the grind
 - Appropriateness of PLM and TEM tests for shingles
 - How friable are shingles? What are the health risks?

More Information

King County LinkUp website

www.kingcounty.gov/linkup

Shingles Recycling website

www.shinglerecycling.org

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