



King County

**Department of Transportation
Road Services Division**

Shingles in Paving

Kevin Kelsey, King County Materials
Laboratory

Recycling and Paving with Recycled Asphalt Shingles
August 5, 2014



Shingles in Paving Demonstration Project

SE 416th St - Enumclaw



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THIS STREAM IS IN YOUR CARE

COAL CREEK

WITHIN THE GREEN-DUWAMISH WATERSHED

3038

Jackson 8

HOLEPLUG

HOLEPLUG

Truck



BEGIN
PAVEMENT
TEST AREA
CALL BEFORE YOU DIG
800-KR0AKS

07/21/2014 13:18

SE 416th Street Overlay Test Section Layout

Station 10 + 20

Station 36 + 50

Station 63 + 10

Station 89 + 66

Station 116 + 00

TEST SECTION # 1

TEST SECTION # 2

TEST SECTION # 3

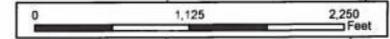
TEST SECTION # 4

15% RAP Only

15% RAP/3% RAS

15% RAP/3% RAS

15% RAP Only



King County Materials Laboratory

SE 416th Street Overlay
Shingles in Paving Demonstration

TEST SECTION LAYOUT

Figure 2

-  Station Line
-  Street Network



January 7, 2010

File Name:
KG T:\Development\ArcMap\ArcMapProjects\SE_416th_St_test_section_map.mxd
Data Sources:
Standard King County datasets used include: trans_network
Roads Datasets Include: SE416thSt_stationing

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Post Construction Testing and Documentation

Pavement Condition ratings

- Walked the Roadway
- Used the Data Distress Van

Pavement Rutting

Roadway Roughness

Skid Resistance Testing



Pavement Performance Results

Three years of extensive material engineering tests and monitoring by KCML, with supplemental testing by WSDOT

Pavement Condition:

- Both KCML and WSDOT surveys revealed PCI of nearly 100.
- The entire roadway is in **excellent** condition.



Test Section 1

07/21/2014 13:29



Test Section 2

07/21/2014 13:29

Test Section 3

07/21/2014 13:25



Test Section 4

07/21/2014 13:18

RAP Section Crack

07/21/2014 13:20

RAS Section Crack

07/21/2014 13:24

Extraneous Materials



07/21/2014 13:31

WSDOT Distress Van Test Findings

- **Rutting** – Minimal but expected rutting; same in all test/control sections.
- **Roughness (IRI)** – Measured below 95 in all test sections; relatively smooth since placement in all test/control sections.



King County Sheriff's Department

- **Skid Resistance** – Favorable skid resistance in wet/dry conditions; same in all test/control sections.



Final Report Conclusions

RAS had no impact, favorable or detrimental, on road performance.

All Reports can be found on the King County Materials Laboratory website:

<http://www.kingcounty.gov/transportation/kcdot/Roads/EngineeringServices/GeotechnicalMaterialsTesting/MaterialsLabServices.aspx>

Washington State University

Long-Term Performance Evaluation

WSU and WSDOT performed lab testing on sample cores to evaluate long-term fatigue cracking, thermal cracking, rutting, and moisture susceptibility.

Findings:

- No significant difference is evident between binders with RAS and those without in terms of resistance to fatigue.
- The rutting resistance of mixtures as well as recovered binders is improved with the addition of RAS.
- In binder tests, thermal cracking resistance of the binders with RAS is less than without RAS, but results were not replicated in mixture tests.

Evaluation conclusion: RAS improves mixture in some ways and is neutral in other ways.

King County Road Services Division Special Provision for RAS in HMA

Based on results of the Shingles in Paving Demonstration Project and recommendations from KCML, KCRSD is developing a special provision for the use of RAS in 2015.

(To be completed by September 2014).



King County Road Services Division

Special Provision for RAS in HMA

KCRSD Special Provision Details:

- **RAS/RAP Replacement Requirements** – 3 percent RAS and 15 percent RAP.
- **Contractor to develop Job Mix Formula and certify**
- **Gradation Requirements** – 100 percent passes 3/8-inch sieve, and minimum of 95 percent passes 1/4-inch sieve.



King County Road Services Division

Special Provision for RAS in HMA

KCRSD Special Provision Details:

- Extraneous Materials – not to exceed 0.5 percent by mass as determined on material retained on the 4.75-mm (No. 4) sieve.
- Blending Methods – Separate cold feed bin or metered pre-blending.
- Follow shingles recycling guidelines as described in King County 2014 Asphalt Shingles Recycling Guidelines.



King County

Shingles Recycling Guidelines

- **Proper Supply Management** – Removal of roofing felt, manual separation of non-shingles debris.
- **Asbestos Management** – Visual inspection of incoming materials, sample testing and verification of no ACM.
- **Compliance with Solid Waste Regulations** – Follow local solid waste management plans and handling regulations or requirements.
- **Worker Safety and Environmental Protection** – Follow all applicable regulations from OSHA, EPA NESHAP, WA L&I, Clean Air Authority, and local health department.
- **Facility Access for Contracting Agency** – Provide Contracting Agency safe access to recycling facility to observe operations and collect samples.

King County Road Services

2015 Paving with RAS

Portion of the Overlay Program

- Place on Heavily Travelled Roadway

Alternative Bid Approach

- Cost Benefit to the County
- Bid Option for the Contractor

- Advertisement – May 1, 2015

King County Roadways

Future Use of RAS

Increase opportunity to use as an alternative bid on roadways under RSD jurisdiction:

- Dependent on Performance
- Dependent on Cost Savings

QUESTIONS?

