

North 63rd Street Pilot Paving Project
Using 5% Asphalt Shingles

Boulder County Transportation Department
April, 2010



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 Project of Boulder County Resource Conservation
 Division

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The Roofs to Roads project has gained support from the Colorado Department of Public Health, Pollution Prevention Advisory Board, Advanced Technology Grant, Region 8 of the Environmental Protection Agency, and from Boulder County's Community Outreach Program.

Our Goals:

1. Keep 100% of Colorado's Waste Shingles Out of Landfills

- 240,000 TONS of asphalt shingles are landfilled in Colorado every year, and 11 million tons per year are landfilled nationally.
- Over 50,000 tons of asphalt shingles were diverted from landfills in 2009.
- Roofers are bringing shingles to collection points.
- Two shingle collections points currently exist in Colorado: Asphalt Specialties has created a collection point in Erie, and has invested in the grinder technology needed to process shingles into RAS.
- Brannan Sand and Gravel creates a collection point for Denver roofers' tear-off shingles. Brannan is also grinding and processing shingles.

2. Establish an Ongoing Market for the Use of RAS

- Develop ongoing use and markets of asphalt material containing Recycled Asphalt Shingles, with municipalities and CDOT writing specifications that allow or mandate the use of Recycled Asphalt Shingles (RAS) from tear-off (demolition) shingles.
- Ensure the public benefits from the significant costs savings recycled shingles offer over the price of virgin or raw asphalt, currently \$5000/tons in Colorado.

3. Avoid Greenhouse Gases Emissions

- A typical paving project (5,000 tons of asphalt) that incorporates 5% recycled shingles (250 tons) avoids the emissions of 27,500 pounds of carbon dioxide (source: COLAS, Sustainable Development: The Environmental Road of the Future: Life Cycle Analysis, September, 2003).

North 63rd Project Description

- North 63rd St. in Boulder County was paved with recycled shingles in April 2009; it is the first road in Colorado to have been paved with this material.
- The one-mile project laid 6 inches of asphalt pavement from Niwot to Oxford on North 63rd St.
- Project Design Engineer, Pamela Hanson, PE; County Engineer, Mike Thomas, PE.
- The north-bound lane includes 20% Recycled Asphalt Pavement (RAP) and 5% recycled asphalt shingles. The south-bound lane includes 20% RAP.
- 4,000 –4,5000 average daily trips.
- PG 58-28



Mix Design

Mix Design

Earth Engineering Consultants, Inc.
Summary of Asphaltic Concrete Laboratory Testing

Sample Information	Client:	ASCI	Mix Information	Date/Time:	4/8/2009 / PM
	Project:	63rd Street - Boulder		Supplier:	ASCI
	Project Location:	Boulder, Colorado		Mix:	S 75
	EEC Project No:	1095016A		Mix No:	E3BM29
	Sample No:	4-9.1		Lift:	N/A
	Location/Tons:	Delivered by ASCI / N/A		Binder:	PG (58-28)

Gradation Results		Gradation (ASTM C 136 & C 117)			
Sieve Size		Percent Passing	Job Mix Tolerance		
in	mm				
1 1/2"	(37.5 mm)				
1"	(25 mm)		100		
3/4"	(19 mm)	100	90	-	100
1/2"	(12.5 mm)	87	81	-	93
3/8"	(9.5 mm)	75	70	-	82
No. 4	(4.75 mm)	60	54	-	64
No. 8	(2.36 mm)	50	42	-	52
No. 16	(1.18 mm)	37			
No. 30	(600 μm)	27	20	-	28
No. 50	(300 μm)	16			
No. 100	(150 μm)	10			
No. 200	(75 μm)	6.4	5.0	-	9.0

Aggregate Moisture

Volumetric Properties		
Test	Properities	Specifications
AC (%) Extraction (ASTM D-2172 Method A)	5.5	5.3 +/- 0.3
Bulk Sp. Gr. @ N _{DES}	2.384	--
Maximum Specific Gravity	2.479	--
Height @ N _{DES} (mm)	62.8	--
% Voids @ N _{DES}	3.8	4.0 +/- 1.2
V.M.A. (%)	14.7	15.3 +/- 1.2
V.F.A. (%)	74.0	65-80
Hveem Stability @ N _{DES}		

Lottman Results		
Test Description and Designation	Design Properties	Specifications
Tensile Strength Retention		
Dry Tensile Strength (psi)		
Conditioned Tensile Strength (psi)		
Average Specimen Saturation (%)		
Average Specimen Voids (%)		

Project Data

The Colorado Department of Transportation (CDOT) is an active member of the Roofs to Roads Advisory Board. CDOT has requested that data be kept on all projects where recycled shingles are incorporated into asphalt pavement. The data currently available on the North 63rd St. project is presented below.

1. Cost of asphalt per ton at time of paving
\$59.00/ton Grade S ¾" HMA in place
\$62.00/ton Grade SX ½" HMA in place

Note: The change to incorporate RAS into this project was made after the contractor was already in place and the project was under way. Because of these factors, the price on this project did not include the reduced costs that can be expected on projects incorporating RAS.

2. Source of the RAS material (manufacturer's scrap or demolition tear-off shingles)

The shingles used in this project were all manufacturer scrap.

3. Length of time between grinding shingles and paving process
There were several months between the time when the shingles were ground and when they were used for paving material. The experience in Colorado is that group shingle piles form an asphalt "cap" on the surface, and the ground material under that "cap" remains viable for months.

4. Construction specifications for paving projects

Boulder County allowed Recycled Asphalt Shingles at a 5% blend in the mix. Section 403.02, "Include RAS at 5%", modifies section 403, Asphalt Pavement.

5. Information about asbestos testing

All the shingles used for this project were asbestos-free. These were manufacturer scrap shingles from 2008 production.

6. Long- term evaluation and monitoring plans for pavement performance and distress

This pavement will be assessed in 2011. The survey uses non-destructive tests.