

RECLAIMED ASPHALT SHINGLES MISSOURI'S EXPERIENCE

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FEBRUARY 5, 2009







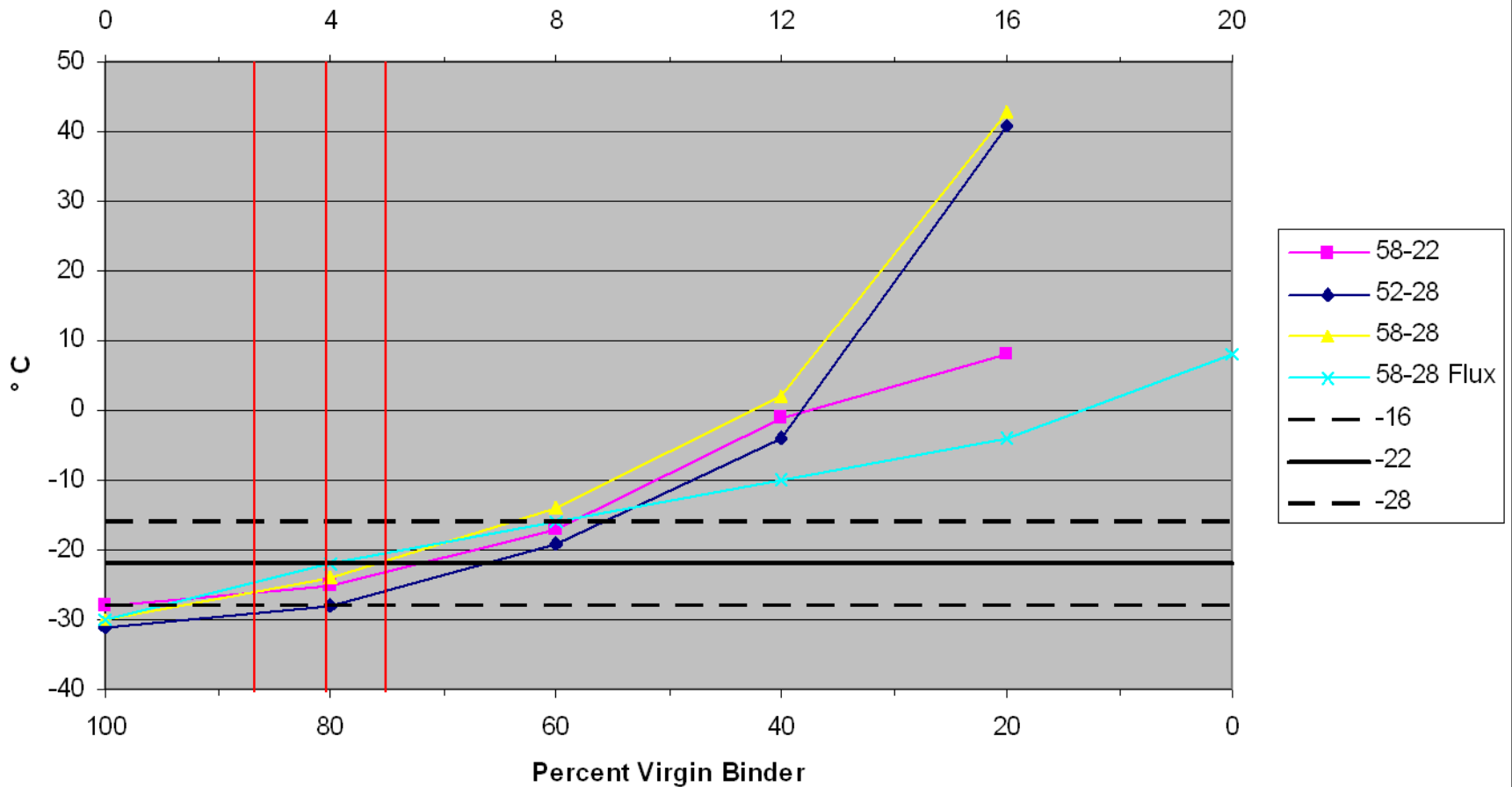
MoDOT Goals

- **Not Focused on Environmental Effects**
- **Engineering Properties First**
 - Harmful Effects of Deleterious Material
 - Asphalt Binder Properties
- **Safety – Asbestos, Nails, etc.**
- **If Everything Else Works Out, Landfilling is Reduced**

Binder Blending

Critical Low Temp.

Percent Shingles @ 5% Total Binder in Mix



Specifications

- **MoDOT Standard Specification Section 403**
- **AASHTO**
 - **MP 15 “Use of Reclaimed Asphalt Shingles as an Additive in Hot Mix Asphalt (HMA)”**
 - **PP 53 “Design Considerations When Using Reclaimed Asphalt Shingles (RAS) in New Hot Mix Asphalt (HMA)”**

Section 403

Asphalt

- Mixtures Containing PG 64-22
- No Consideration of Tear-Off or Waste
- 7% Maximum
 - No change w/ $\geq 70\%$ virgin binder
 - PG 58-28 w/ $\leq 70\%$ virgin binder
- Counts as RAP at 1:1



Section 403 Deleterious Material

- **Other Foreign Material – OFM**
 - 3.0% Total including wood
 - 1.5% Wood

Section 403

Gradation

- **Solvent Extraction for Gradation and Binder Content**
 - ◆ Paper mat in some shingles and roofing paper
(Burn-off oven OK for gradation only)
- **Standard Gradation Option**
 - ◆ Avoids Liberating Fibers in Lab
What A Mess!!

Standard Gradation

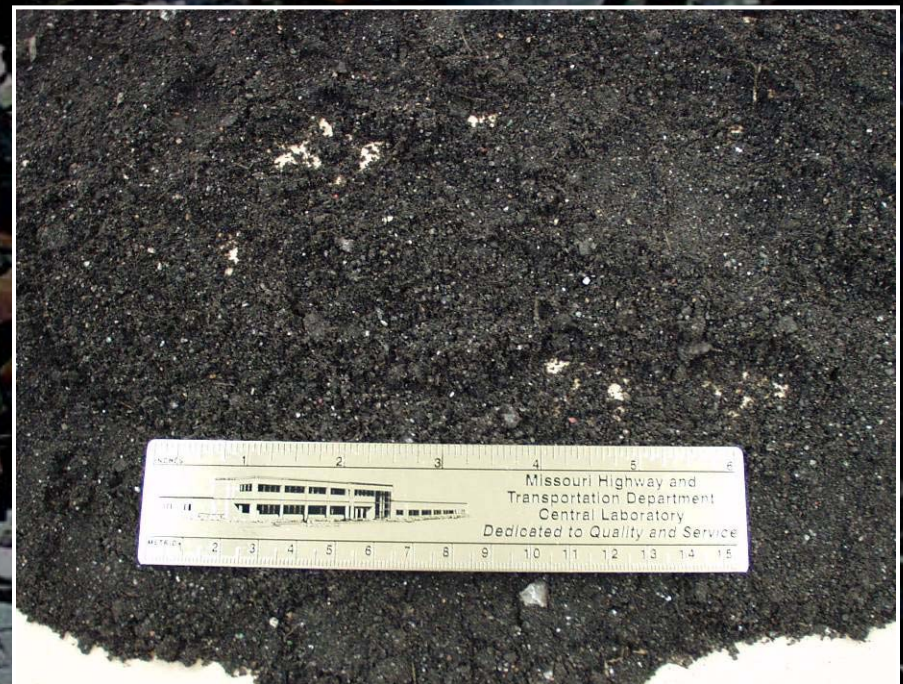
Shingle Aggregate Gradation

Sieve Size	Percent Passing by Weight
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95
No. 8 (2.36 mm)	85
No. 16 (1.18 mm)	70
No. 30 (600 μm)	50
No. 50 (300 μm)	45
No. 100 (150 μm)	35
No. 200 (75 μm)	25

Ground Shingles

Typical

Fine



Have You Ever Burned Up a Burn-Off Oven?



Don't use a 2000 g. sample of fine shingles!!

Blending with RAP?

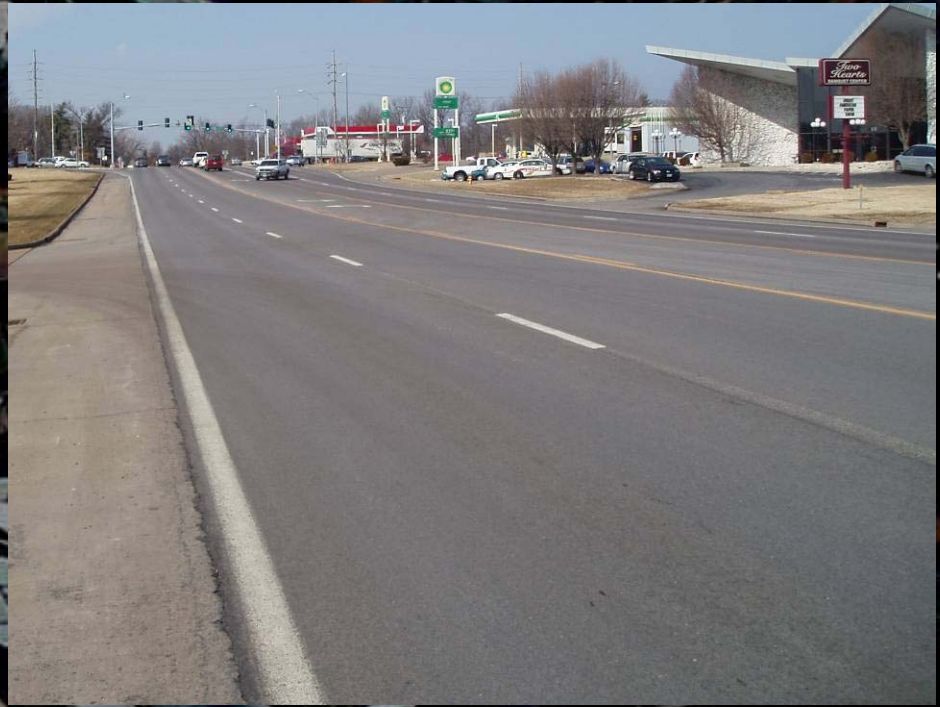
- **Blending Allowed Through Calibrated Cold Feed**

Rte. 61/67, St. Louis Co. 19 mm PG 70-22 Binder Course



1. PG 58-28
2. PG 58-28 /
5% RAS
3. PG 64-22 /
5% RAS
4. PG 64-22

No Reflective Cracking or Rutting to Date...





3 Years Old



Problems with RAS Mixtures

- Sporadic Mixing Problems Confined to Plants not Mixture
- Harder to Place in Cool Weather

Short Term Success



Where Are We?

- 2008 - 39 of 360 Mixtures Issued Contain RAS
- Known Processors and HMA Producers
 - 11 Processors
 - 12 HMA Producers
- Pooled Fund Study
- Best Practices Guide

Pooled Fund Study

- Specifications
- Mix Design
- Asphalt Replacement
- Environmental Needs
- Demonstration

<http://www.pooledfund.org/projectdetails.asp?id=1208&status=1>

shinglerecycling.org

Recycling Tear - Off Asphalt Shingles:

Best Practices Guide



October 11, 2007



Questions?

- Higher Shingle Contents
- Performance w/ Modified Binders
- Rejuvenators
- Substitution for Fibers in Gap Graded Mixtures
- Beneficial
- Specification for Other Uses



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