

ASPHALT SHINGLES in HMA MoDOT SPECIFICATION

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RAS in HMA SHOWCASE
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shinglerecycling.org

Recycling Tear - Off Asphalt Shingles:
Best Practices Guide



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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/ $< 70\%$ virgin binder
- Counts as RAP at 1:1

Section 403 Deleterious Material

- Other Foreign Material – OFM
 - 3.0% Total including wood
 - 1.5% Wood
- Nails, Nails, Nails – Included in OFM
- Asbestos

NESHAP



EPA – NESHAP

National Emission Standards for Hazardous Air Pollutants

- 40 CFR 61 Subpart M for Asbestos
Appendix A
- Exempt of Testing Requirements;
Shingles from Residential Dwellings in
Accordance with Local Requirements
- MO DNR No Requirements Beyond Local
- Commercial Not Excluded
- DOCUMENT YOUR SOURCE



- Moot Point under NESHAP Rule
“Post-consumer RAS shall be certified to contain less than the maximum allowable amount of asbestos as defined by national or local standards.”

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

Section 403

Aggregate Specific Gravity

- Calculated from Max. Theoretical
 - Light alcohol spray for floaters
 - Remove anything else floating
- Low Absorption Aggregates

$\therefore G_{se} \approx G_{sb}$

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}}$$

Ground Shingles

Typical

Fine



Coarse vs. Fine

- Coarse
 - Quicker
 - Less expensive equipment
- Fine
 - Higher rate of incorporation
 - Flows easier

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

AASHTO

- Recycled Materials Resource Center (RMRC) White Paper
- AASHTO Specifications
 - MP 15 – Use of RAS
 - PP 53 – Mix Designs w/ RAS
 - Dec. 2008, Ballot current revisions

AASHTO MP 15

- Spec. for RAS Quality
 - Asbestos relies on NESHAP rule (effectively <1%)
 - Deleterious allows for demolition waste (allowed not desired)

AASHTO PP 53

- Procedure for HMA Mix Design
 - Mixtures w/ $\geq 70\%$ virgin binder may be exempt from grading
 - Option for “Standard Gradation” and use of Gse
 - Closer look at shingle binder availability factor

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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