




Recycled Shingles in HMA



Robert Lee TxDOT

Introduction

- What we know? ①
- What we've done? ②
- What's new? ③
- What's next? ④



What we know?


- What we know? ①
- What we've done?
- What's new?
- What's next?

Background

- *Approximately 13 million tons of asphalt shingle waste is generated per year*
 - *Post manufacture (scrap): 1.5 million tons*
 - *Post consumer (tear-off): 11.5 million tons*
- *Less than 5% of shingle waste is recycled*



There's a lot of asphalt in those shingles



- Granular/aggregate
- Waterproofing asphalt
- Base (fiberglass or organic felt)
- Waterproofing asphalt
- Back surfacing

Component	Organic Felt	Fiberglass Mat
Asphalt cement	30-36%	19-22%
Felt (Fiber)	2-15%	2-15%
Mineral aggregate (#30)	20-38%	20-38%
Mineral filler/stabilizer	8-40%	8-40%

What we know?

It's good for the environment!



What we know?

Cost savings can be substantial

Price (\$/Ton)			
Type D PG 64-22	with 20% RAP	with 5% Shingles	with 15% RAP & 5% Shingles
\$39.75	\$34.80	\$36.10	\$32.39



What we know?

What we've done?

What we know?


What we've done? **2**

What's new?

What's next?

SH 31 – Navarro County


- May, 1997
- Type C with AC-20
 - Section 1 – 5% man. waste
 - Section 2 – 5% tear-offs
 - Section 3 - Control
- Initial construction issues with tear-offs section
- Overall performance good –comparable to control
- Part of first research project in Texas



What we've done?

TCEQ

- Allow Manufactured Waste
 - Memo - March, 2006
 - Treated the same as RAP – counter flow drum
 - Up to 15%



What we've done?

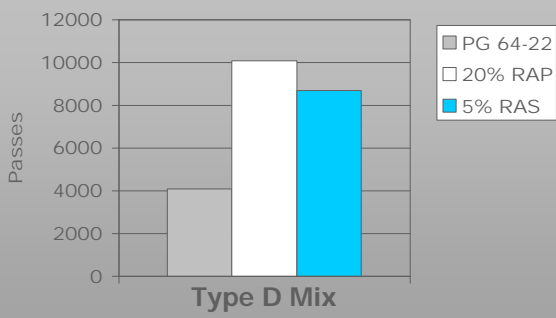
City of Dallas



- July, 2008
- Type D (commercial)
- For cities, counties & municipalities
- PG 64-22
- Used 8% shingles
 - Manufactured Waste
- 20% RAP was used as alternate design

What we've done?

Performance Testing – Hamburg




Mix Type	Passes
PG 64-22	~4000
20% RAP	~10000
5% RAS	~8500

What we've done?

Shingle asphalt is stiffer than paving asphalt

Binder	PG Grade	AC %
PG 64-22	67	5.2
RAP	87	5.0
Shingles	96	24.0




What we've done?

5% RAS is about equivalent to 20% RAP

An addition of 5% RAS or 20% RAP in the mix gives roughly one grade bump in the binder as shown by the DSR.

High Temp Grade		
Type D PG 64-22	20% RAP	5% Shingles
67	71	74


That same addition of 5% RAS or 20% RAP in the mix shows the stiffness doubling as shown by the Hamburg



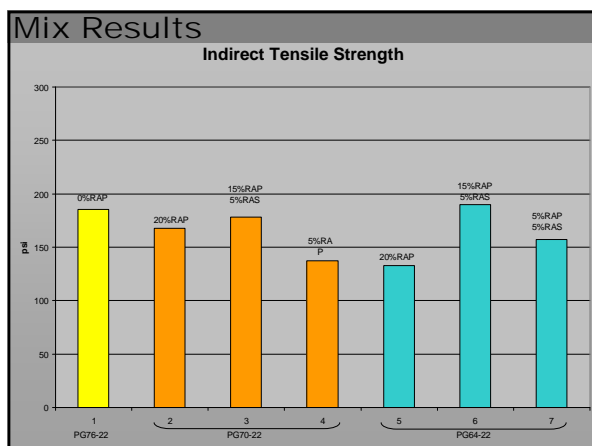
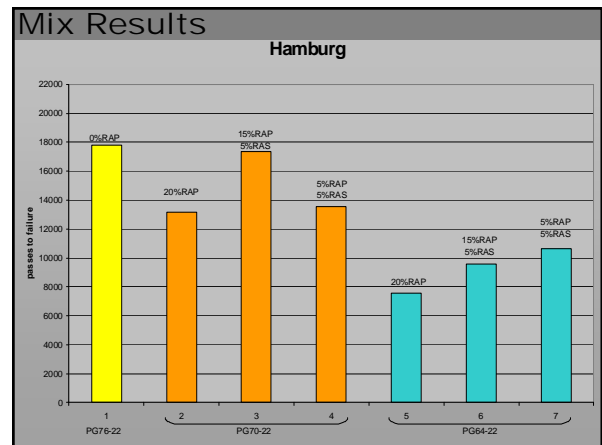
What we've done?

TCEQ

- Added residential tear-off shingles
 - Memo – Feb., 2009
 - Still up to 15%
 - Asbestos certification and testing
 - Deleterious material < 1.5%
 - No direct flame to shingle material




TEXAS COMMISSION ON ENVIRONMENTAL QUALITY



TxDOT

- Special Provision
 - 341-024
- Allows manufactured waste and residential "tear-offs"
 - up to 5%
 - deleterious limited to 1.5%
 - 100% passing 1/2" sieve
- RAS can be combined with
 - RAP
 - WMA
 - Substitute Binders (lower binder grade)



What we've done?

New Special Provision

Table 1A
Maximum Allowable Amounts of Recycled Binder, RAP & RAS

Mixture Description & Location	Maximum Ratio of Recycled Binder to Total Binder (%)	Maximum Allowable % (Percentage by Weight of Total Mixture)		
		Unfractionated RAP ²	Fractionated RAP ³	RAS ⁴
Surface Mixes ⁵	35	10	20	5
Non-Surface Mixes ⁶ < 8 in. From Final Riding Surface	40	15	30	5
Non-Surface Mixes ⁶ > 8 in. From Final Riding Surface	45	20	40	5



Considerations

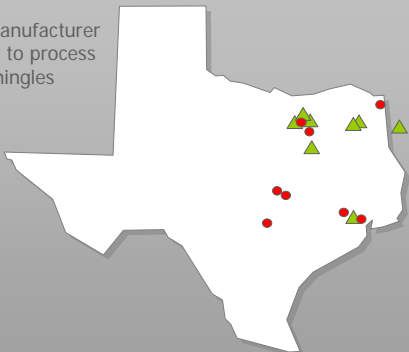
- *Shingle Type*
- *Processing*
- *Blending*
- *Storage*



What we've done?

Shingle Type and Processors

- ▲ Shingle Manufacturer
- Capability to process asphalt shingles



What we've done?

Processing

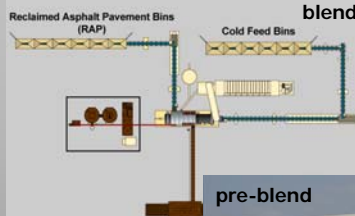
- *Proper Grind Size*
 - *Easier to design mixes*
 - *Alleviates issues with laydown*
 - *Facilitates better mixing in the drum*
 - *Especially when running WMA*



Most processors have gone to a finer grind since they first started.

Blending

blend during production



Storage

- *Limited storage time*
 - *processed material wants to stick back together*
- *Keep dry and/or drainable*
- *Can pre-blend with RAP or sand*



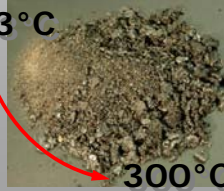
Updated Test Procedure

- *Tex-217F, Part III, "Determining Deleterious Material in Recycled Asphalt Shingles"*



451°F

233°C



300°C

What's next?

What about the rest of the HMA Specs?

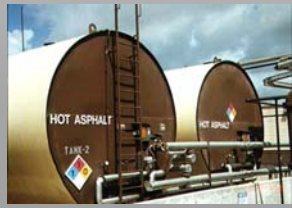
- *After the 341 SP is approved:*
 - *Item 342 - PFC* 
 - *Item 344 - SuperPave and CMHB*
 - *Item 346 - SMA*
 - *Other Special Specs.*
- *Other Uses*
 - *Cold Mix*
 - *Base*
 - *Fuel for cement plants*
 - *Dust Control*



What's next?

Bottom Line

- *An available 13 million tons of shingle waste, containing 20% liquid AC*
- *2.6 million tons of reclaimable liquid AC*
- *At \$400.00 per ton that's \$1.04 billion worth of liquid asphalt every year*



Questions

