

SPECIFICATIONS FOR RECYCLED MATERIALS

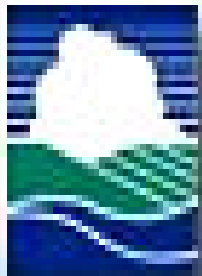
Robert Lee, P.E.

TxDOT



TCEQ INVOLVEMENT

- ▶ Allow Manufactured Waste
 - ▶ Memo - March, 2006
 - ▶ Treated the same as RAP – counter flow drum
 - ▶ Up to 15%
- ▶ Added residential tear-off shingles
 - ▶ Memo – Feb., 2009
 - ▶ Asbestos certification and testing
 - ▶ Deleterious material < 1.5%
 - ▶ No direct flame for shingle material



**TEXAS COMMISSION
ON ENVIRONMENTAL QUALITY**

BASIC SPEC LANGUAGE FOR RAS

- ▶ Special Specification - 3224
- ▶ Allows manufactured waste and residential “tear-offs”
 - ▶ up to 5%
 - ▶ deleterious limited to 1.5%
 - ▶ 100% passing 1/2“ sieve, 95% passing 3/8” sieve
- ▶ RAS can be combined with
 - ▶ RAP
 - ▶ WMA
 - ▶ Substitute Binders (lower binder grade)



5% RAS OR 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*



APPROVED LIST

- ▶ Have met regulatory and specification requirements
- ▶ Have a quality control plan for asbestos testing plan in place
- ▶ Keep records of materials processed for chain of custody purposes

Nonhazardous Recycled Materials

NOTE: Refresh the page to view the most current list.

The following producers are prequalified to supply the listed nonhazardous recycled materials, based on a history of satisfactory environmental testing and a documented quality control plan, as described in DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines."

The materials shown on this list are prequalified based on environmental suitability only; engineering suitability must still be determined according to the appropriate engineering specifications for the application in which they are used.

The Department reserves the right to randomly sample and test prequalified materials at any time for specification compliance.

Prequalified Producers of Nonhazardous Recycled Materials			
Producer	Contact Info	Recycled Material	Primary Applications
HPP Corporation Genoa Red Bluff Facility D12120B-SOUT07	Mark Briggs 2070 Genoa Red Bluff Houston, TX 77034 (281) 487-0766	Concrete, Asphalt, Road Base, Industrial Sands, Ceramics, Filter Cakes, Soils, Construction Debris	Base, Flexible Base, Embankment, Backfill
Flex-O-Lite 1601 Northwest 19 th St. Paris, TX 75460	Owen Fox 1601 Northwest 19 th St. Paris, TX 75460	Glass Cullet	Glass Traffic Beads
Potters HC 30, Box 20 Brownwood, TX 76801	Gary Whyte HC 30, Box 20 Brownwood, TX 76801	Glass Cullet	Glass Traffic Beads
Swarco 900 North Denton Mexia, TX 76667	Kevin Stanley 900 North Denton Mexia, TX 76667	Glass Cullet	Glass Traffic Beads
Weissker 60 Dundaff St. Carbondale, PA 18407	Bill Wade 60 Dundaff St. Carbondale, PA 18407	Glass Cullet	Glass Traffic Beads
Southwest Shingle Recycling 9550 South Central Expressway Dallas, TX 75241	Melissa Eisenberg 9550 SouthCentral Expressway Dallas, TX 75241 (510) 593-1197	Shingles (Pre-consumer and tear-off)	Asphalt Concrete
APAC-Texas, Inc. Gribble Plant 11050 Luma Rd. Dallas, TX 75229	David Morton (214) 926-9116	Shingles (Pre-consumer)	Asphalt Concrete

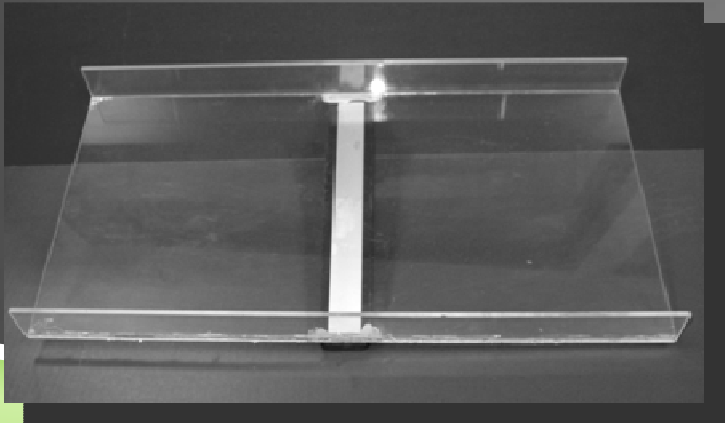
CHANGES & ADJUSTMENTS

- ▶ Tex-217-F Part III
- ▶ Tex-236-F
- ▶ Blending of RAS with sand or fine RAP
- ▶ Production Control of Recycled Binder Ratio

TEX-217-F PART III

DELETERIOUS MATERIALS

$$P = \frac{M + N_{3/8} + N_4 + N_8 + N_{30}}{W_T} \times 100$$



TEX-236-F

IGNITION OVEN

Table 2—Recommended Weight of Recycled Material Sample

Recycled Material Type	Recommended Weight of Sample, g
Reclaimed Asphalt Pavement (RAP) ¹	1000-4000
Recycled Asphalt Shingles (RAS) ²	500-700

1. Refer to Table 1 for recommended sample weights.

2. Sample size exceeding the recommended weight above may not completely ignite the asphalt.

SPECIFICATION CHANGES

REGARDING RAS

- ▶ Add sand meeting the requirements of Table 1 and Table 2 or fine RAP to RAS stockpiles if needed to keep the processed material workable. When RAS is pre-blended with sand or fine RAP, the pre-blended stockpile will be considered as RAS and limited to no more than 5.0% of the HMA mixture.

SPECIFICATION CHANGES

REGARDING RAS

- ▶ **JMF Adjustments.** If necessary, adjust the JMF before beginning a new lot. The adjusted JMF must:
 - ▶ be provided to the Engineer in writing before the start of a new lot;
 - ▶ be numbered in sequence to the previous JMF;
 - ▶ meet the mixture requirements in Table 5;
 - ▶ meet the master gradation limits shown in Table 6; and
 - ▶ be within the operational tolerances of JMF2 listed in Table 9.



RECYCLED MATERIALS TABLES

From Updated Specifications



TXDOT HMA SPECIFICATIONS

- ▶ Item 340 Dense Graded (Method Spec.)
- ▶ Item 341 Dense Graded (QC/QA)
- ▶ Item 342 Permeable Friction Course (PFC)
- ▶ Item 344 Performance Designed Mixtures (Superpave)
- ▶ Item 346 Stone Matrix Asphalt (SMA)
- ▶ Other

3224 - PROPOSED FOR 340 & 341

Mixture Description & Location	Maximum Ratio of Recycled Binder to Total Binder (%)	Maximum Allowable Weight % (Percent by Weight of Total Mixture)		
		Unfractionated RAP	Fractionated RAP	RAS
Surface Mixes	20 30	10	20	5
Non-surface Mixes < 8"	20 35	10 10	30	5
Non-surface Mixes >8"	20 40	10 10	40	5

PFC – PROPOSED FOR 342

Mixture Description & Location	Maximum Ratio of Recycled Binder to Total Binder (%)	Maximum Allowable Weight % (Percent by Weight of Total Mixture)		
		Unfractionated RAP	Fractionated RAP*	RAS
Surface Mixes	10	0	10	0

* Applies to Coarse Fractionated RAP only

PERFORMANCE DESIGNED MIXTURES - PROPOSED FOR 344

Mixture Description & Location	Maximum Ratio of Recycled Binder to Total Binder (%)	Maximum Allowable Weight % (Percent by Weight of Total Mixture)		
		Unfractionated RAP	Fractionated RAP	RAS
Surface Mixes	25	10	20	5
Non-surface Mixes < 8"	30	10	25	5
Non-surface Mixes >8"	35	10	30	5

SMA – PROPOSED FOR 346

Mixture Description & Location	Maximum Ratio of Recycled Binder to Total Binder (%)	Maximum Allowable Weight % (Percent by Weight of Total Mixture)		
		Unfractionated RAP	Fractionated RAP	RAS
Surface Mixes	15	0	15	5
Non-surface Mixes	20	0	20	5

Recycled Materials Blending Program - Dense Graded

Enter Fields Highlighted In Blue

Mixture Information

% Asphalt form JMF	5.0
Layer	Surface
Binder Grade	PG 70

Virgin Material Costs

	\$/ Ton
Aggregate	15.00
PG 76	722.00
PG 70	675.00
PG 64	574.00
Other	<input type="text"/>
Price / Ton of Mix	\$ 48.00

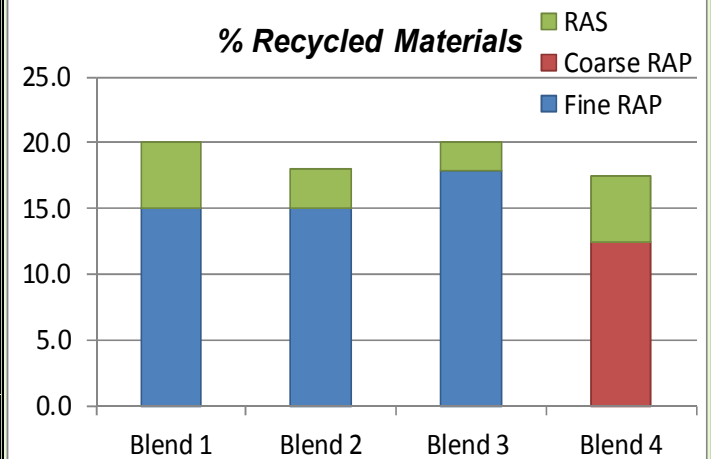
Recycled Material Costs

	\$/ Ton	% Asphalt
1) Fine RAP	20.00	6.0
2) Coarse RAP	15.00	4.0
3) RAS	25.00	20.0

Blends

	Virgin	Blend 1	Blend 2	Blend 3	Blend 4	
Binder Grade	PG 70	PG 70	PG 70	PG 70	PG 70	
% Fine RAP	0.0	15.0	15.0	17.9	12.5	
% Coarse RAP	0.0	5.0	3.0	2.1	5.0	
% RAS	0.0	38.0	30.0	29.9	30.0	Out Of Spec
% Recycled Material Limit	20					
% Recycled Binder	0.0	38.0	30.0	29.9	30.0	Out Of Spec
% Recycled Binder Limit	30					

% Recycled Materials



Economics (Mix Savings)

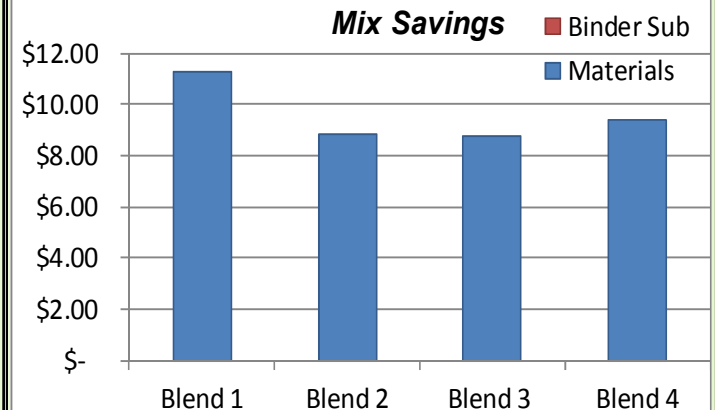
	Virgin	Blend 1	Blend 2	Blend 3	Blend 4
Recycle Material Savings	\$ -	\$ 11.29	\$ 8.85	\$ 8.76	\$ 9.40
Binder Substitution Savings	\$ -	\$ -	\$ -	\$ -	\$ -
Total Savings	\$ -	\$ 11.29	\$ 8.85	\$ 8.76	\$ 9.40
Adjusted Price/Ton	\$ 48.00	\$ 36.71	\$ 39.15	\$ 39.24	\$ 38.60

Economics (Value of Recycled Material)

(Replacement Value - Cost)

Fine RAP	\$ 34.60
Coarse RAP	\$ 26.40
RAS	\$ 122.00

Mix Savings

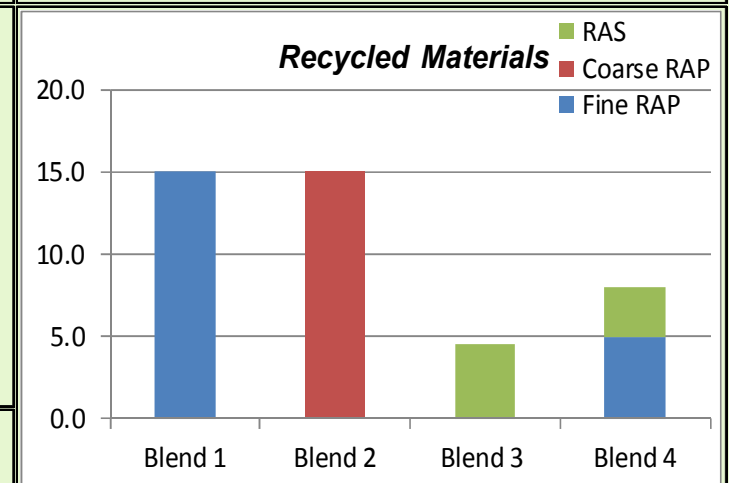


Recycled Materials Blending Program - SMA

Enter Fields Highlighted In Green

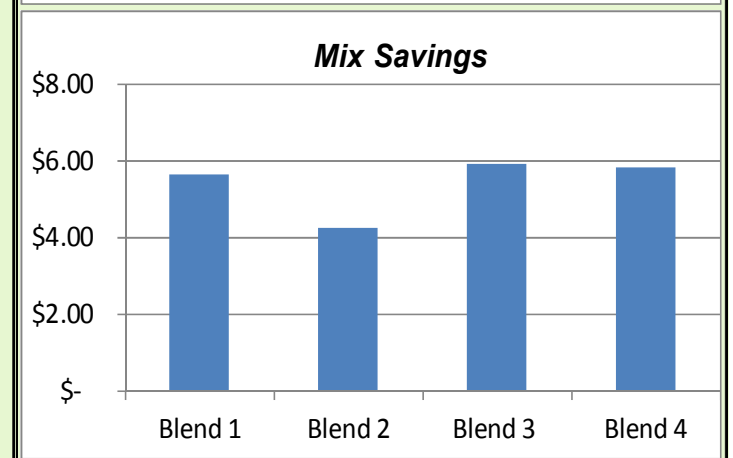
Mixture Information	Virgin Material Costs	Recycled Material Costs																																		
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">% Asphalt form JMF</td> <td style="border: 1px solid black; text-align: center;">6.1</td> </tr> <tr> <td>Layer</td> <td style="border: 1px solid black; text-align: center;">Surface</td> </tr> <tr> <td>Binder Grade</td> <td style="border: 1px solid black; text-align: center;">PG 76</td> </tr> </table>	% Asphalt form JMF	6.1	Layer	Surface	Binder Grade	PG 76	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">\$/ Ton</td> </tr> <tr> <td style="width: 70%;">Aggregate</td> <td style="border: 1px solid black; text-align: center;">15.00</td> </tr> <tr> <td>PG 76</td> <td style="border: 1px solid black; text-align: center;">722.00</td> </tr> <tr> <td>AR</td> <td style="border: 1px solid black;"></td> </tr> <tr> <td colspan="2" style="text-align: center;">Price / Ton of Mix</td> </tr> <tr> <td></td> <td style="border: 1px solid black; text-align: center;">\$ 58.13</td> </tr> </table>	\$/ Ton		Aggregate	15.00	PG 76	722.00	AR		Price / Ton of Mix			\$ 58.13	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2"></td> <td style="text-align: center;">\$/ Ton</td> <td style="text-align: center;">% Asphalt</td> </tr> <tr> <td style="width: 5%;">1)</td> <td style="border: 1px solid black;">Fine RAP</td> <td style="border: 1px solid black; text-align: center;">20.00</td> <td style="border: 1px solid black; text-align: center;">6.0</td> </tr> <tr> <td>2)</td> <td style="border: 1px solid black;">Coarse RAP</td> <td style="border: 1px solid black; text-align: center;">15.00</td> <td style="border: 1px solid black; text-align: center;">4.0</td> </tr> <tr> <td>3)</td> <td style="border: 1px solid black;">RAS</td> <td style="border: 1px solid black; text-align: center;">25.00</td> <td style="border: 1px solid black; text-align: center;">20.0</td> </tr> </table>			\$/ Ton	% Asphalt	1)	Fine RAP	20.00	6.0	2)	Coarse RAP	15.00	4.0	3)	RAS	25.00	20.0
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Blends					
	Virgin	Blend 1	Blend 2	Blend 3	Blend 4
Binder Grade	PG 76	PG 76	PG 76	PG 76	PG 76
% Fine RAP	0.0	15.0			5.0
% Coarse RAP	0.0		15.0		
% RAS	0.0			4.5	3.0
% Recycled Material Limit	15				
% Recycled Binder	0.0	14.8	9.8	14.8	14.8
% Recycled Binder Limit	15				



Economics (Mix Savings)					
	Virgin	Blend 1	Blend 2	Blend 3	Blend 4
Recycle Material Savings	\$ -	\$ 5.61	\$ 4.24	\$ 5.91	\$ 5.81
Binder Substitution Savings	\$ -	\$ -	\$ -	\$ -	\$ -
Total Savings	\$ -	\$ 5.61	\$ 4.24	\$ 5.91	\$ 5.81
Adjusted Price/Ton	\$ 58.13	\$ 52.51	\$ 53.89	\$ 52.21	\$ 52.31

Economics (Value of Recycled Material)	
<i>(Replacement Value - Cost)</i>	
Fine RAP	\$ 37.42
Coarse RAP	\$ 28.28
RAS	\$ 131.40



WMA, RAP & RAS



QUESTIONS?

