

RAP In HMA In California

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A Short History

Caltrans evaluated RAP use in several forms in 1970's and 1980's:

- Cold In-Place Recycling
- Hot In-Place Recycling
- RAP use in Hot Mix Asphalt

But, low binder costs, etc. made the effort involved unattractive in late 1980's & 1990's



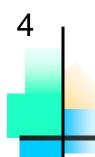


More Recent History

Caltrans and Industry have developed specifications for:

- Cold In-Place Recycling
- Cold Foam Full Depth Recycling
- Hot In-Place Recycling
- RAP use in Hot Mix Asphalt

Moderate interest in CIPR, Cold Foam, and HIPR



RAP in HMA History

1996 –

- Dedicated/Blended Piles of RAP
- Binder blending and Final Binder Testing
- Performance Testing of Mix and Binder

2000 -

- Dedicated/Blended Piles of RAP
- Binder blending and Final Binder Testing

Etc., Etc.

Less than moderate interest by Caltrans or Industry



RAP in HMA Since 2003

Specifications:

- Contractor's Option DGAC and QC/QA projects
- Maximum 15% RAP
- Live Piles of RAP
- No final binder blend testing
- HMA meets all requirements

As a CCO during Construction

Misunderstandings – Producers/Engineers/Contractors

As an SSP in projects

Misunderstandings/Mistrust – Caltrans





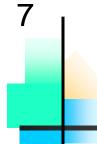
RAP Site Evaluations 2007

Stantech and Caltrans Evaluated 4 Sites for conditions and structural adequacy

Information available from T_Joe_Holland@dot.ca.gov







RAP in HMA Since 2003

Use Statewide (from District poll)

<u>Year</u>	<u>10%</u>	<u>15%</u>
2004	1	1
2005	3	10
2006	5	7
2007	6	9





RAP in HMA Standard Specifications

(November 2007)

Specifications:

- Contractor's Option All DGAC
- Maximum 15% RAP No more than +/-%5 change
- Live Piles of RAP
- No binder/blend testing no adjusting binder grades
- HMA meets all requirements

In "Amended to Read" Section 39

Included in all projects





RAP in HMA Standard Specifications

(November 2007)

Annual Mix Design Verification:

- Contractor prepared mix design JMF submittal
- Verification on plant produced HMA
 - ✓ No more than +/-5% adjustment in RAP

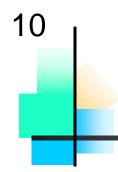
Production Start-up for all projects

- Re-verification of all aggregate and mix qualities
 - ✓ RAP aggregate not tested

Requests for use – So Far 2008

- 10% RAP 2 submittals
- 15% RAP 8 submittals
 - Some may be under old specifications and prepared by District





(HMA Using up to 15% RAP)

Procedure Summary

- Obtain representative samples of RAP
- Evaluate RAP
 - ✓ Binder content
 - ✓ Aggregate gradation & specific gravity
 - ✓ Rice specific gravity
- Prepare Mix Design
 - ✓ Determine combined gradation Virgin aggregate + RAP
 - ✓ Determine approximate bitumen ratio
 - ✓ Calculate quantity of new binder
 - ✓ Determine batch weights
 - ✓ Prepare test specimens using Hveem Compactor
 - ✓ Determine OBC
- Conduct QC testing during production



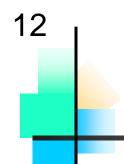


(HMA Using up to 15% RAP)

Procedure Summary

- Obtain representative samples of RAP
 - √ From piles in Mix Design
 - ✓ From feed system during production
- Obtain representative samples of Aggregate/RAP blend
 - √ Virgin aggregate from feed system
 - ✓ Blend determined as a mathematical equation
 - % Virgin + % RAP from daily sampling
- Obtain representative samples of HMA
 - ✓ Behind the paver





7. EXAMPLE

7.1.1 Given:

7.1 RAP EVALUATION

Determine the asphalt content and gradation of the RAP approprie for the samples provided:

Extract BinderSpecific Gravit

Tired	GT 429, Part 1	WITH DRYTS, Method B	CT 382	C1.309	
RAP Samplin	Weight (fbs.)	Asphalt Content [®] (%)	Asphalt Content ² (%)	Theo. Max Specific Gravity of RAP (Gravi	
1	42	5.7	5.8	2.535	
161	AID	0.5	5.5	2.521	
v ot i	KAP	5.8	5.9	2.542	
AVERAGE	42.3	5.7	5.7	2.533	

[%] by weight aggregate; "For information only

CT 202 RAP Gradution (aggregate recovered from ASTM D 2172 & CT 382 tests)

Extraction GradaIgnition Oven

Wilson or Wilson	Sample I	The Control of the Co	Sample II		Searment 18		
Sleve Stan	ASTM-02172	GT-382	ASTM 02172	CT 362	ASTM 02172	CT 382	
1.12"	100.0	100.0	100.0	100.0	100.0	100.0	
1.0	100.0	100.0	100.0	100.0	100.0	100,0	
14	100.0	100.0	100.0	900.0	100.0	100.0	
tion	82.3	81.5	8.1.1	81.9	84.3	83.9	
3,68*	78.2	78.7.	77.5	76.8	75.1	74.3	
4 1	62.4	63.3	65.2	63.6	59.4	61.4	
5rada	tion	60.5	50.3	49.7	44.0	46.1	
JIUUU	34.5	39.0	35.6	34.7	28.7	28.2	
No. 30	27.6	27.2	21.8	22.2	19.9	20.6	
No. 50	17.7	17.6	13.2	13.5	12.8	10.5	
No. 100	11.1	11.3	9.4	8.9	13.2	12.7	
No. 200	4.8	4.2	5.1	4.7	5.3	3.9	

Codevitated

RAP Aggregate Gradation Correlation Factor

For each sleve.

RAP Appropria Gradution Correlation Factor = (Average ASTM D 2172 gradution) - (Average CT 382 gradution)

Determine Correlation Extraction vs. Ignition

Slove Size -		AND INSTRUMENT OF BUILDING					
DIRECT DIES	ASTM 02172	CT SEZ	Correlation Factor				
1.107	100.0	100.0	0.0				
47	100.0	100.0	0.0				
14"	190.0	300.0	0.0				
1 Fact	82.6	82.4	0.2				
3/8"	26.9	79.6	0.3				
No. 4	62.3	62.8	-0.6				
	en 40.7	43.4	0.3				
n Uv	34.3	34.0	0.3				
No. 30	23.1	23.3	-0.2				
No. 50	14.6	13.6	0.0				
No. 100	11.2	11.0	0.3				
No. 200	5.1	4.3	0.8				

7.2 MIX DESIGN

Determine a reix design incorporating

MAP aggregate in the aggregate blond (15% maximum):

7.2.1 Gwest:

VIRGIN AGGREGATE K PACTORS IS IN CT 3000.

Relative particle sauchness and surface capacity

K ₄	N _d
1.4	1.0

COMBINED AGGREGATE GRADATION

(See Table 2 of the avanigle work sheet in Section 7.2.3)

Combined Statutation Sugarance

ADDREGATE:		MP.	5.	4"	. 1	at a	341		Ree	A Durot	Nature	of Samet	Croshe	ed Sand	Blend	
No Stituted and RAP		d.b.	- 6	.0		0.0	78	.0		f.D :	- 1	1.0	- 1	0	930.0	1
to black two links		0.1 5.6		et e	31.1		26.9		23.3		11.1		0.0		100.0	Spec.
Steve Sittle	Desired % Passing	"S, of titleast (w/ EUA(F)	Desired % Fearing	Scottliesol. Jun 1947)	Desired % Passing	% of Bland (of RAP)	Gentlent % Freezing	Ni of Bland (wi RAP)	Desired % Passing	North Mond (set PUUF)	Sestont N. Frankry	% of Blend (w/ BUD)	Desired % Passing	% of Bland (w/ BAP)	Total Bland (ort RAP)	Carnitia
142	100.0	10.0	700.6	5.0	100.0	28.0	300.0	255.0	100.0	21.0	1900.011	10.0	0.0	0.0	500 P	
	100.0	10.0	100.0	5.0	100.0	28.0	100.0	265.0	100.0	24.0	100.0	10.0	0.0	0.0	100 0	100
94	100.0	10.0	100.0	5.0	100.0	28.0	900.0	298.0	100.0	21.0	100.0	10.0	0.0	0.0	900 D	100.
Calc	100.0		04.3	4.7	(N) Ib	18.3	100 D	26.0	100.0	21.0	100 D	10.0	0.0	0.0	96.4	79-99
laic	пат		mai	nea		Cat		23.0	100.0	21.0	100.0	10.0	0.0	0.0	75.7	95-55
Cuit	of I of C				910	MULL		8.3	99.2	36.6	97.5	0.8	0.0	0.0	46.5	48-63
(o. f)	66.0	6.6	1.0	0.1	3.0	0.8	8.0	10.2231	38.7	78.6	80.8	8.1	0.0	0.0	38.3	33-53
io. 16	52.0	1.2	1.0	4.1	3.0	0.8	4.0	1.0	96.1	13.9	60.6	6.3	0.0	0.0	27.3	29-40
ip. 30	39.0	3.9	1.0	9.1	3.0	0.8	3.0	0.8	48.5	70.2	43.3	4.3	0.0	0.0	20.1	34-39
in, 50	280.0	2.6	1.0	0.1	2.0	0.6	2.8	8.5	33.0	6.5	21.8	2.2	0.0	0.0	12.8	5-21
66, 100	76.0	-1.6	1.0	0.1	2.0	0.6	1.0	10.3	20.0	4.2	7.2	.0.7	0.0	0.0	7.4	6.16
96. 200	10.6	3.1	11.00	0.1	1.00	0.3	1.0	0.1	12.5	2.3	3.3	0.3	0.0	0.0	4.8	3-6

Mikeled or 1-2000%.

Cartostelles: Approximate Bitarren Ratio (ASR) and the percentage of course, fine, and RAP aggregate in the aggregate blend

First, check the K factors of the virgin appropria-

Per Section 36-2.12 of the Standard Suscifications, H., and K. parnot exceed 1.7:

KIND OF LY AS CHO.

第二七五七七子 --- 四位

Now, determine AGR of contribed appregate:

R = 1% settined No. 85 = 186% - 5% passing No. 81

$$ADR = \frac{4.81 + 7.6 + 12.67}{400}$$

Milhards. IR: - ("Is netwood No. 8)

5 - 1% massive No. 8 & sets/red No. 2000.

1% passing No. 2006

8 = (% passing No. 8) - (% passing No. 200) + 34.3% - 4.8%

F = 1% passeng No. 2000.

4.8%

+ 34.5%

-0.31794Thomascone:

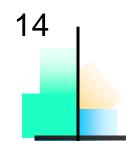
- 100% - 36.3%

$$AAR = \frac{4R + 7S + 12F}{100} = \frac{(4 \times 13, 7) + (7 \times 31.5) + (12 \times 4.0)}{140} = -5.36$$

Determine to A BR exercises of pages. New, and RAP aggregate in the aggregate blends

Goenic aggregate (P.) (retained No. 4 sieue)	= (100% - % listal bland passing No. 4) - (RAP aggregate in bland % RAP passing No. 4) = (100% - 48.5%) - (10% - 8.2%) P ₁ = 49.8%
Pine aggregate (PJ (passing No. 4 sleve)	= (% total blend passing No. 4) - (% RAP passing No. 4) = 148.5% - 3.2%) P ₂ = 46.2%
PONT aggregate (Pg)	P ₂ = 16.0%

Chadic P. + P. + P. = 40.8% + 40.2% + 10.0% = 100%



7.2 MIX DESIGN (Continued):

7.2.2 Given: BATCH WEIGHT INPUTS

(Note: given injuts are for one sample with asphalt content equal to ASR. When using the betching worksheet shown in Section 7.4 to develop a mix design, injuts for each sample shall be extend securitarily.)

Table 1: Input for Bin Batch Weights (from Table 1 of the example work sheet in Section 7.2.3)*

Total Apphait Content, %	6.3
Desired Sample Wt. g	1200.0
Weight of RAP, g	120.5
Weight of New Asphalt, g	53.9
Wt. of Virgin Appropries o	1005.6

When using RAP in RMA role designs, the apprepate gradations and total septials content are altered slightly from original batch percentages due to the expiral contained in the RAP. Therefore, the input data above must be entered separately for each total desired asphalt content to properly determine batch weights at each asphalt content.

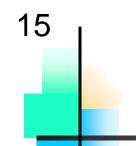
Calculate: BATCH WEIGHTS (See the example work sheet in Section 7.2.3)

Bin Batch Weights

	Fraction	- MAR		34		16.2		318		200 G K S	71.000	Programme	0.0010	Crushed	Same
			120.5		57.0		319.1		296.3		239.3		114.9		0.0
	T' - 3/4"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0]	0.0
Virg	- A	TOMOG	440	Plan	7:14	0.1	19.5	0.0	0.0	0.0	0.0	0.0	.0.0	0 D	0.00
- VII 2		ggreg	alt.	DIGII		: (64.0)	204.2	3.7	11.0	0.0	0.0	0.0	0.0	0.0	6.0
U	3/6" - No. 4	90 ₁₇ P	20.6	23.3	10.3	25.6	81.7	64.3	190.63	0.8	1.9	2.5	2.1	0.0	0.0
	No. 4 - PAN	83.0	100.0	2.0	1.1	4.3	13.7	32.0	94.8	96.2	227.4	97.5	111.1	0.0	0.0
	200000000000000000000000000000000000000	100.0	120.5	100.0	57.0	500.0	276.1	100.00	295.3	1:00:01	2:29.7	100.0	114.01	0.0	0.01

Cumulative Bin Batch Weights

Frecken	RAP		3/4"		1/2"		208		Rock D	lust	Matural	Sond	Crushed	I Sand
1"-34"	0.0	0.0	0.0	120.5	0.0	177.4	0.0	496.50	6.0	782.8	0.0	1012.1	0.0	1146.3
3/4"+1/2"	0.0	0.0	3.8	124.3	19.5	196.9	0.0	499.5	0.0		0.0	9032.1	0.0	1146.1
1927 - 3/85	0.0	0.0	39.7	163.0	204.2	401.1	11.0	597.5	0.0	792.4	0.0	1012.1	0.0	1146.1
3/6" - No. 4	20.5	20.5	13.5	176.3	81.7	482.8	190 6	698.0	1.9	784.7	2.8	1015.0	0.0	1146.1
No. 4 - PAR	100.0	120.5	1.1	177.4	. 13.7	498.5	94.8	T92.8	237.4	1032.1	4333	11148.1	0.0	1146.1
S	120.5		57.11		21201		2585.2	-	2383	The second second	1980		0.01	



7.2 MIX DESIGN (Continued):

7.2.3 Given:

Component	Bulk Specific Gravity	Composition (%)	Source
Asphalt binder in RAP	1.02 (G _{tr})	P _{to} = 5.7%	Section 7.1.1
Asphalt binder in mix:	1.02 (G _b)	Use ABR=P _b = 5.3%	
Course apgragate Iretained No. 4 sieve)	2.720 (G _i)	P.= 49.8%	Section 7.2.1
Fine aggregate (passing No. 4 sieve)	2.700 (O ₂)	P ₁ = 40.2%	
RAP	Calculate	P ₃ = 10%	
Compacted Mixture	2.440 (G _{ra})		CT 308, Method A

Where: ABR = Approximate Bitumen Ratio for the combined appropriate gradation (from Section 7.2.1)

P., = composition. % by dry weight of aggregate

Om = effective specific gravity of RAP aggregate (assumed equal to bulk specific gravity)

Calculate:

VOIDS in MINERAL AGGREGATE (VMA) - See Lab Procedure 2

First, executate the effective specific gravity of the RAP aggregate:

From LP-2: Where:

$$G_{tot} = \frac{100}{100 + P_{tot} - P_{tot}} = \frac{G_{tot} = \text{ specific gravity of asphalt binder in RAP = 1.02}}{G_{tot} = \frac{100 + P_{tot} - P_{tot}}{G_{tot}} = \frac{G_{tot}}{G_{tot}} = \frac{G_{tot}}{G_{tot}}$$

2.769

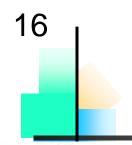
Sample I:

2.765

Now, find the bulk specific gravity of the aggregate bland (G $_{\rm sp})\!:$

$$G_{st} = \frac{P_1 + P_2 + P_1}{\frac{P_1}{G_0} + \frac{P_2}{G_2} + \frac{P_2}{G_{st}}} = \frac{49.8 + 40.2 + 10.0}{\frac{49.8}{2.720} + \frac{40.2}{2.700} + \frac{10.0}{2.765} = 2.716$$

$$VMA = 100 - \left[\frac{G_{cb}}{G_{cb}} \times \left(\frac{100}{100 + P_b}\right) \times 100\right] = 100 - \left[\frac{2.440}{2.716} \times \left(\frac{100}{100 + 5.3}\right) \times 100\right] = -14.7$$



7.2.3

RAP in HMA Lab Procedure #9

Mary

Example Worksheet for Computing Laboratory Batch Weights for HMA Mixtures Containing RAP

Mix Type

N, Rush

- pellow coll denotes a required input.

■Calculate Batch Weights (ABR-5%, ABR, ABR+5%, ABR+10%)

Table 1: Batch Weights for Virgin Aggregate, RAP, and New Asphalt Binder

Palorieter	Storypho 83	Stormples 87	Sample att	Sample:	Sarryke 95
Dissipaci Total Applicat Contact of Min. % (DWA)	43	4.8	5.3	5.5	6.3
Desired Not Nis: Sample Weight, g	1290	1290	1200	1200	1297
Desired Weight of Aggregate, g	1100.5	1140.01	1129.6	1134.2	1128.9
New Asphalt, % (DWW)	5.7	6.2	6.7	5-2	6.7
Reight of New Asphalt to be Added; g	42.9	48.4	63.0	59.3	64.7
RAP. % (016/A)	10.0	10.0	10:0	10.6	10.6
Weight of RAP to be Added, g	121.6	121.0	120.6	118.5	119.3
New Aggregate, %	90	200	5/0	90	96
Weight of Wath Appropriate, p	1035.5	1000.5	1005.6	1020.8	1016.0
Check	1200.0	1200.0	1200.0	1200.0	1200.0

Table 2: Combled Gradation Surregay

ACKREGATE:	B	1.0	300		527		202"		Book Deat		Metural Servi		Crusteel Servi		Etherus ²	
to active extent 10.0		- 1	.0:	20.0		20.0 59.6		21.0 23.3		10.0		0.0		100.0	Sec.	
Aug Street and BAR	6.6		1.0												Space Limits	
Skevo Skra	Desired to Passing	ts of Elevel (set BAP)	Desired % Passing	Scot Brend (or EAP)	Destroid % Passing	To of Ellend (but PLAP)	Desired V Pressing	To OF Riberos (ne' RIAP)	Descript 16 Passing	N. of Blend (of BAP)	Designed 15, Palasing	N. of Blench (of BAP)	Descreed No. Prouring	North Rigoral - Sel RMP1	Total Mesot (see Sees	
110*	100.0	10.0	100.0	5.0	108.0	28.0	300.0	26.0	100.0	21.0	100.0	19.0	0.1	0.0	100.0	1000
T.	100.0	30.0	1,00.0	5.0	1,08,0	28.0	100.0	26.8	100.0	21.0	100.0	16.6	0.6	0.0	100.0	100
197	100.0	10.0	100.0	6.0	100.0	26.0	194.0	24.6	100.0	21.0	100.0	10.0	0.6	9.0	10000	100
VIII.	- 306/D	10.8	99.3	4.7	93.9	25.5	196.0	201.0	100.0	21.0	100 D	10.0	0.1	0.0	88.6	79.64
1/6"	100.0	10.0	25.3	1.3	22.9	0.4	56.3	25.0	100.9	21.0	100.0	10.0	0.8	0.0	76.7	98.84
No. 46	03.0	0.3	200	0.1	4.3	1.3	32.0	8.3	69.2	20.8	97.5	9.4	0.1	9.0	48.5	45.68
49.89	1000	6.6	1.01	0.1	200	0.8	8.0	20.3	55.7	18.6	80.8	0.7	0.8	0.0	36.3	33-53
Ha 10	25000	5.2	1.0	0.1	2,0	0.31	4.0	4.0	66.4	13.9	62.4	0.3	0.4	0.0	27.3	20.41
40.00	39.0	3.9	1.0	0.1	3.0	0.8	3.0	0.8	48.6	10.2	43.3	4.3	0.1	0.0	20.1	14-30
44, 60	2910	2.6	1.0	0.1	20.0	0.6	2.0	0.6	33.0	6.5	25.5	2.2	0.5	0.0	12.8	6-21
No. 100	10.0	1.6	170	0.01	200	0.6	1.0	0.0	20.0	4.5	7.2	0.7	0.1	0.0	7.4	5/19
45.200	10.0	1.1	1.0	0.1	1.0	0.5	1.0	6.3	13.6	2.0	2.3	0.5	70.8	0.0	4.8	3-6

* Must = 100%



Table 3: Input for Bir Batch Waights (from Table 1)¹

100

Total Asprait. Context, %	6.3
Dissent Sample Wt., g	1200
Weight of RVe*, g	125.5
Weight of New Asphalt, g	223
Agastatis a	1025,0

¹When using RAP in HMA mix designs, the aggregate gradations and total septral content are allered slightly from original hotal percentages due to the author contained in the RAP. Therefore, the reput dots above must be ordered separately for each total desired asphalt content to present determine batch weights at each apphalt content.

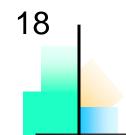
Bin Batch Weights

Fraction	RAP		3/4"		1/2	1/21		345		Rock Dust		Natural Sand		Crushed Sand	
		120.50		57.0		2/19/1		296.3		239.3		114.00		.0.0	
T' - 200F	2.00	0.0	9.9	0.8	9.0	6.0	.0.0	8.0	20,0	0.0	0.0	6.00	0.0	0.0	
3/4" - 1/7"	0.0	0.0	6.7	2.6	6.1	18.50	0.0	1.0	0.0	0.4	9.0	6.0	0.0	0.0	
1/27 - 3/37	0.0	0.0	08.0	38.7	84.0	204.2	3.7	11.0	0.0	0.0	0.0	1.00	0.0	0.4	
3/8° - No. 4	17.0	20.5	23.3	13.3	25.6	81.7	64.3	198.5	0.8	1.9	2.5	1.8	0.0	0.0	
No. 4 - PAN	85.0	100.0	1.0	3.1	4.3	13.7	32.0	94.6	99.2	237-4	97.5	111.1	0.0	0.0	
A din	ct C	amb	ina	10	made	Him	1000	256.2	100.0	239.3	100 11	1160	0.0	0.0	

Adjust Combined Gradation

Currulative Bis Buton Weights

Freitre	HAP.		347		112		345"		Rock David		Heteral Sensi		Crusteel Send	
T*-34	0.0	0.0	0.0	120.5	0.0	177.4	0.0	496.5	0.0	T92.8	0.0	1002.1	0.0	1146.1
364" - 52"	0.0	0.0	3.8	124.3	19.5	196.9	0.0	494.5	0.0	792.8	9.66	1032.1	0.01	11546.1
107 - 301	0.0	0.0	36.7	193.0	204.2	401.1	11.0	587.5	D.D	792.8	0.0	1000.1	0.0	11/46,1
3/61 - No. 4	20.5	20.6	13.3	375.3	83.7	482.8	190.5	998.0	1.9	794.7	2.8	1005.0	0.0	1146,1
No. 4 - PAN	100.0	120.5	4.1	177.4	13.7	454.5	94.8	792.0	232.4	1000000	111.1	1148.1	0.0	1146,1
	120.5		57.6		116.1		296.0		2363		114.0		0.0	



Spec

Limits

TOOL

7.3 PRODUCTION TESTING

1.1/2*

Slove Size

7.3.1 Given: Production testing data for 1500 tons of paving:

RAP (daily

sample).

100.0

CT 202 Actual Gradation (aggregate from CT 382):

Production Testing

Combined Gradution

	1327	PARTIE	15,050,50	1.000000000	LUNGVI	1000	
	1/2"	88.7	83.2	94.0	91.5	79-99	
■Dail	3/81	Liab D	00111140	£892 D	AD	68-88	to and delica
-Dan	VIZIII	LIUILIN	esuits	I OL IN	AI a	LATER	ite gradation
	No. 8	42.4	44.1	48.7	43.2	33-53	U
	No. 16	33.3	36.7	37.8	29.6	20-40	
	Mes 200	24.6	24.4	99.0	28.3	4.44,560	

100.0

100.0

No. 50: 16.2 18.7 13.6 16.4 9-21 No. 100 10.8 14.4 12.1 15.3 6-16 No. 200 4.5 3.5 4.2 3-65.4

Virgin Aggregate (sample/ 500 ton)

Sample A Sample B Sample C

100.0

100.0

Calculate: Corrected RAP Gradation (for each sieve); Combined Gradation

Corrected RAP gradation = (Actual gradation) = (correlation factor)

Combined gradation = (% BAP in mix) x (Corrected RAP gradation) + (% Virgin Aggregate in mix) x (Sample gradation)

100.0

100.0

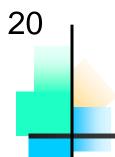
	125000000000000000000000000000000000000	BAE	1076	VIII DE	- Additional age	307a	COST	4		
sieve size iemat	ically	ombi	Corrected Pediog	radat	. Sample	Sample C	Sample A	Sample B	Sample C	Spec Limits
1.1/2"	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
1.	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100
3/4*	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	500
1/2"	0.2	88.7	88.9	83.2	94.0	91.5	83.8	93.5	91,2	79-99
3/8*	0.3	73.1	73.4	76.3	69.2	75.7	76.0	69.6	75.5	68-88
No. 4	-0.5	53.3	52.8	56.5	54.3	51.1	56.1	54.2	51.3	48-68
No. 8	0.3	42.4	42.7	44.1	48.7	43.2	44.0	48.1	43.1	33-53
No. 16	0.3	33.3	33.6	36.7	37.8	29.6	36.4	37.4	30.0	20-40
No. 30	-0.2	24.6	24.4	21.1	22.9	26.3	21.4	23.0	26.1	14-30
No. 50	0.6	16.2	17.0	18.7	13.6	16.4	18.5	13.9	16.5	9-21
No. 100	0.3	10.8	11.1	14.4	12.1	15.3	14.1	12.0	14.9	6-16
No. 200	0.0	4.5	5.3	3.5	4.2	5.1	3.7	4.3	5.1	3-6

& Also

Pilot Project with RAS

- Post Product Pre-Consumer Waste
- In Partnership with Industry
- Grant from CIWMB
- Searching for Pilot in Southern California or Bakersfield





Thank You for Your Attention

Any Questions?

