

Effect of RAP on Asphalt Cement

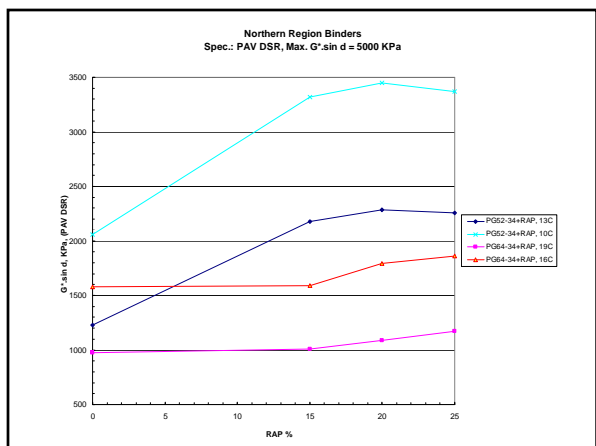
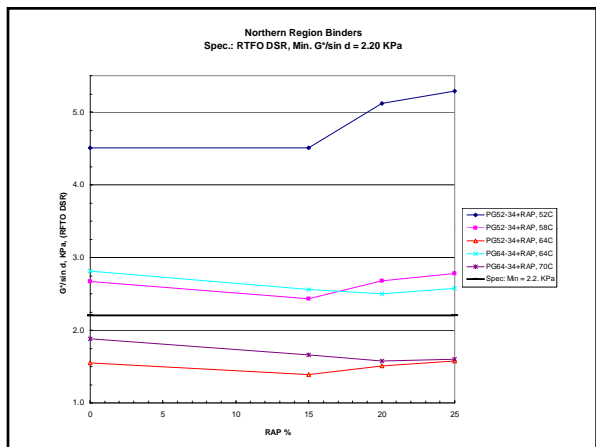
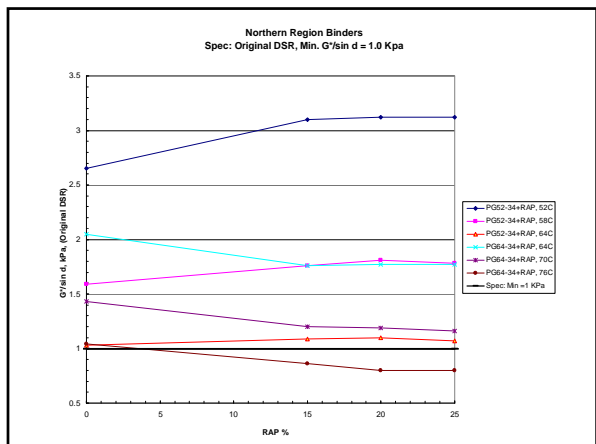
Shauna Tecler
US Oil & Refining
Alaska Asphalt Pavement Summit 2009

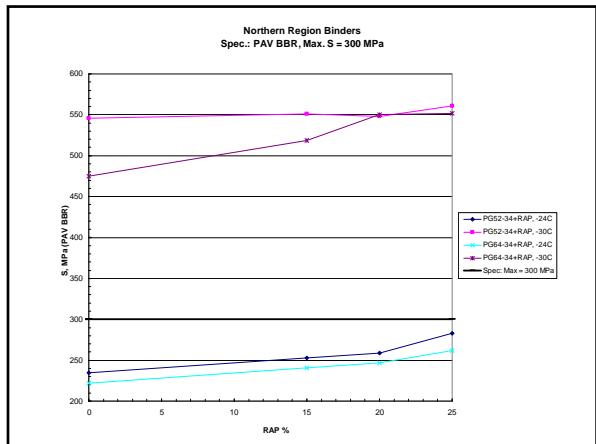
Why Use RAP?

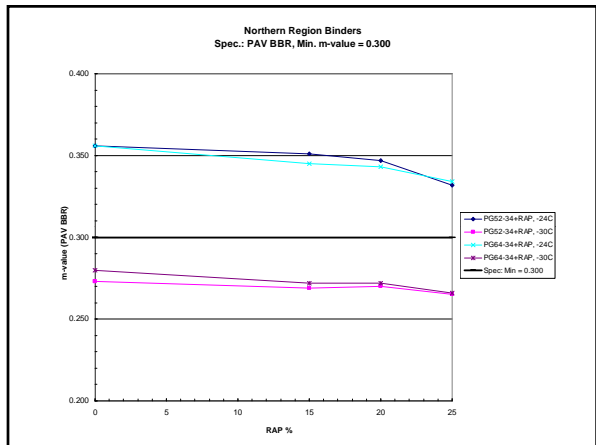
- Aggregate in shorter supply
- Reduce landfill
- RAP is hard aggregate
- Lower asphalt content
- Lower cost of mix
- NCHRP Project 9-12 says RAP OK
- Use of Reclaimed Asphalt Pavement (RAP) using Superpave Specifications (FHWA/IN/JTRP-2002/6)
- How much can you use without changing something

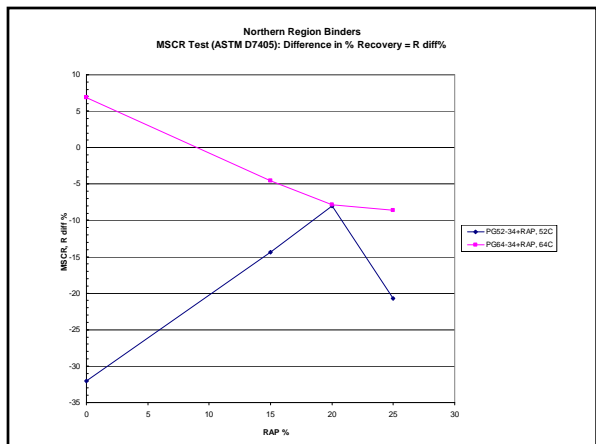
Materials

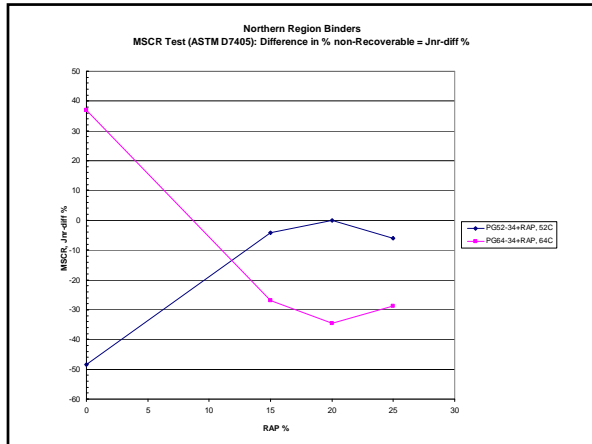
- RAP from each of the three region of Alaska Department of Transportation and Public Facilities (AKDOT & PF)
- 2 asphalt from each region was obtain by AKDOT & PF
 - Northern PG52-34 and PG64-34
 - Central PG52-28 and PG64-34
 - Southern PG58-28 and PG64-28









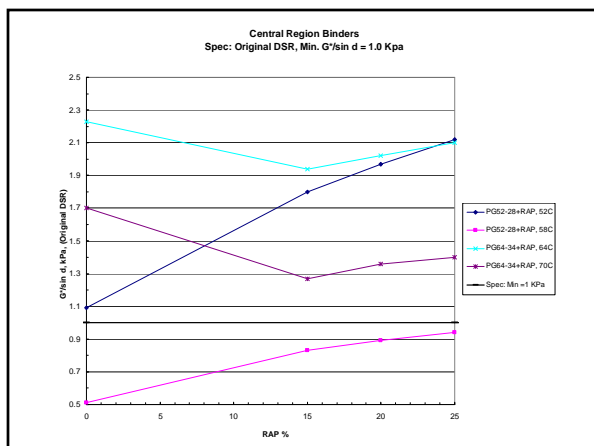


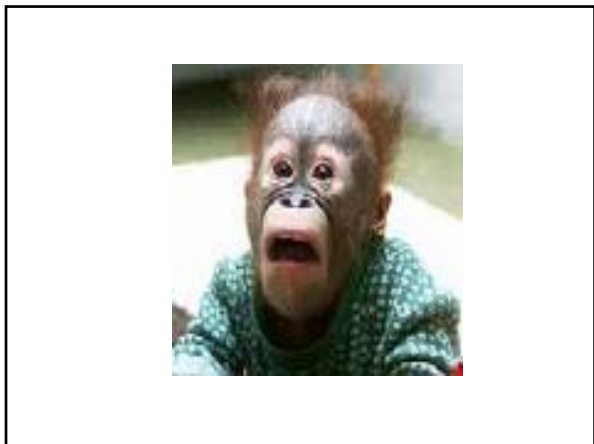
CR	RA P%	at, deg.C			
CR, Orig DSR	0	PG52-28+RAP, 52C	PG52-28+RAP, 58C	PG64-34+RAP, 64C	PG64-34+RAP, 70C
		1.09	0.51	2.23	1.70
	15	1.80	0.83	1.94	1.27
	20	1.97	0.89	2.02	1.36
	25	2.12	0.94	2.10	1.40
CR, RTFO DSR	0	PG52-28+RAP, 52C	PG52-28+RAP, 58C	PG64-34+RAP, 64C	PG64-34+RAP, 70C
		3.01	1.31	2.84	1.84
	15	3.16	1.49	2.78	1.71
	20	3.61	1.46	2.71	1.88
	25	3.75	1.69	2.59	1.65
CR, PAV DSR	0	PG52-28+RAP, 16C	PG52-28+RAP, 13C	PG64-34+RAP, 22C	PG64-34+RAP, 19C
		3587	5619	2448	1578
	15	3402	5519	1004	1680
	20	3663	5313	1027	1655
	25	3803	5034	1038	1647

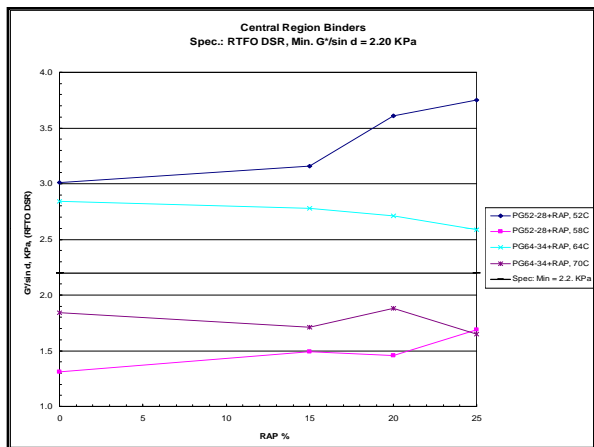
CR, PAV S	0	PG52-28+RAP, -18C	PG52-28+RAP, -24C	PG64-34+RAP, -24C	PG64-34+RAP, -30C
		197	441	247	519
	15	195	458	273	545
	20	198	449	275	576
	25	206	469	280	570
CR, PAV m-value	0	PG52-28+RAP, -18C	PG52-28+RAP, -24C	PG64-34+RAP, -24C	PG64-34+RAP, -30C
		0.356	0.284	0.313	0.250
	15	0.350	0.275	0.313	0.242
	20	0.349	0.280	0.313	0.237
	25	0.351	0.279	0.312	0.240

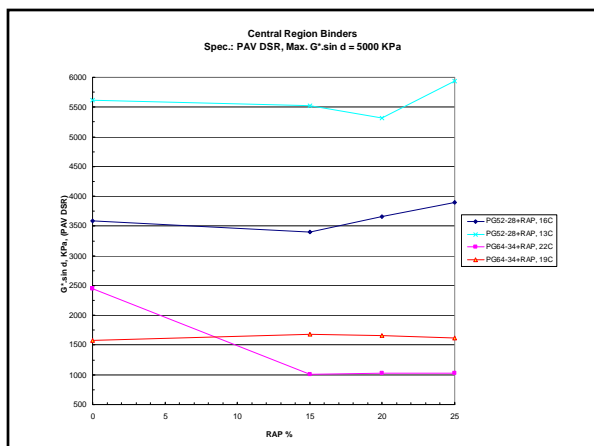
PG52-28+RAP, 52C			PG64-34+RAP, 64C	
CR, MSCR Rdifff%	0	75.07		1.07
	15	71.56		-5.03
	20	57.03		-1.84
	25	50.69		-7.86
PG52-28+RAP, 52C			PG64-34+RAP, 64C	
CR, MSCR Jrdifff%	0	13.38		7.17
	15	6.17		-12.58
	20	18.23		-1.64
	25	20.84		-16.40

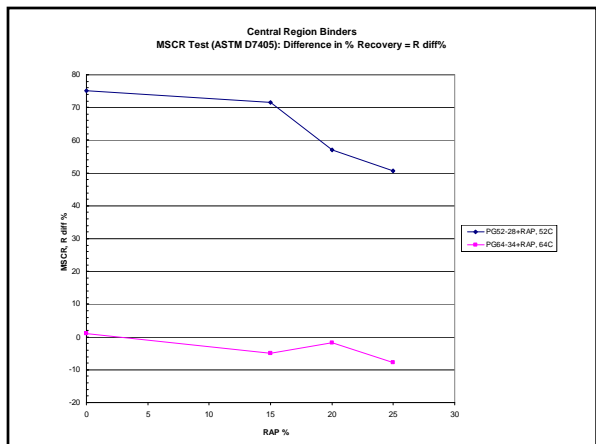
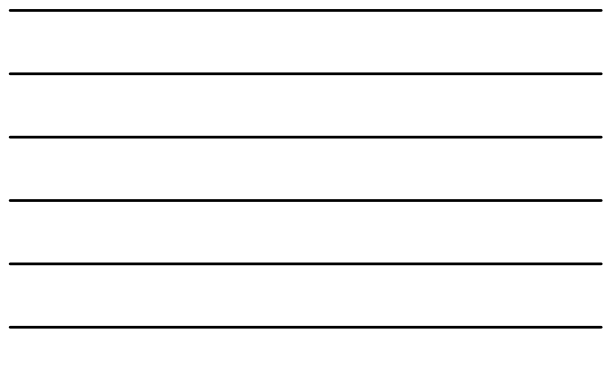
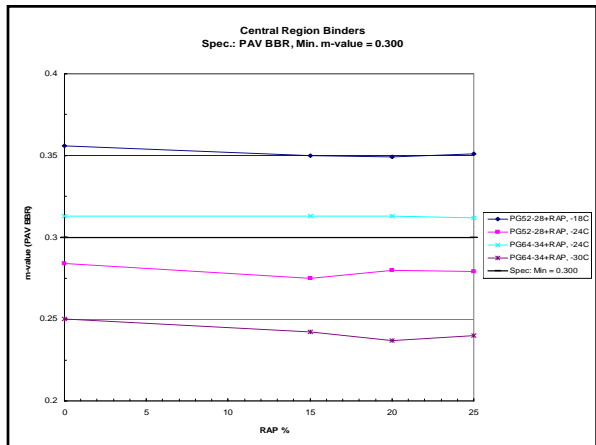
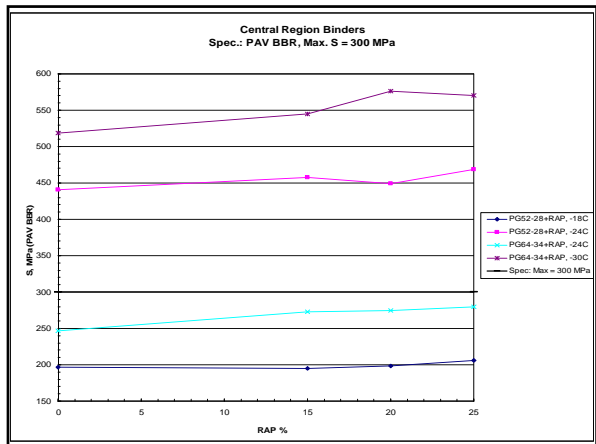
AKDOT&P F	Material	VirginRAP Blend	Pass/Fail		Actual Grade	Elastic Recovery @ 25C (%)	RAP Binder Content, %
			Temperature (C) *	Performance Grade			
Central	PG 52-28	100/0	54.9	52-28	54-28	12	
		85/15	56.5	52-28	54-28	11	
		80/20	57.1	52-28	55-28	13	
		75/25	57.6	52-28	56-28	14	
	PG 64-34	100/0	83.2	64-34	67-34	98	
		85/15	74.0	64-34	66-34	95	
		80/20	75.4	64-34	67-34	95	
		75/25	75.3	64-34	66-34	93	
RAP binder	0/100	70.7	-	-	-	3.91	

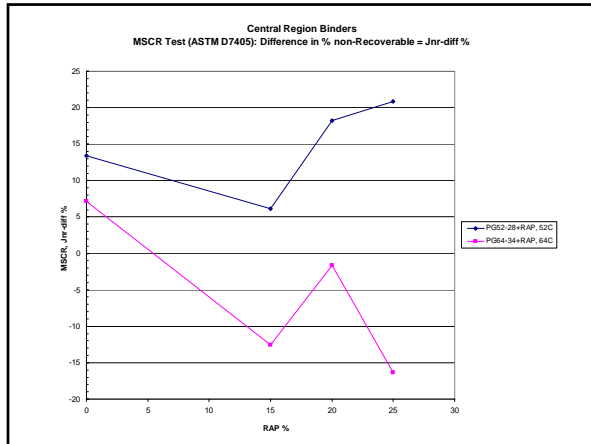








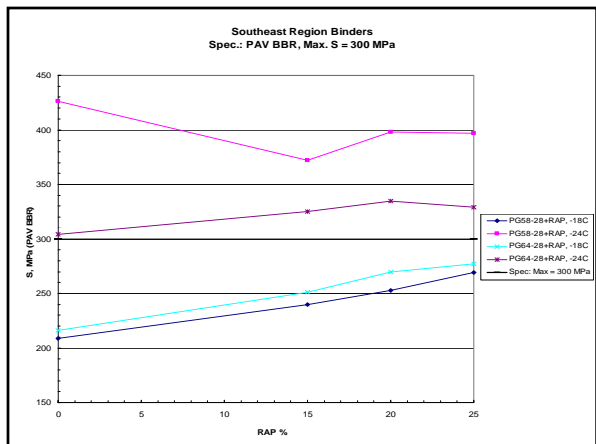
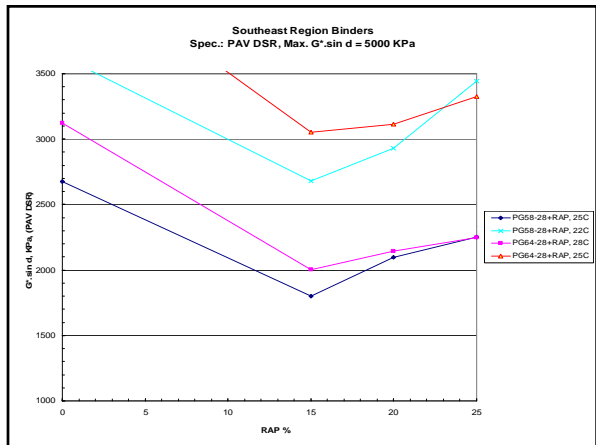
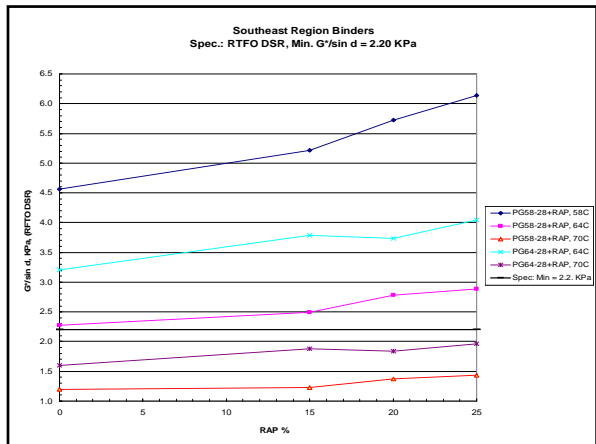


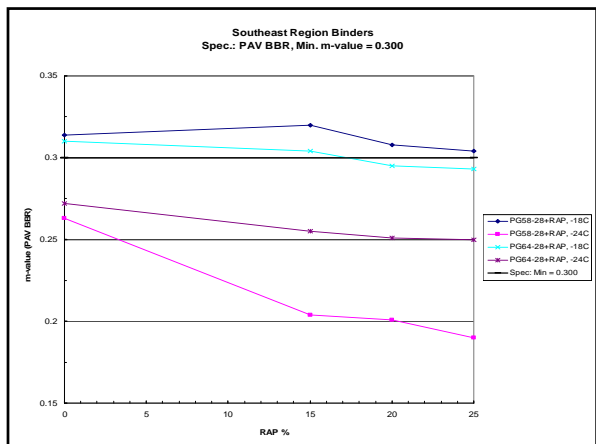


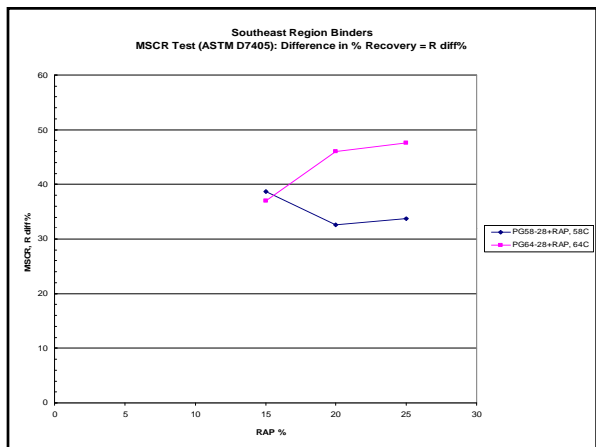
SER	RA P % at, deg.C	PG58-28+RAP			PG64-28+RAP	
		58C	64C	70C	64C	70C
SER, Orig DSR	0	2.49	1.31	0.70	1.38	0.75
	15	2.99	1.39	0.72	1.94	0.91
	20	3.18	1.5	0.72	2.09	0.98
	25	3.43	1.65	0.78	2.13	1.04
SER, RTFO DSR	0	4.56	2.27	1.20	3.21	1.60
	15	5.22	2.49	1.23	3.79	1.88
	20	5.72	2.78	1.37	3.73	1.84
	25	6.14	2.89	1.43	4.05	1.96
SER, PAV DSR	0	2676	3631		3124	4424
	15	1800	2681		2004	3053

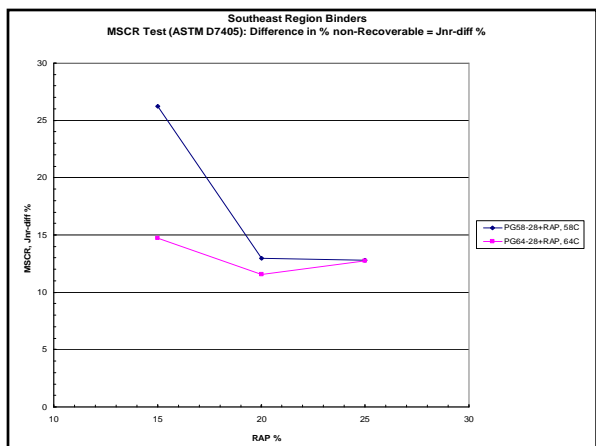
SER, PAV S	PG58-28+RAP, -18C		PG64-28+RAP, -18C	
	209	426	216	304
15	240	372	251	325
20	253	398	270	335
25	269	397	277	329

SER, PAV m-value	PG58-28+RAP, -18C		PG64-28+RAP, -18C	
	0.314	0.263	0.31	0.272
15	0.320	0.204	0.304	0.255
20	0.308	0.201	0.295	0.251
25	0.304	0.190	0.293	0.250









Conclusions

- The low amounts of RAP considered in this study (15,20 and 25%) can be used in an HMA without testing the RAP binder properties.
- Results are consistent with other national studies done.
- AKDOT will be modifying the RAP provision in the specifications.

Questions