Delta S Durability Testing (ΔT_c)

Durability testing (ΔTC) results from NCAT show a higher likelihood of cracking resistance in mix designs containing 35% RAP with 5% or 10% Delta S (dosed to the recycled binder content) compared to mix designs containing 35% and 20% RAP mixes without Delta S. With a criteria of -5°C for control cracking resistance of asphalt mixes, the two 35% RAP mixtures containing Delta S would pass, while the two without Delta S would be more susceptible to failure due to premature cracking.

Delta S Durability Testing (ΔTC)				
	35% RAP + 5% Delta S*	35% RAP + 10% Delta S*	Cracking Group 35% RAP**	Cracking Group 20% RAP Control**
DSR Unaged (°C)	81.1	75.6	84.9	90.1
DSR RTFO (°C)	79.7	76	82.8	88.6
DSR PAV (°C)	24.4	21.8	18.8	25.6
BBR PAV-S (°C)	-25.7	-27.4	-32.3	-26
BBR PAV-m (°C)	-22.3	-24.9	-23	-16.6
ΔT_c (°C)	-3.4	-2.5	-9.5	-16.6

*Binders extracted from lab mixes **Binders extracted from plant mixes

Mix Design Information	Cracking Group 20% Control & High Density	Cracking Group 35% RAP	Cracking Group 35% RAP + 5% Delta-S
% Total AC Required	5.72	5.7	5.71
Max Spec. Gravity Mix (Gmm)	2.474	2.481	2.477
Bulk Spec. Gravity Mix (Gmb)	2.375	2.382	2.378
Design Air Voids (Va)	4	4	4
VMA	15.6	15.7	16
VFA	74.5	74.6	75.3
Dust/Asphalt Ratio	1.24	1.25	1.11
Effective AC (Pbe)	5.03	5.05	5.24
Absorbed AC (Pba)	0.73	0.68	0.5
% AC Contribution from RAP	1.09	1.91	2.01
% AC Contribution from RAS	0	0	0
% Virgin Binder	4.63	3.79	3.71
% Recycled AC Replacement	19.05	33.47	35.12
Gradation (% Passing)			
1-1/2"	100	100	100
1"	100	100	100
3/4"	100	100	100
1/2"	99.8	99.7	100
3/8"	99	98.3	98.8
#4	74.1	74	70.7
#8	50.5	52.3	49.5
#16	38.9	40.7	41.2
#30	26	26.8	30.1
#50	15.1	15.3	15.4
#100	9.4	9.6	8.6
#200	6.2	6.3	5.8

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