The Latest Research on Reclaimed Asphalt Pavement

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Roads and Bridges Live

October 12, 2010

Performance Studies of Asphalt Pavements with Greater than 25% RAP

Randy C. West, NCAT

October 7, 2009

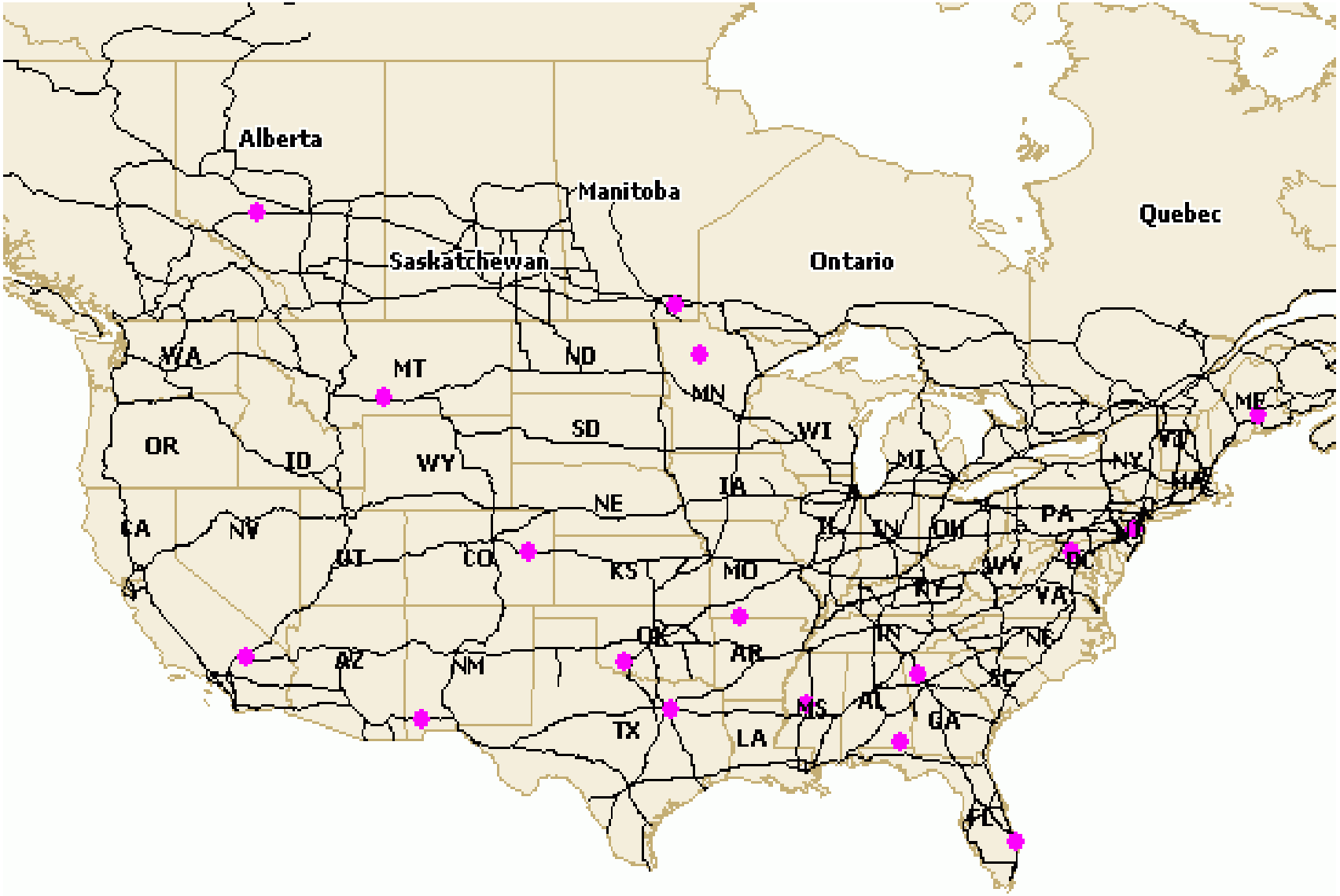
A Performance Comparison of RAP vs. Virgin Mixes

- LTPP SPS-5 pavement sections
- 18 U.S. states and Canadian provinces
- At least 30% RAP used in recycled mixes
- Projects range in age from 6 to 17 yrs

LTPP SPS-5: RAP vs. Virgin

- Four comparison pairs per project (location)
  - 2” overlay, no mill and no mill
  - 5” overlay, no mill and no mill
- Five performance measurements (annual)
  - Rutting, mm
  - IRI, m/km
  - Fatigue cracking, m^2
  - Transverse cracking, # per section
  - Longitudinal cracking, m
- 340 comparisons: graphed, tabulated differences, statistical analyses

SPS-5 Project Locations



General Performance

Percentage of Sections **Below** General Pavement Performance Thresholds

Distress Parameter	Threshold	RAP Sections	Virgin Sections
IRI	2.0 m/km	86%	89%
Rutting	10 mm	71%	78%
Fatigue Cracking	25% of WP area	60%	72%
Longtnl. Cracking	25% of section length	79%	86%
Transverse Cracking	20 cracks per section	47%	64%
Block Cracking	10% of section area	89%	94%
Raveling	10% of section area	75%	69%

Summary of Statistical Analyses

Distress Parameter	Virgin Performed Better than RAP		RAP Performed Better than Virgin	Insignificant Difference Between RAP and Virgin	RAP Performed Equal to or Better Than Virgin
IRI	42		39	19	58
Rutting	33		29	38	67
Fatigue Cracking	29	>	10	61	71
Longtnl. Cracking	15		10	75	85
Transverse Cracking	32	>	15	53	68
Block Cracking	3		1	96	97
Raveling	7		15	78	93

Possible Causes of Higher Occurrence of Fatigue Cracking in RAP Mixes

- Lower effective binder content
- Binder is more brittle
- Lower in-place density
- Higher dust contents

Possible Causes of More Fatigue Cracking in RAP Sections

State/Province	# Pairs: Rec.>Vir.	Softer Vir. Binder in Rec. Mix?	Asphalt Content		P200	
			Vir.	Rec.	Vir.	Rec.
Alabama	2	Y	4.8	5.0	4.0 √	5.1
California	2	N	5.3 √	3.8	4.3 √	6.2
Mississippi	3	N	5.9	5.7	5	5
Montana	4	Y	4.8 √	3.7	5 √	7.8
New Jersey	2	Y	4.8	4.8	n.a.	n.a.
Alberta	4	Y	5.4	5.4	8.6 √	10.5
Manitoba	2	N	5.9	5.9	5 √	6

CONCLUSIONS

Based on the long-term performance of a large number of projects across North America…

- Pavements using ≥ 30% RAP perform equal or better than virgin pavements in most cases
- Transverse and fatigue cracking were observed more often in some pavements with RAP compared to pavements with all virgin materials
- Differences in cracking performance for several locations may have been due to lower asphalt contents and/or higher dust contents

More info:

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