11th Annual Association of Modified Asphalt Producers Savannah, Georgia February 1-3, 2010

Various Modifications and Material Designs in Nebraska

Robert C. Rea, P.E. Nebraska Department of Roads





11th Annual Association of Modified Asphalt Producers

Nebraska's Use of Modifiers

Crumb Rubber Techniques

□ Tear Off Shingles

□ RAP Mix Incentive





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SB SBR Latex Emulsions Crumb Rubber + Transpolyoctenamer





Modified Binders used in Nebraska

PG58-34
 PG64-28
 PG64-34
 PG70-28
 PG76-22





Modified Binders used in Nebraska

PG - 28's used to be standard low temperature grade

Mixes





Modified Emulsions used in Nebraska

CRS-2P
CRS-2L
CRS-2VHL*
HFMS-2P
HFMS-2L





Modified Emulsions used in Nebraska

CRS-2VHL*





CRS-2L



CRS-2VHL

08/26/2009

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BIG RED....GOING GREEN???



Huskers – Not anytime Suh-n



Asphalt Paving Construction – Yes!!!



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Crumb Rubber Techniques



Wet Process Using 20% CRM Gap Graded Mixes Binder Contents of 8.5%





2000 Hwy 2 – Lincoln East



10 years later



Crumb Rubber Techniques



Dry Method using 6-8% CRM Dense Graded Mixes Binder Contents of 5.5%









Approximately 200 feet in 2 locations

"Waffling"

- Associated with Compaction and over rolling to obtain density of 92.5%
- •Reduced in place density to 91% and alleviated the problem







Crumb Rubber Techniques



Wet Process Using 10% CRM Dense Graded Mixes Binder Contents of 5.5%





2008 US 136 – Fairbury West



2009 Hwy 91 - US 81 to Leigh



Crumb Rubber Techniques



Terminal Blend Using 6-8% CRM Dense Graded Mixes Binder Contents of 5.5%





2009 Hwy US 159 – Rulo West



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Nebraska new specifications allowing RAS in SHOULDER MIXES



- NDOR specification effective November of 2009 allows up to 10 % RAS in the Type SPS Shoulder
- Material will be eligible for Contractor Rap Incentive





- Reduction and elimination in tipping fees for roofing contractors
- Tipping Fees \$21.00 per ton in Lincoln, NE
- Reduce the amount of shingles and the waste stream entering our landfill and extend the landfill's lifetime capacity
- Reduce consumption of fossil fuels/oil
- Supplement the increasing demand of infrastructure building materials





- Lab extracted Binder from ground shingles
- Graded out as PG 110 19 by backcalculation
- Blended with Virgin PG 52-34
- 70% Virgin & 30% RAS
- Final Grade of PG 66 29 → Standardized Grade PG 64 28





- Savings from asphalt cement \$12.00 per ton
- Savings in aggregate \$.30 cents per ton
- Savings from Handling Fee \$2.50 per ton

Total Savings - **\$14.80 per ton of HMA**





Allowing 10 % of Recycled Shingles in our SPS Shoulder mix will......

Potential Savings of up to



Each Year





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□ RAP Mix Incentive

- Nebraska Pays for Binder Quantity Separately
- No incentive to underrun and established quantity when most often the contractor would own the RAP at the completion of the project
- Would keep and use on private work or sold to others
- Binder savings was not recovered or benefitting NDOR





Mix RAP Content

2007 2009



Avg. RAP Content

1,623,033 Tons Hot Mix

112 mixes of which 55 had 0% RAP (51%)

Average RAP Content of 6.85%





Aggregate Savings

6.85% RAP, Use 111,178 Tons Less Aggregate

■ 111,178 Tons @ \$10 = **\$1,111,780**





Binder Savings

6.85% RAP, Use 6004 Tons Less Binder

6004 Tons @ \$425 = \$2,551,700





Total Savings

Aggregate \$1,111,780 + Binder \$2,551,700

TOTAL = <u>\$3,663,480</u>





RAP Savings Comparison

2007



2,078,669 Tons Hot Mix

137 mixes of which 10 had 0% RAP (90%)

Average RAP Content of 27.3%





Aggregate Savings

• 27.3% RAP, Use 567,477 Tons Less Aggregate

■ 567,477 Tons @ \$10 = **\$5,674,766**





Binder Savings

• 27.3% RAP, Use 30,644 Tons Less Binder

■ 30,644 Tons @ \$575 = **\$17,620,300**





Total Savings

Aggregate \$5,674,766 + Binder \$17,620,300

TOTAL = <u>\$23,295,066</u>





Total Savings <u>\$23,295,066</u>

Average 30% shared as incentive

TOTAL Savings to NDOR <u>\$16,306,546</u>





2007 vs 2009 Savings from RAP

■ 2007 → \$3,663,480

■ 2009 → \$16,306,546

Increase of <u>\$12,643,066 per year</u>











New Considerations with Increased RAP

Temperature grades, especially.....
 Low Temperature Grades





New Considerations with Increased RAP

Temperature grades, especially.....
 Low Temperature Grades





- With 10% RAP using PG64-28 (one modification)
- Say 2.5% Polymer, combined mix contained a total of <u>2.25% Polymer Loading</u> in the mix/binder matrix





Conventional (PG 64-28)





- With 50% RAP using a PG58-34 (one modification)
- Say 2.5% Polymer, combined mix contained a total of <u>1.25% Polymer Loading</u> in the mix/binder matrix





High Recycle Conventional (PG 64-28)







- Looking at grades and total Polymer Loading..... use a PG64-34 (two modifications)
- With 50% RAP using a PG64-34 (two modifications)
- Say 5% Polymer, combined mix contained a total of <u>2.50% Polymer Loading</u> in the mix/binder matrix





High Recycle Polymer Loading (PG 64-34)











Last but not least, Polymer Modification





I-80 – Lincoln to Omaha – 10 Years



SP-5

- PG 70-28
- SBS Modification
- 10 Years Old
- 4 Inch Overlay
- Original 10 inch
 Concrete Built in 1960
 (50 years Old)
- Carried 40 Million ESAL's so far







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"Properly Modified Asphalts are the largest technological advancement and material improvement for performance in Asphalt Pavements and Bituminous Surface treatments"

> Robert C. Rea, P.E. Nebraska Department of Roads





Questions?