UPDATE ON RAP EXPERT TASK GROUP

Northeast Asphalt User Producer Group Meeting
Atlantic City, New Jersey
October 8, 2008
The Public is Environmentally Conscious
A huge fight between East and West—over the oil sands—is just starting

Even now, fish pulled from the Athabasca downstream of the oil sands taste of gasoline and smell of burning galoshes in the fry pan. The landscape is perforated by more than presents a scenario almost too frightening to contemplate and suggests Alberta may already be too far gone for redemption—indeed, that it is environmentally doomed. "When you
And people react

BUT... I like my SUV!
WHY RAP?

Material Savings $/ton vs. %RAP

- $300
- $400
- $500
- $600
- $700

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%

- $-5.00
- $0.00
- $5.00
- $10.00
- $15.00
- $20.00
- $25.00
- $30.00
- $40.00
- $50.00
- $60.00
- $70.00
Conservation of Energy

- Using 1 ton of RAP conserves 200,000 BTU’s of energy
  - Aggregate mining, processing & delivery
  - Asphalt refining & delivery
So, What Does RAP Save?

- 1,000,000 tons RAP per year
- 1,600,000 gallons gas
- 1800 Ford Expeditions
  Gas for a year
Recycled Hot Mix Asphalt

### Millions of Tons

- **Asphalt pavement**: 80.3
- **Scrap steel**: 70.0
- **Newsprint**: 6.2
- **Concrete pavement**: 3.3
- **Glass bottles**: 2.9
- **Aluminum cans**: 0.9
- **Lead-acid batteries**: 0.8
- **Magazines**: 0.5
- **Plastic containers**: 0.3

#1
RAP EXPERT TASK GROUP

- Formed in 2007 by FHWA
  - Identify barriers to use
  - Research technology gaps
  - Assemble best practice
  - Resource to states
SURVEY OF RAP USE

- 51 Responses (Including Ontario)
- Data as of Mid 2007
- Dependent on Person Responding
- Good Baseline
FINDINGS

- Most States Allow RAP use
- Most Specifications Limited Practical Use of Higher Percentages
- Some Differences on Mix Type
- Few Limits Based on Plant Type
  - Georgia
  - Hawaii
  - Massachusetts
  - New Hampshire
  - South Carolina
Percent Allowed -- Base Mixes

0%  10%  15%  20%  25%  ≥30%  n/a
Percent Allowed -- Intermediate Mixes

The map illustrates the percent allowed for intermediate mixes across different states in the United States. Each state is color-coded based on the percentage allowed:

- 0% (Red)
- 10% (Yellow)
- 15% (Orange)
- 20% (Brown)
- 25% (Purple)
- ≥30% (Green)
- n/a (Gray)

The states are shaded accordingly to reflect their respective percent allowed for intermediate mixes.
Percent Used -- Intermediate Mixes
Percent Allowed -- Surface Mixes

- 0%
- 10%
- 15%
- 20%
- 25%
- ≥30%
- n/a

Map of the United States with states colored based on the allowed percent of surface mixes.

Legend:
- 0%
- 10%
- 15%
- 20%
- 25%
- ≥30%
- n/a
Recent Experience Using >25% RAP
Specification Barriers

- Quality Concerns
- Consistency of RAP
- Durability of Mixes
- Ability to Meet Volumetric Requirements
- Stiffness of Binder
- Use with Polymers
Industry Barriers

- Control of RAP
- Dust & Moisture
- Increased QC
- State Specifications
Who Retains Ownership of RAP?

![Map showing the distribution of ownership responsibilities across the United States.]

- **Contractor** (Blue)
- **Agency** (Orange)
- **Both** (Yellow)
Quality Concerns and Misperceptions

- RAP is a waste material, look at the stockpiles
  - Don’t base on unprocessed multiple source RAP piles or a few contractors who don’t manage RAP well
  - Set Best Management Practices for processing and feeding RAP
Quality Concerns and Misperceptions

- RAP contains some aggregates which were allowed in the past that don’t meet today’s requirements.
  - Superpave specifications require consensus aggregate properties on the blend of aggregates. This is a sound approach and treats RAP aggregate the same as virgin aggregate.
Crushed RAP
Fractionated RAP

Two Sizes Typical
Processed RAP Stockpiles

Handle Normally
Consistency of RAP

- Milled material often needs no additional processing
  - Mix was placed under tighter control limits than today’s aggregate production limits
  - Use milling machine to control size
Ability to Meet Volumetrics

- Same volumetric controls on RAP and non-RAP mixes
- VMA and dust/asphalt ratio are design challenge
Durability of RAP Mixes?

- Not much information on the performance of past high RAP projects
- Most frequent distresses
  - Raveling
  - Cracking (longitudinal, transverse)
- Good performance from good construction?
ETG Goal
High RAP Field Projects

- Documentation
- Mix design process, production, and construction
- Performance testing
- Develop information for future mix design and quality control procedures
FHWA Mobile Asphalt Laboratory

- Material Characterization
- Mix Design Replication
- Mix Production Sampling
- Volumetric Property Measurements
- Performance Testing
- Pavement Structure Evaluation
Laboratory Activities At NCAT

- Extraction and Recovery
- PG Classification
- Moisture Susceptibility
- Dynamic Modulus
- IDT Creep Compliance and Strength
ETG Goal
Input to RAP Research

- Measure Binder Properties without Recovery
  - RAP mortar: #8 RAP materials
    - Measure the properties of the RAP mortar using the BBR or DSR
    - Measure the dynamic modulus of the RAP materials
Delaware I-95 (200,000 AADT)

Mainline
SMA (No RAP)
PG76-22

Shoulder Mix
30% RAP
PG64-28
Superpave 9.5 mm
Mainline right lane in @ 3 years

HMA Base Course
Depth from surface: 50 mm
30% RAP
Superpave 19 mm
RAP ETG

- Meets twice per year
- Select location based on
  - Invitation
  - States (agency and industry) seeking to
    - Increase RAP use
    - Discuss specifications
SO, In a Nutshell

- RAP ETG promotes the healthy use of RAP

Thanks