

RAP Management Practices in the U.S.A.

ISAP Workshop
2009-08-08

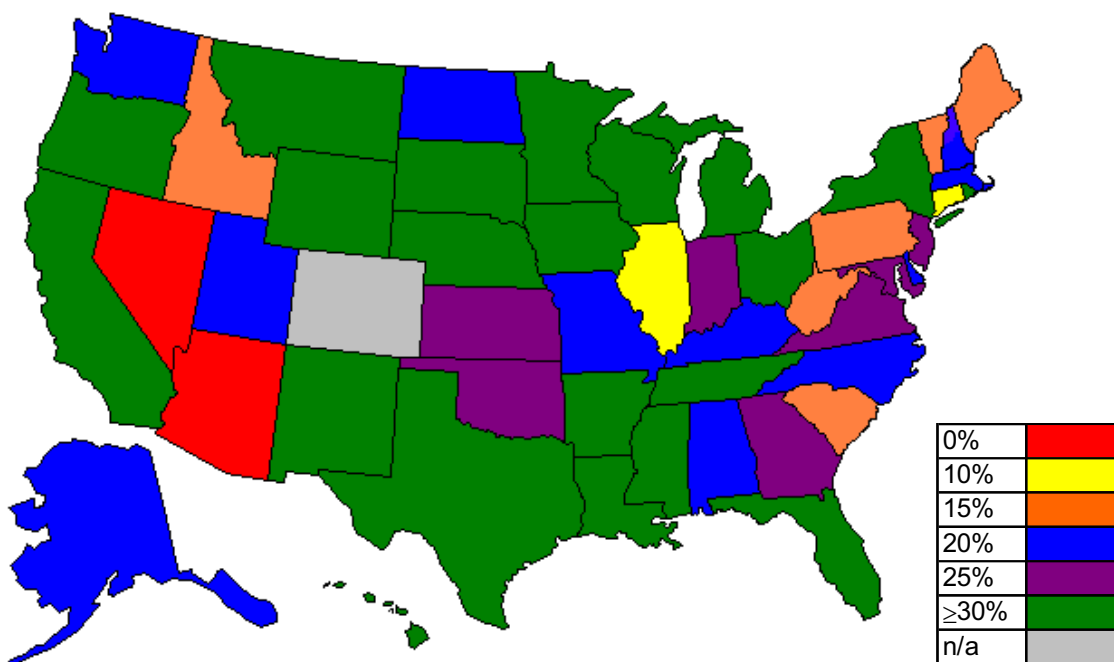
EXPERT TASK GROUP

- FHWA sponsored
- Formed in 2006
- Members from
 - Highway Agencies
 - Contractors
 - University Researchers
- Goal
 - Remove Barriers to Use
 - Improve Technology

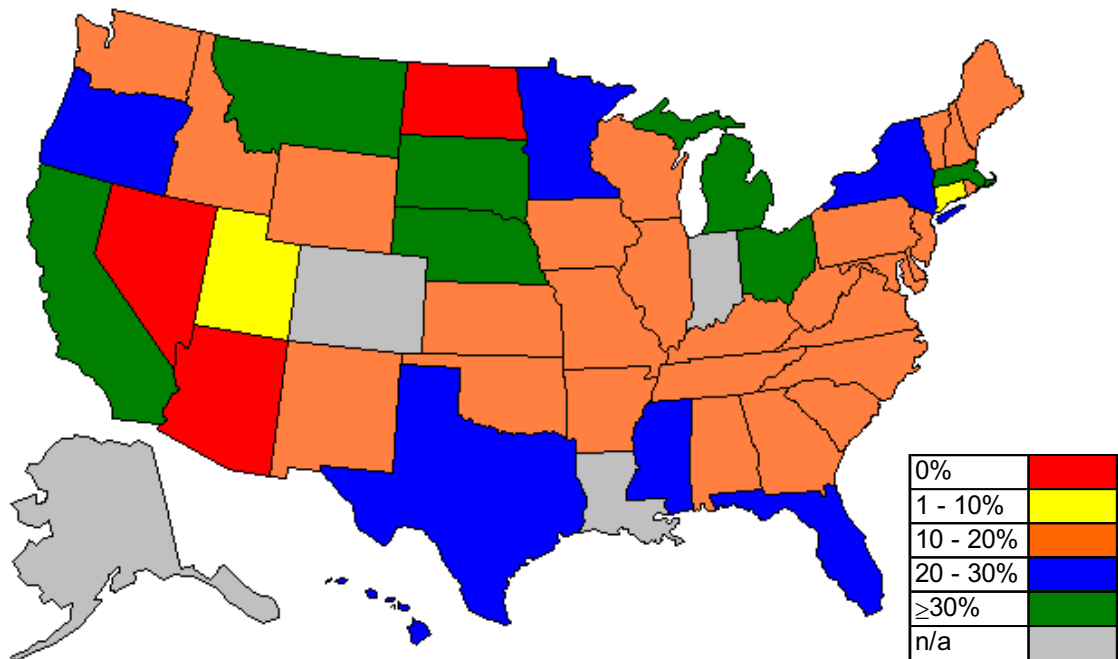
Highway Agency Survey

- 51 Responses (Including Ontario)
- Most States Allowed RAP use
- Most Specifications Limited Practical Use of Higher Percentages
- Some Differences on Mix Type
- Few Limits Based on Plant Type

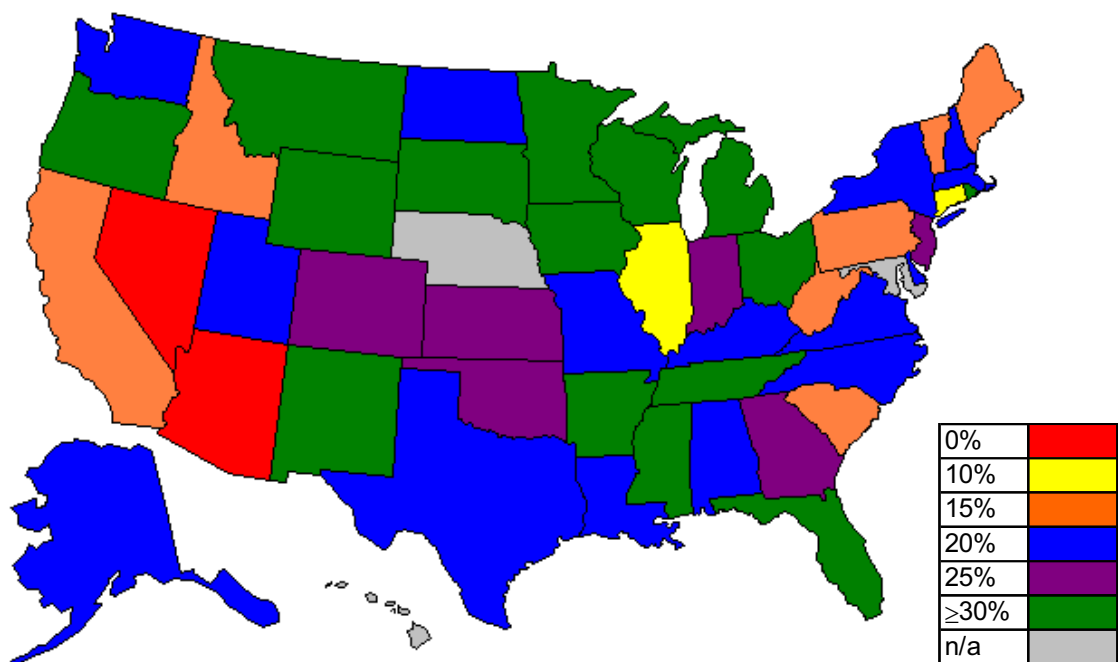
Base Mixes -- Specified



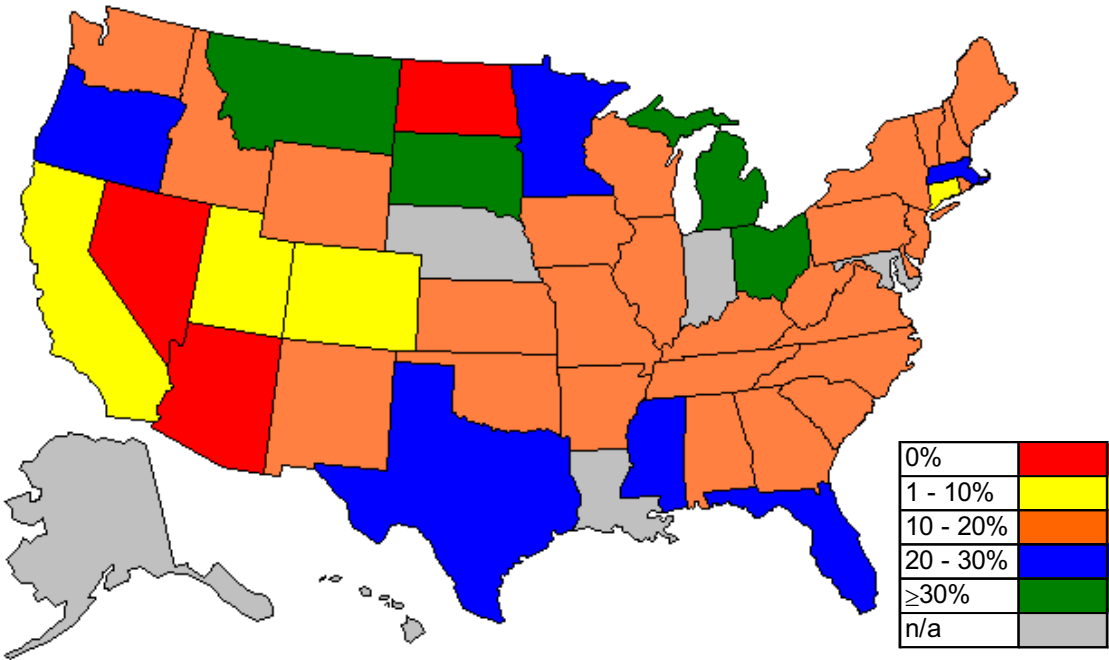
Base Mixes -- Average Use



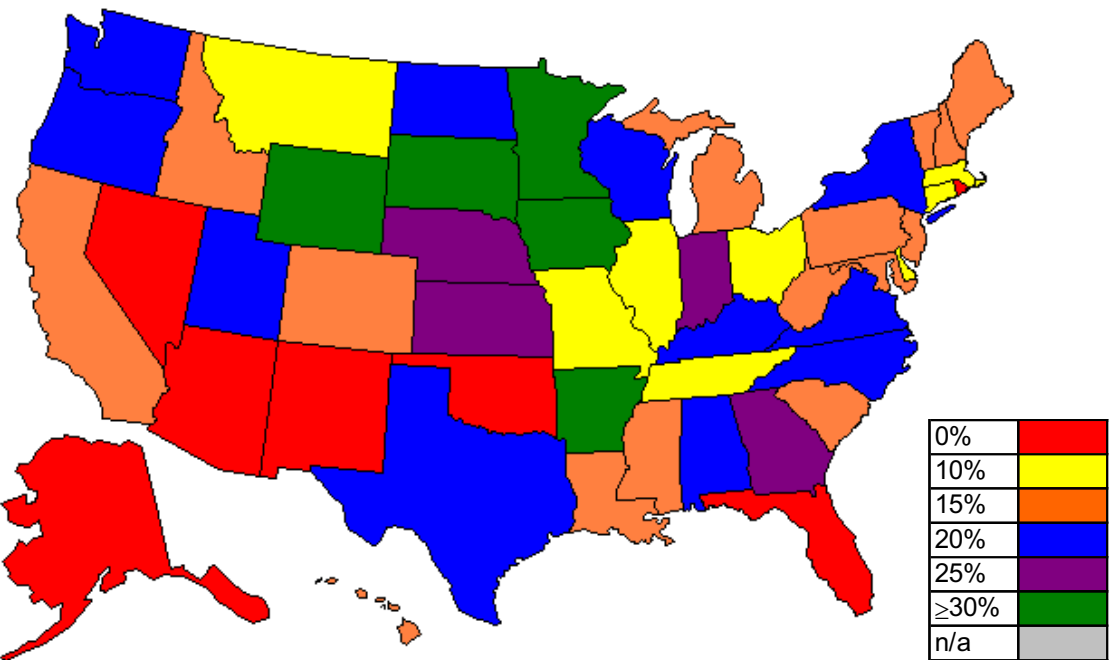
Intermediate Mixes -- Specified



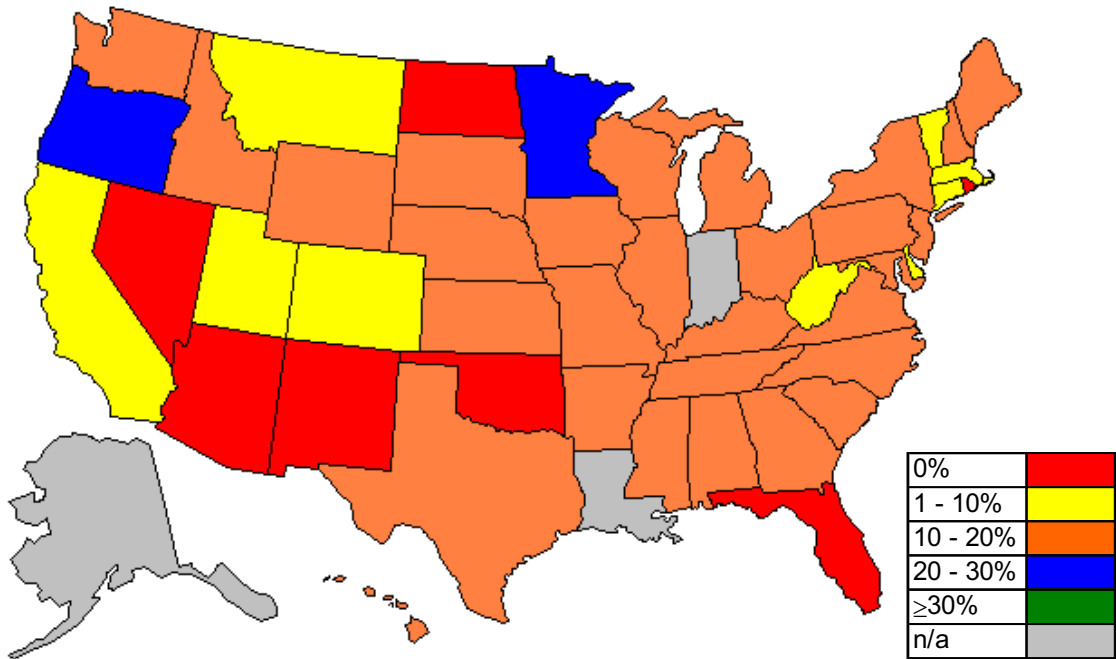
Intermediate Mixes -- Average Use



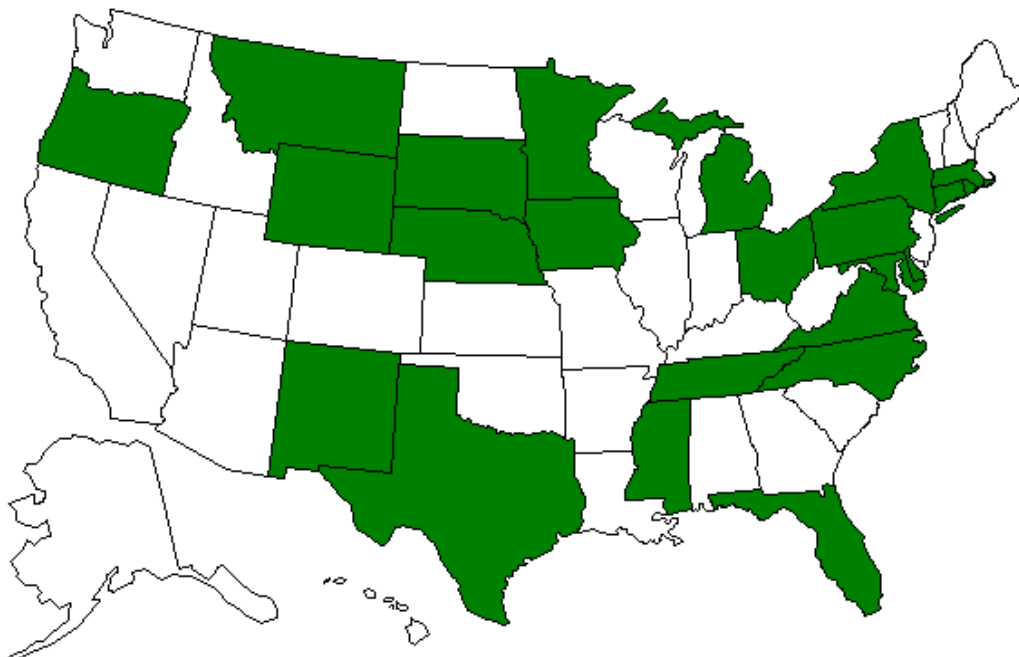
Surface Mixes -- Specified



Surface Mixes -- Average Use



Recent Experience Utilizing >25% RAP



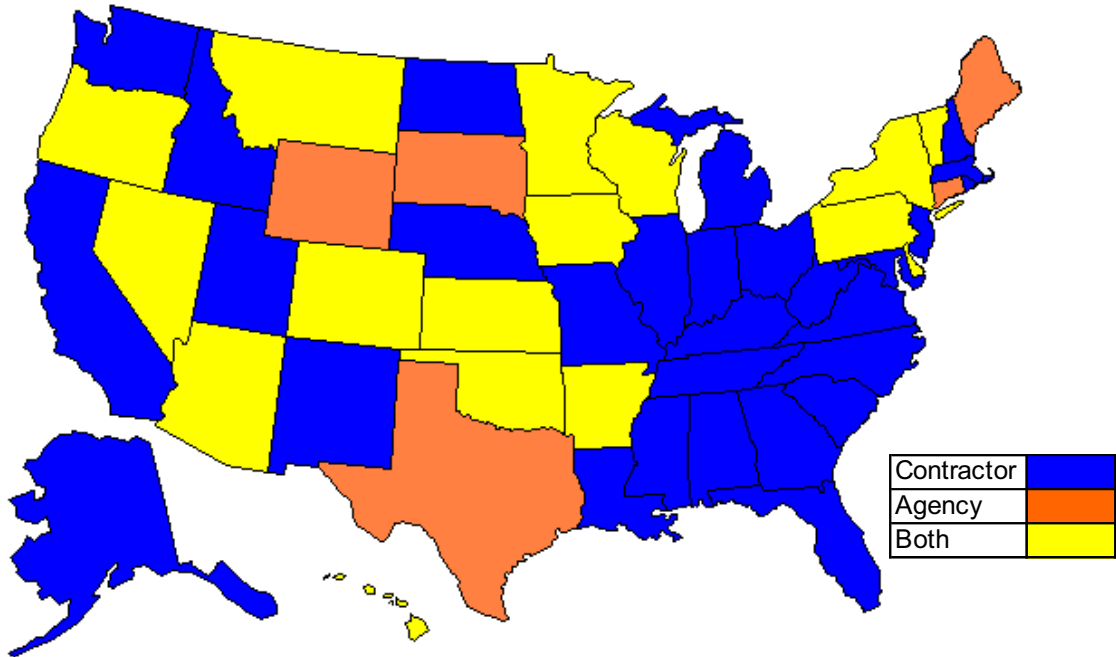
Specification Barriers

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

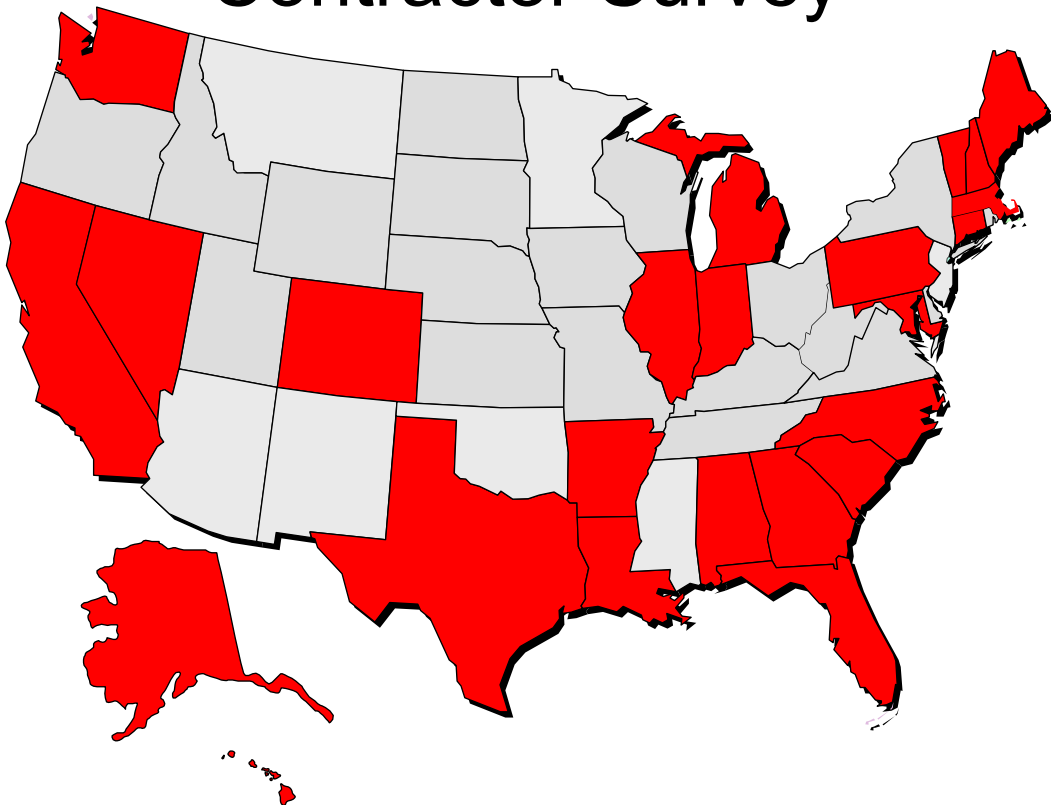
Industry Barriers

- Control of RAP
- Dust & Moisture
- Increased QC
- State Specifications

Who Retains Ownership of RAP?



Contractor Survey



Type of Plants

- Batch 25%
- Continuous 75%



Number of RAP Cold Feed Bins

- One 61%
- Two 36%
- Three 3%



Supply of RAP



- Stable 51%
- Declining 24%
- Increasing 25%

RAP Management Practices

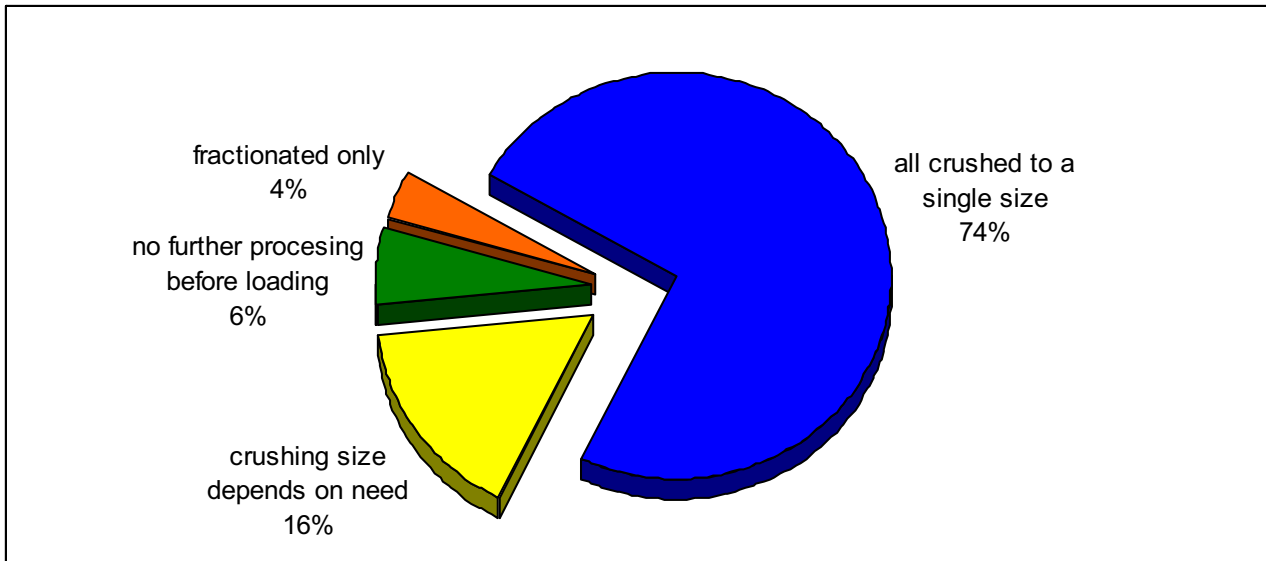
- Combine all RAP into a single stockpile

50%

- Maintain separate stockpiles for different sources of RAP

50%

RAP Processing



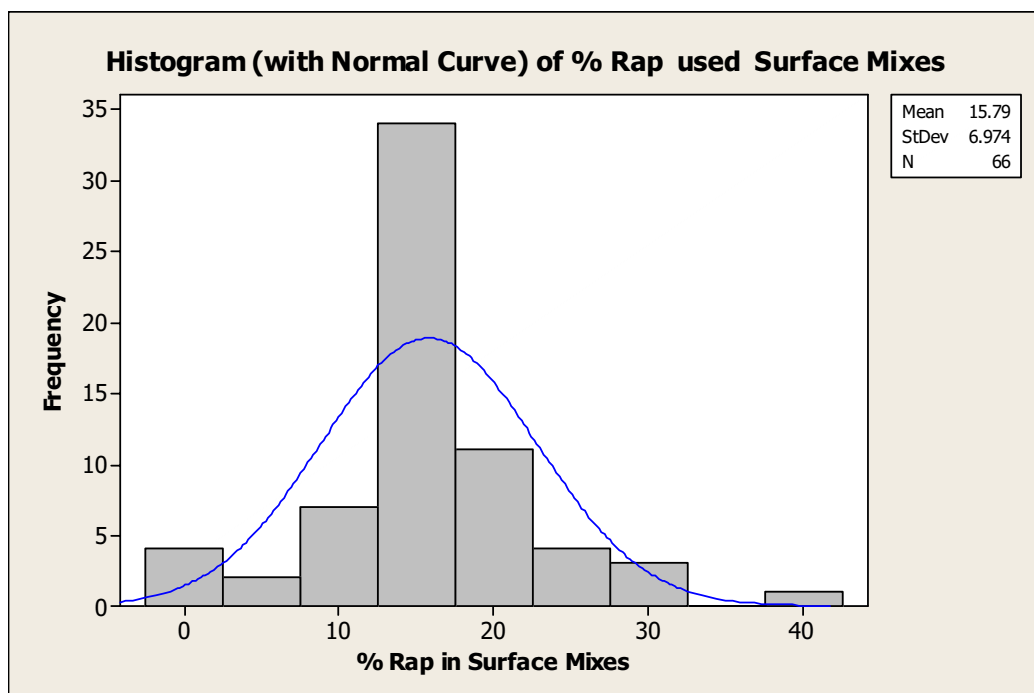
RAP Crushing: Max Size

Screen Size	% of Responses
< 12.5 mm	6%
12.5 mm	52%
16.0 mm	16%
19.0 mm	11%
25.0 mm	5%
> 25.0 mm	11%

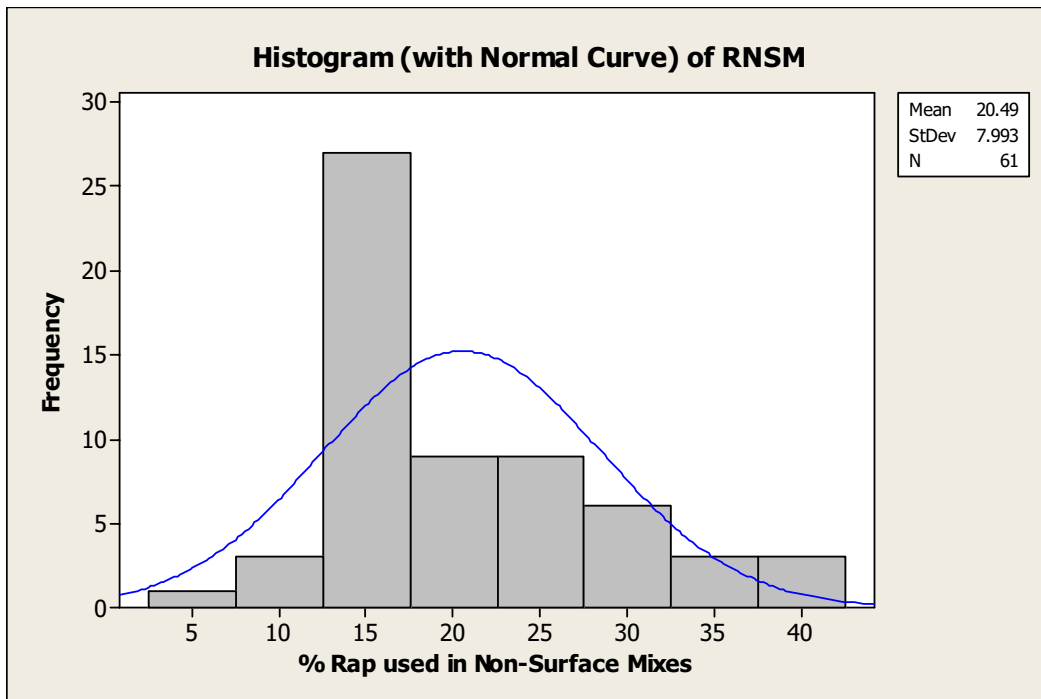
Quality Control: Frequency of Testing RAP Stockpiles

Testing Frequency (one test per...)	% of Responses
500 tonnes or less	43%
Greater than 500 tonnes, less than or equal to 1000 tonnes	33%
Greater than 1000 tonnes, less than or equal to 2000 tonnes	20%
Greater than 2000 tonnes	4%

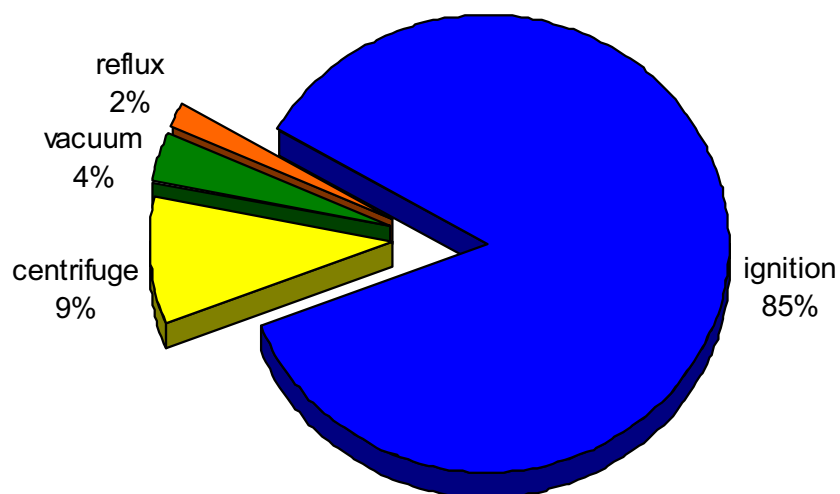
%RAP Used: Surface Mixes



%RAP Used: Non-Surface



Determining AC Content of RAP



Key Findings

- Contractors have limited supply of RAP
 - Only 27% have enough for 25% in all mixes
- Nearly half of producers use the same RAP% in surface and non-surface mixes
- Most HMA producers claim that the greatest factor limiting RAP usage is agency specifications

Key Findings

- Most HMA producers do not use best practices for RAP management
 - Separate stockpiles for different sources
 - Crushing to minimize dust
 - Minimizing moisture in RAP stockpiles
 - Fractionating RAP
- Meeting volumetric properties during production is the second most cited limiting factor for increased RAP usage

Key Findings

- Most HMA producers test RAP stockpiles at least once per 1000 tonnes
- 85% of contractors use the ignition oven to determine RAP asphalt content
- Typical standard deviations:
 - Asphalt content: 0.46%
 - %Passing median sieve: 4.3%
 - % Passing 0.075 mm sieve: 1.1%

Acknowledgements

- Cecil Jones, North Carolina DOT
- Randy West, NCAT
- John d'Angelo, FHWA