

In-Place Recycling Specifications



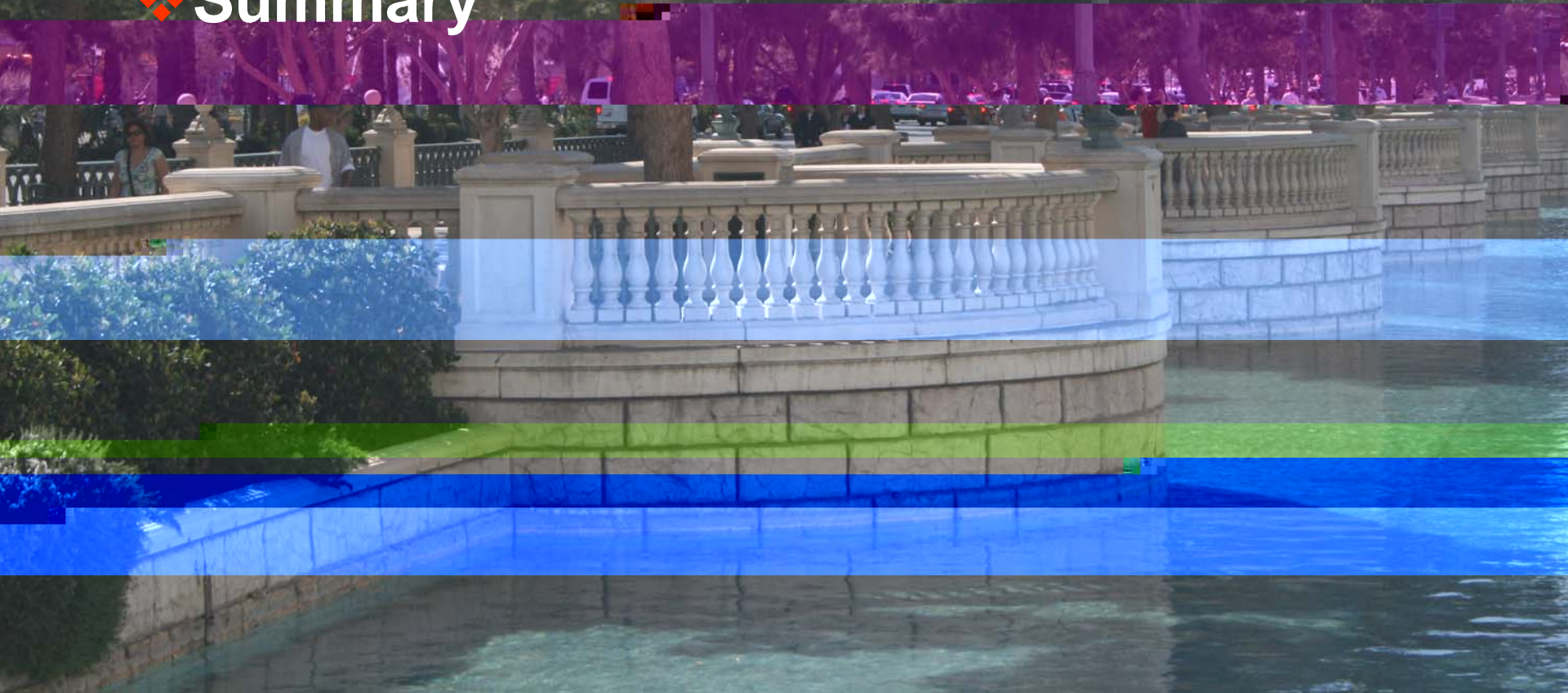
**First Western States Regional
In-Place Recycling Conference
June 3-5, 2008 Salt Lake City**

Outline

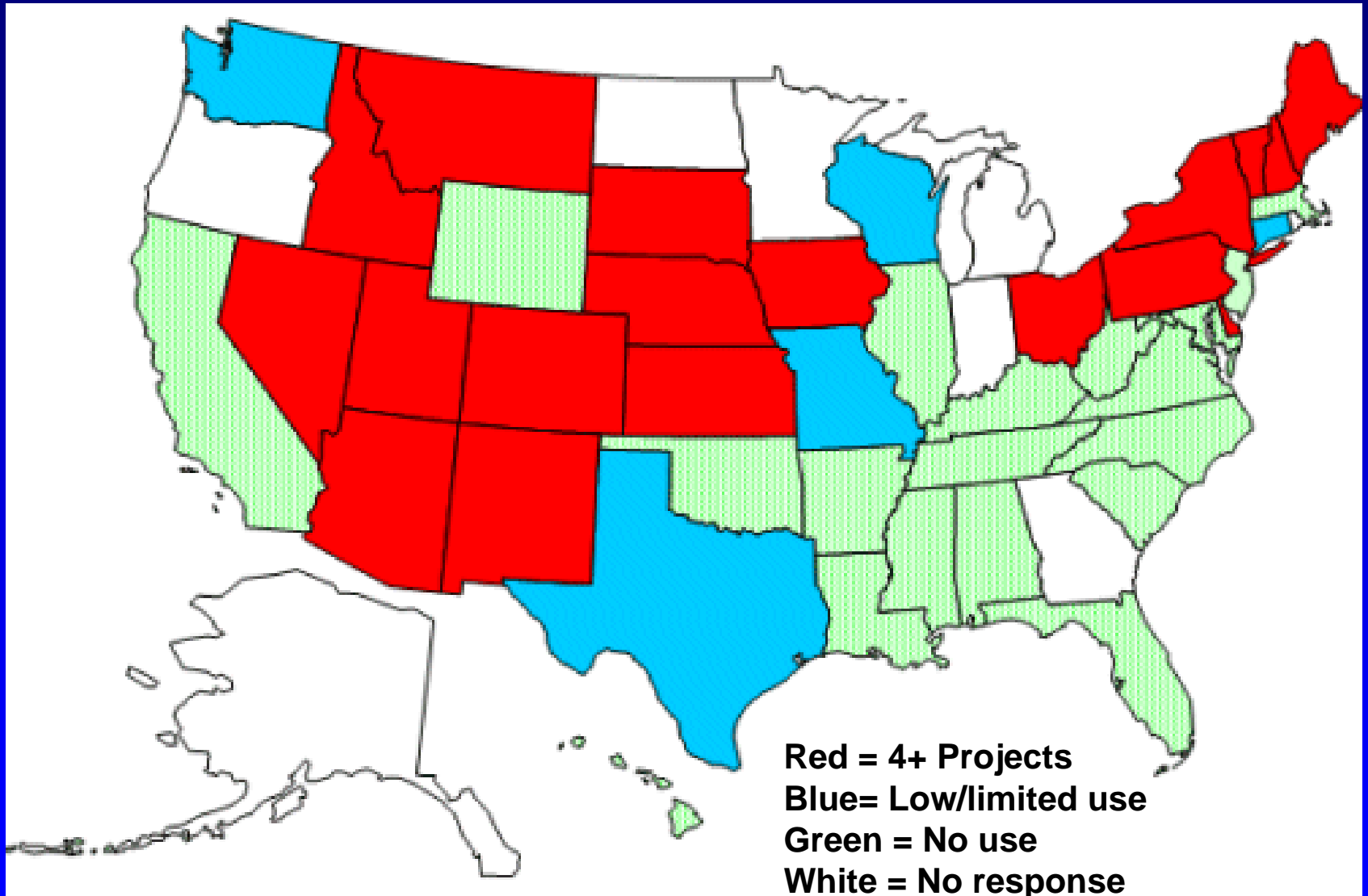
- ❖ Cold In-Place Recycling (CIPR)
- ❖ Hot In-Place Recycling (HIPR)
- ❖ Summary

Outline

- ❖ Cold In-Place Recycling (CIPR)
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States Use of CIPR



Specification / Information Review

- ❖ Arizona
- ❖ California
- ❖ Colorado
- ❖ Iowa
- ❖ Kansas
- ❖ Nevada
- ❖ Pennsylvania
- ❖ South Dakota
- ❖ Utah
- ❖ Vermont
- ❖ Ontario
- ❖ FHWA
- ❖ ARRA
- ❖ PCCAS

Specification Sections

❖ Descriptions ❖ Materials ❖ Mix Designs ❖

Description

- ❖ **Partial Depth (Cold In-Place)**
- ❖ **Full Depth (FDR)**

Description (General)

- ❖ **Milling existing asphalt pavement**
- ❖ **Mixing the millings with an emulsion**
- ❖ **Placing**
- ❖ **Compacting**

Materials - Binders

State	Asphalt Binder
Arizona	HFE-XXP
California	Emulsified RA
Colorado	HFE (Polymer) / emulsified RA
Iowa	Contractor select
Kansas	Emulsified asphalt / asphalt RA
Nevada	CMS-2S
New Mexico	HFE-150P
Pennsylvania	MS, CMS, SS, CSS, HMFS / polymer grades
Utah	Shown on plans

Materials - Additives

State	Additive
Nevada	1.5% quicklime slurry
New Mexico	1.5% hydrated lime slurry
Utah	1.5% quicklime slurry

Mix Design

State	Method
Arizona	Contractor performed
California (Project)	Marshall stability, retained stability, emulsion, cement
Iowa	Gyratory compactor, Marshall stability, retained stability, raveling test
Vermont	50 blow Marshall

QC/QA - Gradation

State	% Passing			
	2-in	1 ½-in	1 ¼-in	1-in
Arizona			100	
California				100
Colorado			100	
Nevada		100		
New Mexico			100	90 - 100
Utah		100		

QC/QA - In-Place Density

State	Density Requirement
Arizona	Specified in plans
California	95 to 105% of max density on test strip
Colorado	100% of field mixed/lab compact
New Mexico	96% of field mixed/lab compact
Utah	96% of field mixed/lab compact

QC/QA - Surface Tolerance / Smoothness

State	Smoothness Requirement
Arizona	1/4-in longitudinal
California	1/4-in transverse
Colorado	3/16-in transverse & 3/16-in longitudinal
Nevada	1/4-in transverse & 1/4-in longitudinal
New Mexico	1/4-in transverse
Utah	3/8-in transverse

Equipment (Typ.)

- ❖ Self propelled machine 12-ft in width
- ❖ Capability to crush and screen material
- ❖ Capable of processing and spreading material in one pass
- ❖ Capable of producing homogeneous material
- ❖ One pneumatic roller at least 25-tons
- ❖ One double drum roller at least 10-tons
- ❖ Rotary broom on site

Climatic Conditions - Do Not Construct

- ❖ Ambient air temperature
 - ❖ ex. below 45 to 65°F
- ❖ Pavement temperature below
 - ❖ ex. below 50 to 70°F
- ❖ Over night temperature at or below freezing
- ❖ Weather is rainy or foggy
- ❖ When proper mixing, spreading and compaction cannot be accomplished
- ❖ Between specific months
 - ❖ ex. October 1 to April 30

Climatic Conditions - Curing Conditions

- ❖ **No vehicles on material until 2-hrs have passed**
- ❖ **Surface treatment/wearing course placed when moisture content is below a certain point**
 - ❖ **Free moisture content – below 1.0 to 1.5%**
 - ❖ **Total moisture content – below 1.5 to 3.0%**
- ❖ **Wearing course must be placed within a certain timeframe**
 - ❖ **Between 14- to 30-days**

Measurement / Payment

- ❖ **Payment based on square yard or unit price per station**
- ❖ **Payment may include bituminous materials on a volume or weight basis**

Layer Coefficients

State	Layer Coefficient
California	Gravel Factor – 1.4 to 1.7
Kansas	0.25 – 0.28
NCHRP 224	0.35 (0.22 – 0.49)
Nevada	0.26

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Specification / Information Review

- ❖ **Kansas**
- ❖ **New Mexico**
- ❖ **Ohio**
- ❖ **Utah**
- ❖ **British Columbia**
- ❖ **Ontario**
- ❖ **ARRA**

Specification Sections

- ❖ **Description**
- ❖ **Materials**
- ❖ **Mix Design**
- ❖ **Construction QC/QA**
- ❖ **Equipment**
- ❖ **Climatic Conditions**
- ❖ **Measurement/Payment**
- ❖ **Layer Coefficients**

Description (ARRA)

- ❖ **Surface Recycling**
- ❖ **Remixing**
- ❖ **Repaving**

Materials - Binders

State	Asphalt Binder
British Columbia	Emulsified recycling agent / Recycling agent
New Mexico	Emulsified recycling agent (blend meet PG binder grade)
Ontario	Select material to provide blend that meets 50 to 80 pen
Utah	Emulsified recycling agent

Mix Design

State	Method
Kansas	Air voids, TSR, rutting resistance, thermal cracking
New Mexico	Must meet specifications for HMA – Section 423
Ohio	Marshall stability, penetration

QC/QA - In-Place Density

State	Density Requirement
British Columbia	97% of lab density
New Mexico	92 to 98% of maximum theoretical
Ontario	Lab compacted air voids between 2.5% and 5.5% (75b Marshall)

QC/QA - Surface Tolerance & Thickness

State	Surface Tolerance	Thickness
New Mexico	1/8-in transverse 1/8-in longitudinal	As specified
Ontario		2-in max, 1.5-in typ

Equipment (Typ.)

- ❖ **Remove all material from pavement surface
- broom**
- ❖ **Self propelled**
- ❖ **Enclosed combustion area**
- ❖ **No open flame in direct contact with
pavement**
- ❖ **Capable of heating pavement to desired
temperature**
- ❖ **Capable of scarifying the heated pavement
to the desired depth**

Equipment (Typ.)

- ❖ **Requirements on laydown temperature of material**
 - ❖ **Typ. Min. 190°F to 230°F**
 - ❖ **Typ. Max. 300°F to 315°F**
- ❖ **Scarification does not break the aggregate particles**
- ❖ **Heating does not char the asphalt surface**
- ❖ **Uniformly distribute material**
- ❖ **Rolling operation must obtain the desired pavement density**

Climatic Conditions - Do Not Construct

- ❖ Ambient air temperature
 - ❖ ex. below 40 to 50°F
- ❖ Pavement temperature below
 - ❖ ex. below 50°F
- ❖ When roadway surface is wet
- ❖ Weather conditions prevent proper placement
- ❖ Between specific months
 - ❖ ex. October 16 to May 14

Measurement / Payment

- ❖ **Payment based on square yard or unit price per station**
- ❖ **Payment may include bituminous materials on a volume or weight basis**

Layer Coefficients

State	Layer Coefficient
None	None Available
Suggested Value	0.40 – 0.44

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Questions

