

**First Western States Regional In-Place  
Recycling Conference  
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**Cold-In-Place Recycling Mix Design**

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# CIP Mix Design

**The Cold-In-Place Recycling Mix Design, we will discuss today has been:**

- **Developed by group - State DOTs, CIPR Contractors, Emulsion Suppliers and others.**
- **Is being used by Nevada DOT & Caltrans (pilot studies).**
- **Adopted by 36<sup>th</sup> Pacific Coast Conference on Asphalt Specifications (PCCAS) as Guidelines for optional use – May 21, 2008.**

# CIP Mix Design

- ❑ In addition to the Mix Design Guidelines, PCCAS also adopted Construction Guidelines.**
- ❑ After job selection, getting pavement samples is the first step for the design.**

# CIR Mix Design

- ❑ **Pavement samples are normally:**
  - ❑ **Core specimens – 4 or 6”**
  - ❑ **Millings**









SR 373  
~~2012+08~~  
FARMER CONEY  
Passing

True Value  
START RIGHT HERE

GILSON

GILSON

GILSON

GILSON

GILSON

GILSON





# CIR Mix Design-Suggested Targets for Cold Recycling Gradation, % P,

<b>Sieve Size</b>	<b>Medium</b>	<b>Coarse</b>
<b>1''</b>	<b>100</b>	<b>100</b>
<b>3/4''</b>	<b>95 ± 2</b>	<b>85 ± 2</b>
<b># 4</b>	<b>50 ± 2</b>	<b>40 ± 2</b>
<b># 30</b>	<b>10 ± 2</b>	<b>5 ± 2</b>
<b>#200</b>	<b>0.8 ± 0.3</b>	<b>0.3 ± 0.3</b>

# CIR Mix Design

- **Mix Design parameters:**
  - **Gradation of RAP – passing 1” (others 1.25” or 0.75”)**  
**-Report**
  - **Asphalt Content - Report**
  - **Bulk Specific Gravity – Report**
  - **Maximum Theoretical Specific Gravity - Report**
  - **Air Voids – Report (Normally 10-16%)**
  - **Marshall Stability, Cured Specimen – 60°C from 16 – 48 hours. – 1,250 lbs. minimum**

# CIR Mix Design

- **Mix Design Parameters:**
  - **Marshall Retained Stability – 70.0% minimum**
  - **Ratio of Emulsion Residue to Cement – 1.8 minimum**
  - **Raveling Test – 2.0% target value**

Large Capacity 2000 Gallon  
Drying Rack  
1000 1000 1000  
1000 1000 1000  
1000 1000 1000

4 8 12

3 7 1

2 6 10

5 9 8





**Raveling Test**

# CIR Mix Design

- **Other Considerations:**

- ❖ **Just in time training (JITT)**

- ❖ **Emulsified Recycling Agent (ERA)**

**Asphalt binder used to make ERA must meet bending beam requirements of PG AASHTO M320. Verifying low temperature requirements where the RAC is placed.**

# CIR Mix Design

- **Emulsified Recycling Agent Requirements:**
  - Sieve test – 0.1% maximum
  - Residue, w% (60.0 w% minimum no max.)
  - RAP Coating Test - Report
  - Test on Residue – Pen. & Absolute Viscosity-  
target values



# CIR Mix Design

- **Questions?**