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).
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.
Pavement samples are normally:

- Core specimens – 4 or 6”
- Millings
CIR Mix Design - Suggested Targets for Cold Recycling Gradation, % P,

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Medium</th>
<th>Coarse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1”</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3/4”</td>
<td>95 ± 2</td>
<td>85 ± 2</td>
</tr>
<tr>
<td># 4</td>
<td>50 ± 2</td>
<td>40 ± 2</td>
</tr>
<tr>
<td># 30</td>
<td>10 ± 2</td>
<td>5 ± 2</td>
</tr>
<tr>
<td>#200</td>
<td>0.8 ± 0.3</td>
<td>0.3 ± 0.3</td>
</tr>
</tbody>
</table>
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
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?