

# **Partnered Pavement Research Program: Update, 2002-03**

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**HVS Consortium Meeting  
October 16,17, Pretoria, RSA**

# Programs

- Water sensitivity of AC mixes
- Deep in-situ recycling (DISR)
- Construction productivity and traffic simulation to expedite major freeway reconstruction projects
- Modified binder (MB) test road

# Programs (cont.)

- I-710 program
- I-15 program
- Dowel bar retrofit studies
- Concrete maturity investigation
- Seasonal monitoring station
- Mechanistic-empirical design procedures, new and rehabilitated pavements

# Water Sensitivity of AC Mixes

- Develop improved methods to mitigate moisture problems through:
  - Mix testing
  - Mix design
  - Construction practices and specifications

# Water Sensitivity (cont.)

- Caltrans Moisture Sensitivity Asphalt Concrete Task Group (MSACTG)
  - National Workshop, February '03
  - Short Course development
- Research program underway
  - Use of shear and fatigue tests on mixes subjected to moisture conditioning

# Deep In- Situ Recycling (DISR)

- Caltrans implementation
  - Four projects; foamed asphalt
- PRC joint effort with Transportek
  - HVS test program, State Route 89 (Truckee, CA)
  - Laboratory and field studies with mixes containing:
    - Foamed asphalt
    - Asphalt emulsion

# State Route 89



# Freeway Rehabilitation

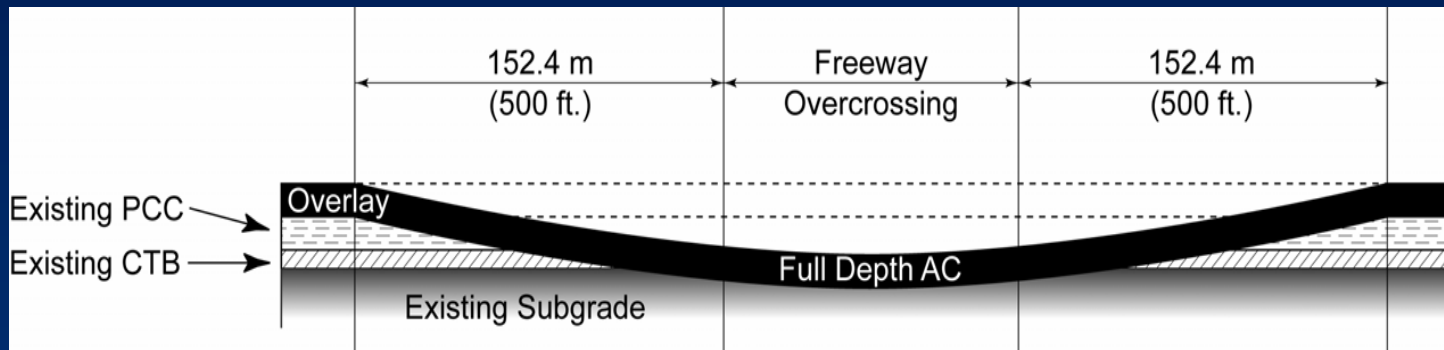
- Construction Productivity (CA4PRS Software)
  - I-10, Pomona, CA
  - I-710, Long Beach, CA
  - I-15, Devore, CA
- Construction productivity combined with traffic simulation
  - I-710
  - I-15
- Four-States program support



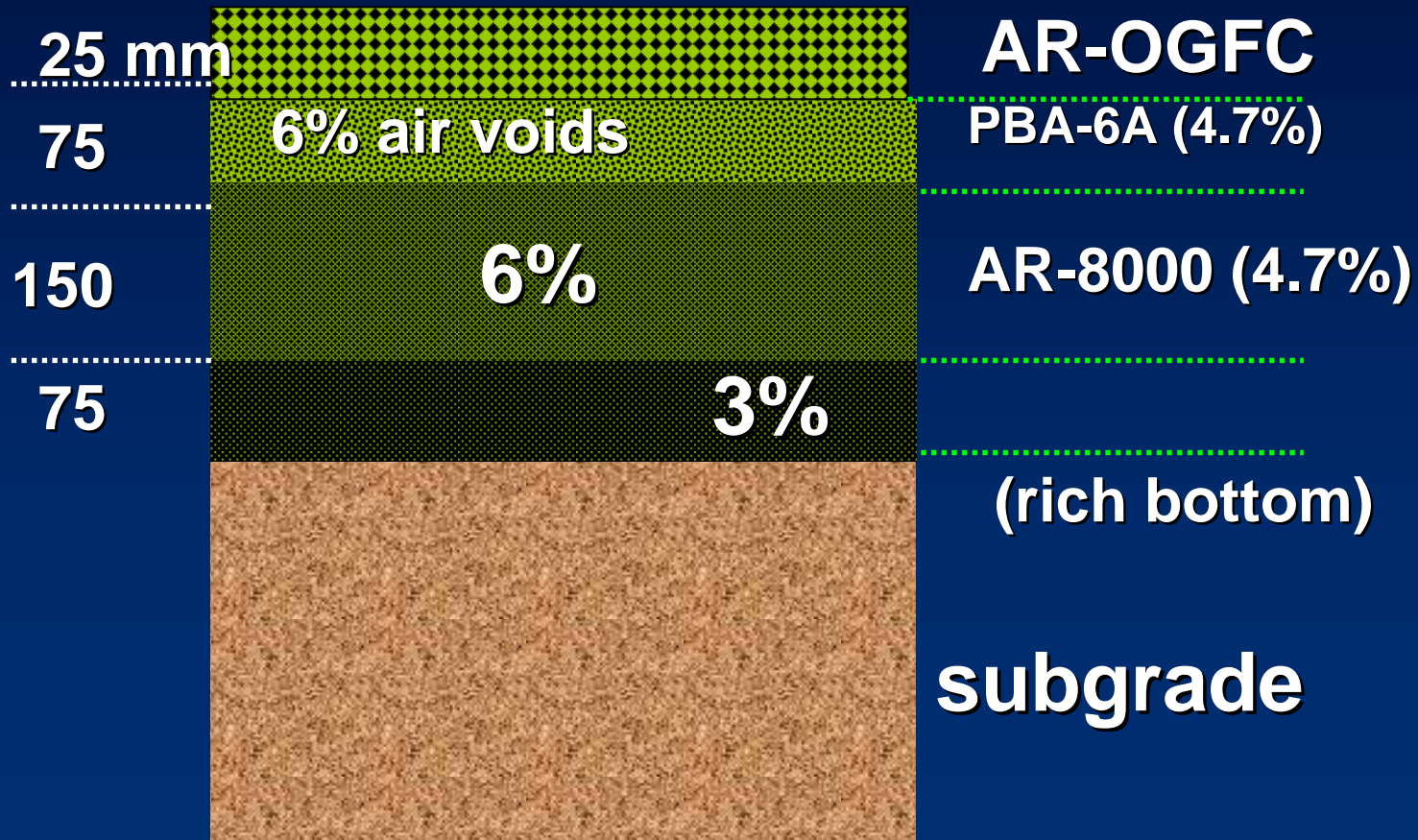
# I-710 Program

- Mix designs
- Structural pavement section designs
- Contractor mix evaluations
- Constructability - both contractor and Caltrans District 7 construction staff
- Traffic operations - District 7 traffic staff
- Follow-up program

# Section Profile

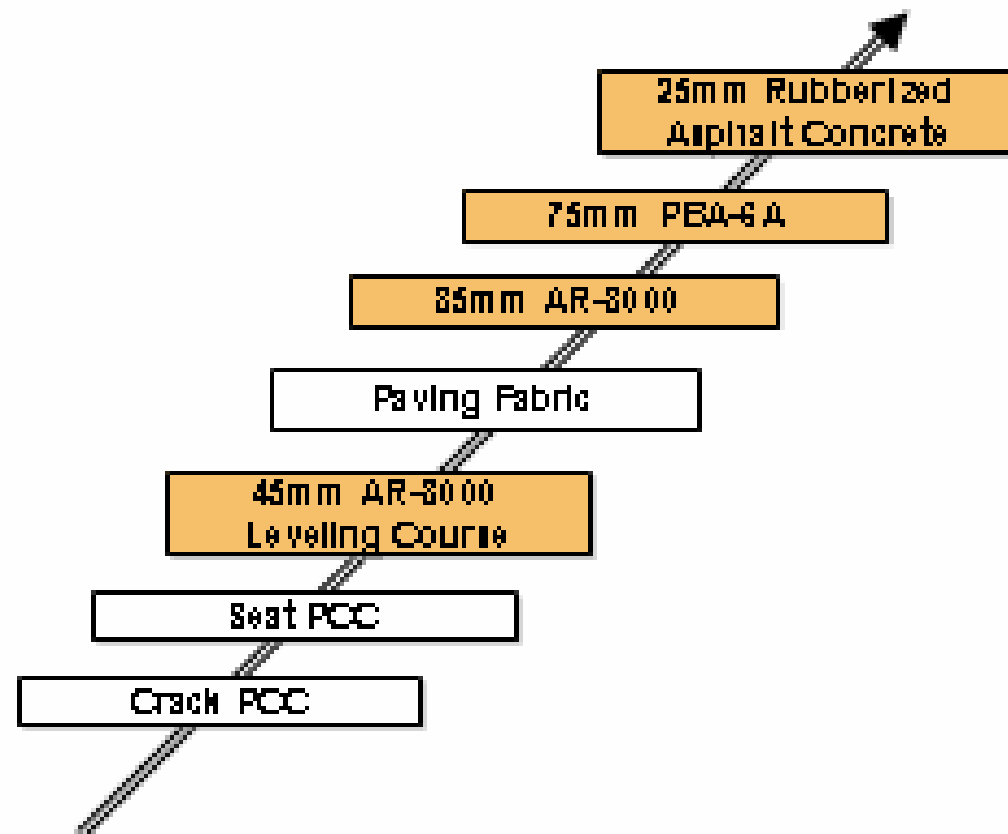


# Final Design



# I-710 Construction

## CSOL: Sequence of Main Activities



# Existing Concrete Pavement



# Placement of Leveling Course



# Installation of Pavement Fabric



# Placement of PBA-6A Mix





# Digout and Placement of Aggregate Base - Working Platform



# Rich Bottom Layer Construction



# I-15 Devore Project: Comparison of Construction and Traffic Alternatives

Construction Scenario	<i>Schedule Comparison</i>		<i>Cost Comparison (\$M)</i>			Max. Peak Delay (Min)
	<i>Total Closures</i>	<i>Closure Hours</i>	<i>User Delay</i>	<i>Agency Cost</i>	<i>Total Cost</i>	
72-Hour Weekday Continuous	<b>8</b>	<b>512</b>	<b>5.6</b>	<b>12.6</b>	<b>18.2</b>	<b>75</b>
55-Hour Weekend Continuous	<b>10</b>	<b>550</b>	<b>14.2</b>	<b>15.1</b>	<b>29.3</b>	<b>195</b>
1 Roadbed Continuous	<b>2</b>	<b>400</b>	<b>6.9</b>	<b>9.9</b>	<b>16.8</b>	<b>195</b>
10-Hour Night-time Closures	<b>220</b>	<b>2,200</b>	<b>4.9</b>	<b>20.4</b>	<b>25.3</b>	<b>35</b>

# Modified Binder (MB) Test Road

- Rehabilitation designs and materials evaluation for reflection cracking
- HVS test program
  - “new” pavement (6 test sections)
  - Overlays on cracked “new” pavement sections

# Modified Binder (MB) Test Road

- Overlay materials (6 sections)
  - MB-4 and MB-15 (modified) binders (3 sections)
  - MAC binder (1 section)
  - AR-4000 (conventional asphalt) binder (1 section)
  - AR-G (asphalt rubber) binder (1 section)
- Thicknesses
  - 80-90 mm (AR-4000, MB-4)
  - 40-50 mm (MB-4, MB-15, AR-G, MAC)

# Dowel Bar Test Program

- Retrofit—HVS testing
  - Ukiah, CA
  - Palmdale, CA
- Laboratory test program
  - Corrosion studies (includes section of 11-year old concrete pavement supplied by WSDOT)
  - Mechanical properties of fiber reinforced polymer (FRP) dowels

# Ukiah Project



# Ukiah Project





# Concrete Maturity

- Laboratory test program (curing temperature, time)
  - Flexural modulus, modulus of rupture, shrinkage, coef. of thermal expansion, activation energy
- Field test program (4 sites, high desert area, CA)
  - Thermocouples, strain meters, JDMDs, weather station installed at each site
  - Continuous monitoring from time of concrete placement

# Seasonal Monitoring Program

- Installation and monitoring of weather stations in each Caltrans District (8 installed to date)
- Seasonal FWD data collection at each site

# Mechanistic-Empirical New and Rehabilitated Pavement Design

- Flexible pavement design procedure
- Software version 1.0 developed for flexible design procedure
- Much of procedure being calibrated with HVS data
- Caltrans workshop in November or December

# Mechanistic-Empirical New and Rehabilitated Pavement Design

- Rigid pavement design procedure
- Evaluation of recently released AASHTO 2002 Design Procedure underway
- Procedure to be augmented with additional design checks for longitudinal and corner cracking being developed at U of Illinois, based on Palmdale HVS data

# Mechanistic-Empirical New and Rehabilitated Pavement Design

- Overlay pavement design
- Developing simple routines for AC on PCC overlays; will require extensive HVS calibration (HVS data from Goal 6 Program being used to define mechanisms)
- May be applicable to AC on AC overlays
- Calibrating empirical-mechanistic models using Arizona and Washington State DOT PMS databases for use in design procedure as well