

Bridge Deck Crack Prevention

Shared By: Craig Knapp
Concrete Committee Chair
Division Of Engineering Services

Deck cracking is a long standing problem.



We spend annually on deck
crack mitigation.

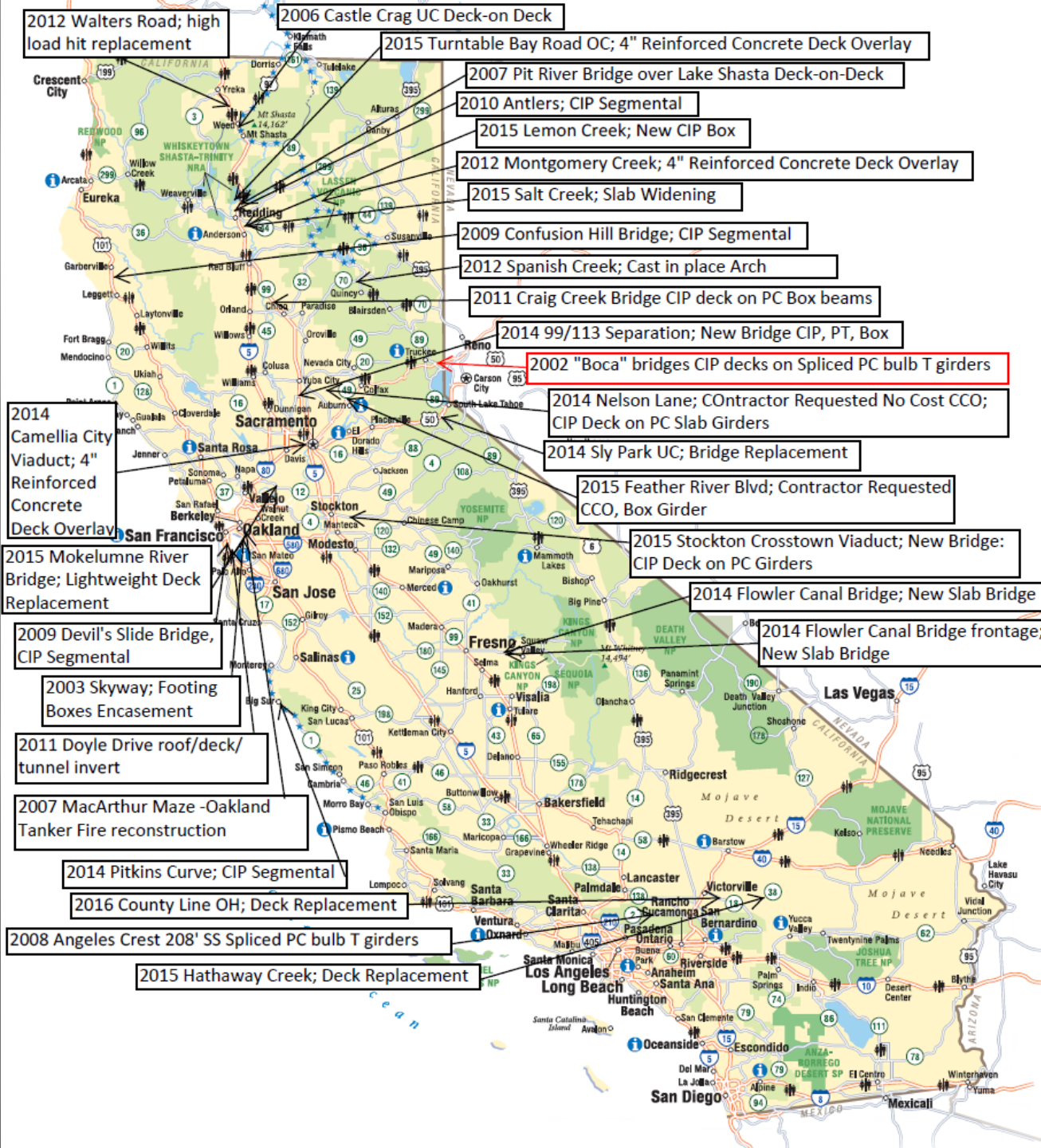
\$50 Million

We have a solution.



This is what it costs.

- ▣ The pilot projects show no measurable change to the price bid for structure concrete.
- ▣ When implemented via CCO the cost has been about:
 - SRA @ 1 Gal/CY = \$25/CY
 - Fibers @ 4 lb/CY = \$25/CY



Specification Summary

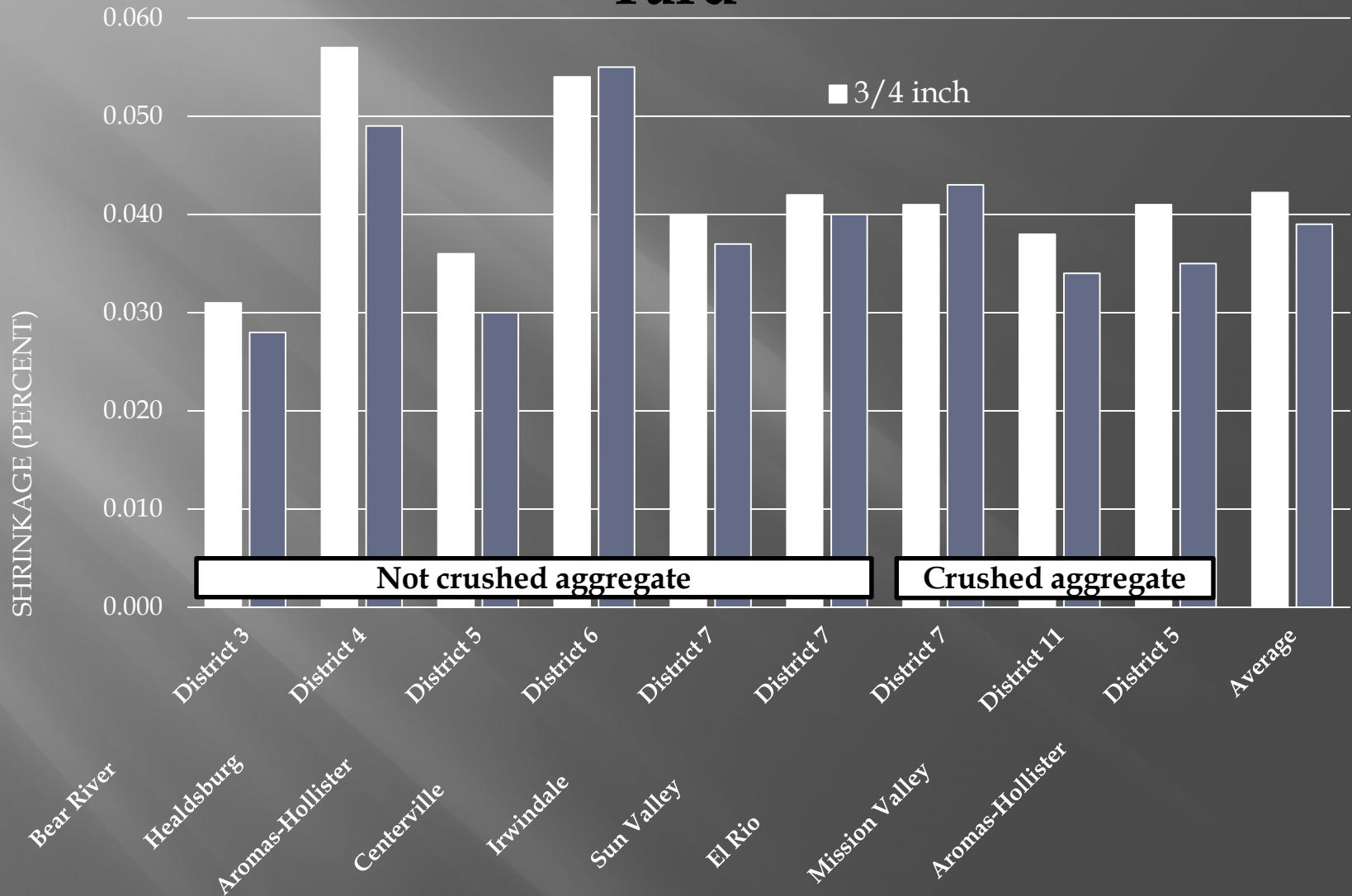
- ▣ The 28 day shrinkage required maximum of 0.032%.
- ▣ Minimum SRA dosage of $\frac{3}{4}$ gal/cy.
- ▣ Require 1 lb/cy of micro fibers and 3lb/cy of macro fibers (polyolefin).
- ▣ Continuous misting from finished strike off until curing medium is applied.

Questions?



Drying Shrinkage (Percent)

28-Days Drying at 7 1/2 Sacks per Cubic Yard



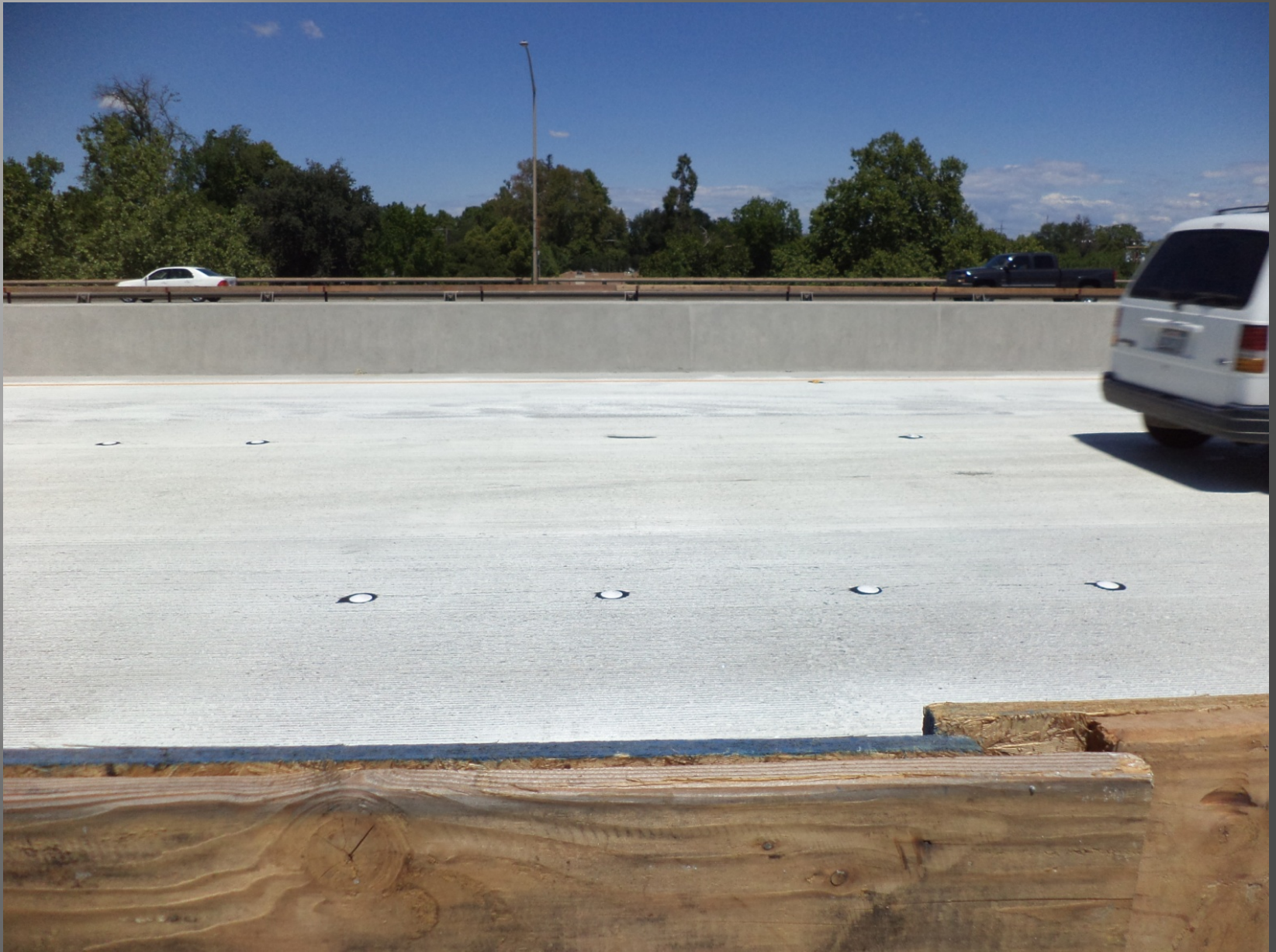
1 year old



1.75 years old



2 years old



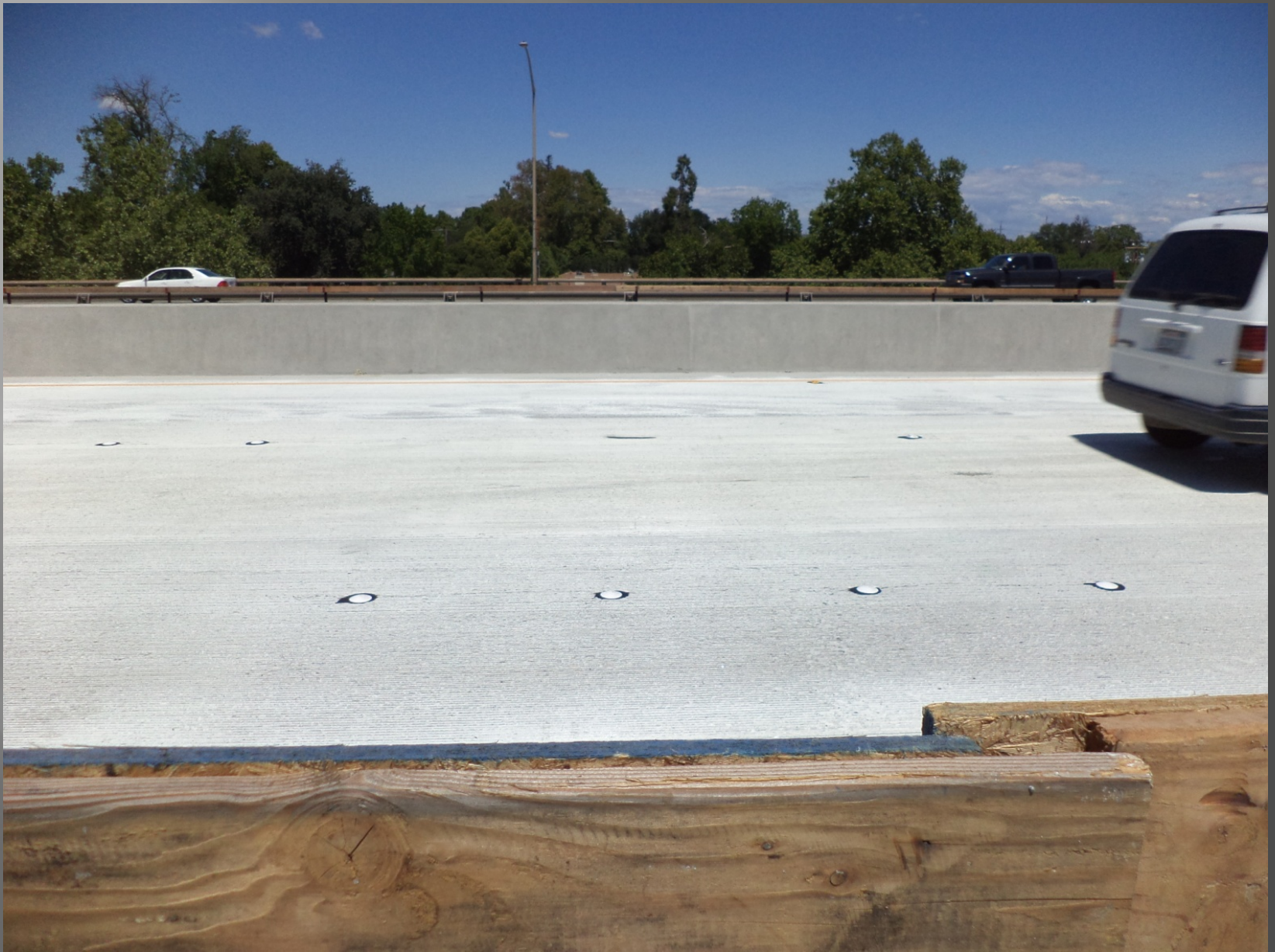
3 years old



8 years old



28 shrinkage = .032 with SRA



28 shrinkage = .032 with SRA



28 shrinkage = .032 without SRA



Misting



Pilots

Contract No.	Bridge Name	Prevention Measurements	% Dry Shrink Limit	Scope of Work	Co-Rte-PM	Bid Opening Date	Completion Date	Ave. Concrete Unit Price (\$/CY)	Ave. Historical Concrete Price (\$/CY)
08-336304	Hathaway Creek	I, IV	0.035	Deck Replacement	SBd-38-26.58	6/12/2014	2/24/2016	\$1,766.00	\$1,432.00
03-0F2204	Sly Park UC	I, II, III	0.035	Replace Bridge	ED-50-R31.30	1/29/2014	T 11/12/2014	\$857.00	\$975.00
10-0S1104	Stockton Crosstown Viaduct	I, II, III	0.025	New Bridge	SJ-4-T14.83	11/20/2013	T 9/8/2017	\$472.00	\$617.00
03-0F2304	Camellia City Viaduct	I, II, III, IV	0.030	4" Reinf Conc OL	SAC-50-1.51	7/24/2013	A 6/19/2014	\$363.00	
07-274804	County Line OH	I, II, III	0.045	Deck Replacement	LA-18-0.19	10/23/2014	T 1/26/2016		
06-342524 (CCO)	Various	I, II, III, IV	0.045	New Slab Bridges	FRE-180-73.1,73.7	3/26/2013	T 10/15/2014		
07-2W7101	Round Springs Creek, Corral Canyon Creek, Oak Creek	I,II,III	0.030	4" Reinf Conc OL	VEN-33-50.91/52.09	Target 7/1/2015	<i>not yet awarded</i>		
02-4F6101	Hartnell Ave OC, Turntable Rd OC	I, IV	0.030	4" Reinf Conc OL	SHA-5-R13.95,R29.32	Target 7/1/2015	<i>not yet awarded</i>		

Pilots

Prevention Measure Legend:

I. High Performance Curing

- a) Fog concrete surface immediately after concrete is placed. Continue until concrete can support curing blankets.
- b) Water cure for 7 days. Monitor water temperature.
- c) Remove the curing blankets after 7 days and apply curing compound.

II. Limit Water Content

Specify maximum water content to 270 lbs/cy of concrete (0.45 w/c x 600 lbs/cy of cementitious material)

Specify minimum water cement ratio to be 0.40. (w/c below 0.40 increases possibility of plastic shrinkage cracks)

III. Limit Cement Content

- a) Specify minimum cementitious material content to 590 lbs/cy of concrete.
- b) Allow optional use of shrinkage reduction admixtures. (Contractor to determine if SRA's are necessary to meet specifications)

IV. Fiber Reinforced Concrete

Add Type III synthetic micro and macro fibers to concrete.