State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

Memorandum

Flex your power!
Be energy efficient!

To: DISTRICT DIRECTORS

Date: August 19, 2009

From: SHAKIR SHATNAWI
Chief, Division of Pavement Management
State Pavement Engineer

File: Pavement Recycling

Subject: Utilizing In-Place Recycling for Pavement Preservation and Rehabilitation

The Department encourages the use of environmentally friendly strategies to preserve and rehabilitate its pavements. In-place recycling strategies remove, recompile, and place existing pavement materials on site during the same day's operation. In-place recycling are innovative strategies that have shown promise recently by:

- Minimizing the demand for new materials
- Reducing the need to haul materials off site to be disposed or recycled.
- Being constructed faster because removal and placement operations are occurring simultaneously.
- Reducing green house gases due to reduction in mining new material and hauling material away from and on to site.
- Being very cost effective where there are significant surface or base repair needs.

To further promote the use of in-place recycling strategies and obtain more experience with the products, the Department is planning to invest $15 million per year from the roadway major maintenance (HM1) program for hot and cold in-place recycling projects on Maintenance Class III roads beginning in the 2010/2011 FY. The $15 million HM1 base funds for Class III roads will be allocated to projects that meet the selection criteria based on statewide priorities, cost effectiveness of the project, and ability to deliver on time. For the HM1 program, Districts should review their Class III roads for potential candidates for the in-place recycling funds.

Requests for the in-place recycling funds should be submitted to and reviewed by your Pavement Reviewer by no later than October 15, 2009.

The Department is also seeking to construct at least 50 lane miles of in-place recycling in the coming four years of the 2010 SHOPP. Districts are encouraged to review their already programmed and candidate CAPM and rehabilitation projects to see if an in-place recycling strategy could be used without impacting the schedule, budget, or life cycle cost of the project.

A matrix of recognized and accepted in-place recycling strategies is attached for your information. The matrix includes a brief description of each strategy, selection and design criteria for each, where to find additional information and specifications, and contacts that you

can discuss each strategy with. You may also consult with your assigned HQ Pavement Reviewer.

c: Michael Miles
Richard Land
District Maintenance Deputies
HQ Pavement Reviewers
HQ Pavement Office Chiefs
District Maintenance Engineers
District Materials Engineers

In-Place Recycling Selection Matrix

In-Place Recycling Strategy	Description	Selection Criteria	Traffic Criteria[2]	Additional Design Criteria, Limitations, and Considerations	Fund Under Program				Specification to Use	Additional Information	Contact
					Preservation		Rehabilitation				
					HM1	CAPM	2R/3R 20-yr	2R/3R 40-yr			
Hot In-Place[1]	Heat & mill/ scarify 1-2"; mix/ add recycling agent & new HMA (admix) as needed; compact mixture	Pavements with < 5% digouts or alligator cracking. Shallow rutting (<1/2"). Bleeding or raveling surfaces OK. Should have uniform existing material. Overlay with HMA to increase traffic capacity.	Limit to roads with 4000 ADT and 8% trucks or less unless agreed to by HQ Division of Pavement Management.	Don't use with > 5% alligator, multiple chip seals, moderate to high sealed cracks, RHMA, GPI, base/ SG failure, moisture problems (poor drainage, pumping, saturated SG). Roughness improvement limited by recycling depth.	x	x			NSSP: Contact Larry Rouen at (916) 274-6194	http://www.dot.ca.gov/hq/maint/FPMTAGChapter13-In-Place-Recycling.pdf http://www.dot.ca.gov/hq/esc/Translab/ope/HIPR.html	Larry Rouen (916) 274-6194 larry.rouen@dot.ca.gov
Cold In-Place[1]	Mill 2-4"; process RAP to 1" minus and mix with foam or emulsified recycling agent (add lime or cement if needed); compact & cap with min 0.15' HMA.	Extensive (>50%) reflective/ thermal cracking or rutting (>1/2"). Will correct roughness (IRI > 170). Do not use for base failures. Do not use if pumping is present.	Limit to roads with 12,000 ADT and 11% trucks or less unless agreed to by HQ Division of Pavement Management.	Recycle depth: Min = 70% exist AC thickness; Max 4" or 75% exist AC thickness, whichever is less. Emulsified recycling agent less susceptible to moisture than foam. Identify & repair drainage problems, weak SG, & base failure. Emulsion must cure 1-3 weeks (under traffic) before capping with HMA.	x[2]	x	x		NSSP: Contact Larry Rouen at (916) 274-6194	http://www.dot.ca.gov/hq/maint/FPMTAGChapter13-In-Place-Recycling.pdf http://www.dot.ca.gov/hq/esc/Translab/ope/CIPR.html	Larry Rouen (916) 274-6194 larry.rouen@dot.ca.gov
Pulverization[1]	Pulverize 5-10"; mix existing AC with at least 1" underlying base; add lime, cement, AB, or kiln dust if needed for strength, thickness, or gradation; grade, compact & seal with prime coat or fog seal; cover with min 0.2' HMA surfacing.	Repair of deteriorated base/ digouts > 20% paving area. Structurally inadequate pavements with extensive (>40%) Alligator 'B'/ 'C' cracking or rutting (>1/2") & deflection >TDS. Corrections to profile, cross slope, or roughness (IRI > 170).	Pilot car or 24 hour traffic control. 2000 ADT with 3% trucks or less, can place traffic on pulverized material temporarily prior to placing overlay with speed reductions. For greater than 2000 ADT with 3% trucks, detour traffic until overlay is placed.	Stabilizing agents may need cure time before opening to traffic. Material swell of 5-10% must be accounted for with widening or off haul. Shallow utilities, numerous access points, or existing AC > 8" problematic. Identify & repair drainage problems, weak SG & base failure.			x	x	NSSP: Contact Robert Hogan at (916) 274-6076	http://www.dot.ca.gov/hq/esc/Translab/ope/Pulverization.html	Robert Hogan (916) 274-6076 robert.hogan@dot.ca.gov
Cold Foam[1]	Pulverize 5-10"; mix existing AC with at least 1" underlying base, foamed asphalt recycling agent, & cement (add AB if needed for thickness or gradation); grade & compact; cover with min 0.2' HMA surfacing.	Repair of deteriorated base/ digouts > 20% paving area. Structurally inadequate pavements with extensive (>40%) Alligator 'B'/ 'C' cracking or rutting (>1/2") & deflection > TDS. Corrections to profile, cross slope, or roughness (IRI > 170). Existing base/SG PI < 12, LL < 50.	30,000 ADT with 8% trucks or less, can place traffic on cold foam base temporarily prior to placing overlay with speed reductions. For greater than 30,000 ADT with 8% trucks, detour traffic until overlay is placed.	Material swell of 5-10% must be accounted for with widening or off haul. Shallow utilities, numerous access points, or existing AC > 8" problematic. Foamed material is moisture sensitive. Identify & repair drainage problems, weak subgrade, & base failure.			x	x	SSP: Contact Robert Hogan at (916) 274-6076	http://www.dot.ca.gov/hq/esc/Translab/ope/CFIPR.html	Robert Hogan (916) 274-6076 robert.hogan@dot.ca.gov

Notes. [1]Refer to specified guidance for additonal information.
[2]For Maintenance Class III Roads only.