

Memorandum

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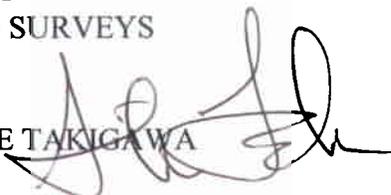
To: DISTRICT DIRECTORS
CHIEF, DIVISION OF CONSTRUCTION
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CHIEF, DIVISION OF ENVIRONMENTAL ANALYSIS
CHIEF, DIVISION OF ENGINEERING SERVICES
CHIEF, DIVISION OF PROJECT MANAGEMENT
CHIEF, DIVISION OF RIGHT OF WAY & LAND SURVEYS

Date: June 22, 2007

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Chief
Division of Design



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Chief
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Subject: Design Information Bulletin 81: Capital Preventive Maintenance (CAPM) Guidelines

This transmittal memorandum provides notice that the above referenced Design Information Bulletin (DIB) is now available on the Division of Design (Design) website <http://www.dot.ca.gov/hq/oppd/dib/dibprg.htm>. This DIB is effective July 1, 2007 for use on all CAPM projects.

PURPOSE

DIB 81 provides information on project selection, project initiation document development and design guidance for CAPM projects, as well as CAPM goals and strategies. These guidelines are now a DIB in order to be more accessible to designers, program advisors and other district staff who are involved in development of CAPM projects.

BACKGROUND

During the 1990's, Congress incrementally broadened the applicability of Federal-aid funding to preventive maintenance activities. The California Department of Transportation (Department) took advantage of this opportunity to develop the initial CAPM guidelines, dated September 16, 1994. The first CAPM projects were delivered in the HA 22 program in the 1995/96 fiscal year. The CAPM Guidelines have since been updated periodically by Maintenance and Design with the most recent being dated April 2, 2002.

This DIB and updated guidelines are primarily in response to Federal Highway Administration (FHWA) and State policy changes. The October 8, 2004 FHWA memorandum, *Preventive Maintenance Eligibility*, recommended various safety enhancements be included on pavement preservation projects. A follow-up FHWA memorandum dated September 12, 2005, *Pavement Preservation Definitions*, defined pavement preservation as a non-structural enhancement made

to existing pavement sections. In addition, the California Department of Finance mandated that certain strategies previously allowed in CAPM were not eligible for a capital program and must be done under maintenance. The summary below further discusses the major updates related to these policy changes.

SUMMARY OF SIGNIFICANT CHANGES

- 1) A Traffic Operational Review has been added to CAPM project development. This review was added to address topics in the October 8, 2004 FHWA memorandum. The intent is to consider inclusion of easily implemented enhancements on CAPM projects. These topics include rumble strips, addition or updating of barrier rail, wet weather collision patterns, and review of existing signing and delineation.
- 2) CAPM strategies are now considered non-structural overlays and as such do not require Traffic Index calculations or deflection studies. Overlay thicknesses are fixed and based on ride and pavement condition. This is consistent with the pavement preservation strategies used by the Department in the Highway Maintenance program.
- 3) Pavement preservation strategies such as thin blanket overlays that were previously included in the CAPM program are now funded under the maintenance program. These have been removed from the guidelines.

IMPLEMENTATION

This DIB is effective July 1, 2007. CAPM projects in development for the 2008 State Highway Operation and Protection program (SHOPP) cycle may use either the CAPM Guidelines dated April 2, 2002 or DIB 81, except Americans with Disabilities Act (ADA) issues must be consistent with guidance provided in this DIB. All CAPM projects developed for future SHOPP cycles must comply with this DIB.

This DIB supersedes the April 2, 2002 CAPM Guidelines subject to the above discussion. Also superseded is a portion of the June 7, 1999 memorandum signed by Robert Buckley and Randy Iwasaki with the subject: *Revised Cost Estimating Procedures for the Scoping of Projects that Include Asphalt Pavement Rehabilitation Work*. The reference to CAPM projects is superseded.

DISTRIBUTION

It is recommended that copies of this DIB be distributed to Project Delivery and Traffic Operations Staff. Although this DIB focuses on work of the district Program Advisor and the Project Engineer, there are significant cross-functional considerations that must be coordinated with other staff for successful implementation.

Attachments

- c: Richard Land, Chief Engineer
 - Deputy District Directors for Design
 - Deputy District Directors for Maintenance and Operations
 - Deputy District Directors for Project Management
 - Tim Craggs
 - Linda Fong
 - Kevin Herritt
 - Mary Beth Herritt
 - Janice Benton
 - Rob Marsh
 - Susan Massey
 - HQ Design Coordinators
 - HQ Design Reviewers
 - All Holders of the Highway Design Manual

DESIGN INFORMATION BULLETIN NUMBER 81

**California Department of Transportation
Division of Design**

Capital Preventative Maintenance (CAPM) Guidelines

APPROVED BY:



**MARK LEJA
Chief, Division of Design**

June 22, 2007

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1.0 INTRODUCTION

1.1 Maintenance Definition

The preservation and keeping of rights-of-way (R/W), and each type of roadway, structure, safety convenience or device, planting, illumination equipment, and other facility, in the safe and useable condition to which it has been improved or constructed, but does not include reconstruction or other improvement. Source: Streets and Highways Code – General Provisions

1.2 Capital Preventive Maintenance (CAPM) Intent

The intent of the Capital Preventive Maintenance (CAPM) program is to extend the service life of pavement with minor distress by a minimum of five-years in contrast to the Roadway Rehabilitation (RRR) program, which restores poor pavement to a good level of serviceability and has a minimum design life expectancy of ten-years.

Since CAPM is preventive maintenance, the nature of projects is more closely related to preventative maintenance projects than to roadway rehabilitation. The work should not propose *major* facility upgrades but should include all appropriate items of work. Ride improvement and preservation of serviceability are key elements of this program. CAPM projects treat pavements that exhibit poor to good ride and minor distress. Therefore, repair strategies selected should be readily constructible (as discussed in Section 3.0) in order to minimize traffic disruption and should provide relief from intensive maintenance activity. CAPM gives the districts the flexibility to make the most effective use of all funds available in the biennial State Highway Operation and Protection Plan (SHOPP).

1.2.1 CAPM Program (20.XX.201.121)

All CAPM projects are programmed in the 20.XX.201.121 CAPM (121) program. The primary purpose of the CAPM program is to repair pavement exhibiting minor surface distress and / or triggered ride as determined by the Pavement Condition Survey (PCS) and the Pavement Management System (PMS). The *Pavement Survey Evaluation Manual* provides guidance on the process of identifying and describing pavement distress.

1.3 Other Related Pavement Programs

1.3.1 Roadway Rehabilitation Program (20.XX.201.120)

Strategies that are more extensive than those described in these CAPM Guidelines are considered to be Roadway Rehabilitation (also known as Resurfacing, Restoration and Rehabilitation or RRR) projects and shall follow the guidance provided in the Highway Design Manual (HDM) and Design Information Bulletin (DIB) 79. For example the following are considered RRR strategies: thicker overlays than described in Section 3.2, cold foam recycling, lane replacement, and crack seat & overlay.

1.3.2 Pavement Preservation Program (20.80.010.122)

The Pavement Preservation (122) program is a maintenance program, is not a part of CAPM, nor is it funded in the SHOPP. Typical Pavement Preservation program strategies include thin and ultra thin blanket overlays/seal coats, diamond grinding of rigid pavement with very low distress, and joint/crack sealing utilizing premium products such as silicon and rubberized sealants.

1.4 CAPM Expectations

It is the expectation that the CAPM program will accomplish the following:

- Maintain the facility in a serviceable and safe condition for the public.
- Perpetuate existing traffic markings, signs and safety devices except as discussed in Section 4.0.
- Correct ride and minor structural defects.
- Fill the gap between preventative maintenance and RRR.
- Make cost effective use of limited resources to bring the facility back to a near-new condition; extending its life and allowing lower-cost preventative maintenance to keep it in good condition.
- Reduce roadway worker exposure to traffic from repeated visits to deteriorating worksites.
- CAPM projects maximize federal participation with capital project funds in a coordinated pavement preservation program.

2.0 PROCESS

2.1 Pre-scoping Activities

The Districts' Pavement Managers/Program Advisors submit project candidates to Headquarters (HQ) Pavement Management Engineer/Program Advisor. The

candidate list should be submitted as early as possible in the annual project development cycle, preferably in late winter/early spring, to assure identification and refinement of the best candidate projects before the development of scoping documents.

2.1.1 Rigid Pavement Selection Criteria

A CAPM project is warranted for rigid pavement if any of the following criteria is met:

- Third stage cracking between 1% and 7% of travel lane miles
- International Roughness Index (IRI) is 170 or more with no or minor distress.
- The presence of faulting.

Projects with a PCS/PMS priority numbers of 3, 4, 12 (poor ride with minor distress), 5, 6 (poor ride with no distress), 9, 10, or 14 (acceptable ride with minor distress) would typically meet either the third stage cracking requirements, faulting or international roughness index measurements listed above.

2.1.2 Flexible Pavement Selection Criteria

Flexible pavements exhibiting minor distress, regardless of ride quality are prime CAPM candidate projects.

- The PCS/PMS pavement distress levels for minor distress corresponding to a priority numbers of 3, 4, 9, 10, 12 and 14 are:
 - 0% Alligator 'B' cracking (ABC) and >15% Patching
 - 1-10% ABC and >10% Patching
 - 11-29% ABC and 0 to 10% Patching
- Flexible pavements with no distress (PCS/PMS priority numbers 5 and 6) and an IRI greater than 170 are also candidates for CAPM projects.

Investigate pavements with rutting exceeding one inch to determine if the failure is in the surface material or in the base. Base failure indicates that the project should be a RRR.

2.1.3 CAPM in Advance of or in Lieu of Roadway Rehabilitation

This is a short-term strategy that will allow the facility to bridge the time it takes to develop a long-lead project and start construction. A CAPM strategy may be appropriate for PCS/PMS priority numbers 1, 2, 7, and 8 projects that have long lead delivery problems. These priority number categories are characterized by major pavement distress. They are generally qualified RRR projects with extremely long lead times due to external causes such as environmental studies, R/W complications, or structure and/or pavement structural section design delays. Here a CAPM project may be considered when the pavement condition must be corrected sooner than a RRR project can be programmed in the SHOPP and delivered in order to relieve field maintenance of an unacceptable burden. The project shall be followed by the appropriate RRR project to be programmed and then constructed when the complicating circumstances are resolved. The HQ Pavement Program Advisor must approve all CAPM projects to be done in lieu of RRR projects.

CAPM projects may be proposed in lieu of RRR projects on Maintenance Service Level Class 3 roads where there is substantial agreement between the HQ Program Advisor and district Program Advisors that the facility is beyond economical management with maintenance strategies. For these projects, design exceptions and a safety review are required if no future upgrades are planned as part of future RRR projects.

2.1.4 Successive CAPM Projects

Successive CAPM pavement strategies may be utilized if the distress criteria requirements in 2.1.1 and 2.1.2 are met, and all improvements addressing correctable collision patterns are included in the project. The district Traffic Safety unit is responsible for determining these improvements. If it is not feasible to include all such improvements, and they would not be otherwise accepted from a normal RRR project, the project should be developed as a roadway rehabilitation project.

2.2 Development of Project Initiation Documents (PID)

A Project Initiation Document (PID) is required in order to program a project into the SHOPP. The CAPM Project Report (CAPM PR) fulfills the requirement for a PID. Additionally, it also serves as the project report that documents approval of the selected alternative. The project selection process for the SHOPP is established by the HQ SHOPP Program Managers.

The district is responsible for the development of the CAPM PR. Guidance for preparation of the CAPM PR is found in Chapter 9 and Appendix H of the Project Development Procedures Manual (Gold Book).

The approved CAPM PR is submitted to both the Headquarters and district Program Advisors for comments. Major projects are programmed in the SHOPP. Minor projects will become part of the districts' annual Minor Program. Most projects will be Categorically Exempt, have little or no environmental impact, and propose work only within existing R/W.

CAPM projects that are consistent with the scope and intent of the 121 program as presented in these guidelines do not require mandatory or advisory design exception fact sheets, except as otherwise noted. The Design Coordinator should be consulted if the CAPM project creates deviations from design standards. These include items such as reduced shoulder width due to the installation of standard dike or bridge approach rail, and increased shoulder cross slope where it conforms to curb and gutter. Project strategies that exceed these guidelines (such as overlays thicker than indicated in Section 3.2 or digouts exceeding 20% of the project cost) need the Design Coordinator concurrence. Otherwise the project will be considered to fall under the RRR program and will need to follow DIB 79 - the RRR Guidelines.

Approved CAPM-PRs that are more than two-years old need to be re-evaluated to determine if the proposed strategy is still valid. The re-evaluation should be based on the most current PCS inventory data and must include a new Scoping Team Field Review.

2.2.1 Scoping Team Field Review

All candidate CAPM projects shall have a Scoping Team Field Review after initial development of a draft CAPM PR in order to further refine project scope. One of the charges of the review team is to determine if CAPM is the appropriate strategy for the proposed site based upon pavement needs, traffic safety, and design standards.

Attendance on these reviews is mandatory for the HQ Program Advisor and the district Program Advisor, and recommended for Design Reviewers. Recommended district staff attendance and review resources are as listed in the attached CAPM Scoping Team Field Review list. The field reviews should be scheduled as time-efficiently as possible so as to encompass several sites when possible. All of the review team should be notified by email or in writing of scheduled reviews prior to Project Approval and Environmental Document (PA & ED). Any project not

reviewed by the HQ Program Advisor is at risk of losing funding if it is determined later to have been improperly scoped.

2.2.2 Life Cycle Cost Analysis

A comparison of different pavement products or strategies using Life Cycle Cost Analysis (LCCA) shall be done in accordance with the Life Cycle Cost Analysis Procedures Manual during the preparation of the CAPM PR. The results of the LCCA shall be documented in the CAPM PR (see Project Development Procedures Manual (PDPM) Chapter 8.) For rigid pavement strategies, a strategy of individual slab replacement with diamond grinding, where warranted, should be compared to lane replacement (a roadway rehabilitation strategy). The designer may also opt to compare a strategy of diamond grinding with thin blanket flexible pavement overlays (composite pavement). For flexible pavements, rubberized asphalt pavements should be compared to conventional asphalt pavements.

3.0 CAPM PROJECT STRATEGIES

CAPM projects shall:

- Use easily constructed corrective strategies as discussed in Sections 3.1 & 3.2 below.
- Concentrate on treating pavements exhibiting minor distress.
- Provide longer service life than preventative maintenance.
- Extend pavement service life a minimum of five-years.
- Improve ride quality and serviceability of pavements.
- Reduce maintenance effort needed on the affected section of road.
- Be constructed without geometric upgrades.
- Provide cost effective minor enhancements as discussed in Section 4.0 below.
- Not degrade any safety, and/or geometric aspects of the facility.
- Conform to the American Disability Act (ADA) maximum running grade in crosswalks.

3.1 Types of Work on Rigid Pavement Projects

Rigid pavement CAPM projects consist of the following types of work depending on the distress found:

- Removal and replacement of such failed slabs as are required to provide smooth and serviceable pavement.
- Continuous diamond profile grinding of rigid pavement to correct poor ride quality from faulting, slab curl and irregular slab replacement surfaces.
- Sealing longitudinal and transverse joints after diamond grinding and/or joint dowel bar retrofit.
- Rout and seal random transverse cracks. i.e.: cracks functioning as a joint >1/4".
- Rout and seal random longitudinal cracks >1/4".
- Dowel bar retrofit of pavement transverse joints prior to diamond profile grinding of retrofitted pavement.
- Cold planning and resurfacing flexible of pavement shoulders.

NOTE: Pavement preparation such as slab replacement prior to diamond grinding of rigid pavement should not exceed 20% of the project's total costs. District pavement managers are encouraged to accomplish any work needed to adhere to these limits using preventative maintenance repairs.

3.2 Types of Work on Flexible Pavement Projects

The standard design for a flexible pavement CAPM project with an IRI less than 170 at PS&E is 0.15' overlay for rubberized asphalt pavements and 0.20' for other asphalt binders' pavements. The flexible pavement may be rubberized asphalt, conventional asphalt, or some other approved modified binders. A 0.20' overlay of rubberized asphalt may be appropriate in certain circumstances and may be utilized with the concurrence of the HQ Program Advisors and Office of Pavement Design.

For flexible pavement CAPM projects with an IRI greater than 170 the standard design is to place a 0.25' flexible pavement overlay in two lifts. Where there are needs to maintain profile grade or vertical clearance, the existing pavement may be planed up to the depth of the dense or gap graded layer (0.25' maximum.) If the necessary ride improvement cannot be adequately addressed within the parameters of these guidelines, the project should be developed utilizing RRR strategies.

A 0.06' - 0.10' Open Graded Friction Course (OGFC) may be added, but is not to be considered part of the overlay requirements.

Dense or gap graded overlays shall extend to the edge of shoulders. (See HDM 635.1(1)). Leveling courses may be needed to improve ride quality and/or insulate from extensive crack sealant, etc. When used, the leveling course is

included as part of the overall overlay thickness. Undesirable material such as bleeding seal coats or excessive crack sealant should be removed before paving. Preparation of the existing pavement surface is important to the success of the project. HDM 635.1(8) provides additional guidance on preparing existing pavement surfaces for overlay. Pavement preparation such as digouts and crack sealing of existing pavement prior to placement of flexible pavement should not exceed 20% of project cost. District pavement managers are encouraged to accomplish any work needed to adhere to these limits using Maintenance resources, including State forces.

In areas with curb and gutter, it may be necessary to grind the entire roadway where previous overlays have increased cross slopes to the maximum acceptable limit. In addition it may be necessary to grind at crosswalks in order to keep the running slope within ADA standards. (See DIB 82-03 for design information on ADA.) This work is not considered to be digouts. Where crosswalk slopes do not comply with ADA and are determined to be technically infeasible to correct, an ADA exception should be sought.

Note: Not all Alligator A and B cracking requires digouts. Digouts typically are warranted for areas of severe distress such as rutting greater than 0.08' (1") and/or loose or spalled pavement. Crack sealing is done on cracks wider than 0.02'(1/4") as a preparation for overlays. Also see Topic 635.1(8) of the HDM.

4.0 ENHANCEMENTS

4.1 Traffic Operational Review

District Traffic Operations will perform a Traffic Operational Review for all CAPM projects. A Traffic Operational Review is an evaluation of potential easily implemented enhancements that should be included in CAPM projects. Potential enhancements should be limited to the following topics:

- The condition and appropriateness of signing and pavement delineation. Determine if any should be added, replaced, revised or improved. This includes accuracy of the location of traffic markings. Are lane and shoulder widths striped properly?
- The maintaining, addition, replacement or elimination of rumble strips.
- The collision patterns related to wet weather.
- The upgrade and/or installation of barrier rail and end treatments.

Recommended enhancements will be incorporated in the project if the inclusion does not change the target construction season. The Project Development Team guides project development on this issue. The enhancements also must not

significantly increase the project cost. Where a Traffic Operational Review recommendation cannot be included on the CAPM project, Design needs to document the decisions and inform district Traffic why the enhancement will not be included in the project.

4.2 Other work appropriate on CAPM projects

- Metal Beam Guardrail (MBGR) height shall be adjusted as necessary to meet current standards. In-place guardrail shall be from 26" to 29" in height.
- Bridge approach rails and non-standard sections of MBGR shall be upgraded to current standards as needed.
- End treatments for all in-place MBGR and Vehicle Impact Attenuators shall have appropriate upgrades to NCHRP Report 350 Crash Test Standard compliant end treatments as site specifics dictate. Refer to the list of approved end treatments and attenuators for specific products on the Office of Traffic Safety Program's Approved Products web site.
- Existing dike not meeting current standards (HDM Topic 303) should be replaced with the appropriate standard dike. The installation of dike not meeting current standards requires approval of an advisory design exception fact sheet.
- Replace existing traffic stripe, pavement markings, damaged loop detectors as well as safety devices not otherwise discussed in the Traffic Operational Review.
- Drop-offs at edge of pavement shall not be allowed. "Shoulder Backing" material shall be specified and used. (See Shoulder Backing Guidelines on HQ Designs' Pavement Technical Guidance intranet web page.)
- Drainage and other traffic operational deficiencies should typically be addressed using separate funds or as a separate project. Drainage modifications should be limited to what is necessary to maintain existing drainage patterns.

CAPM Scoping Team Field Review List

Team Members

- HQ 121 Program Advisor*
- District 121 Program Advisor*
- Project Engineer*
- Materials Engineer
- Traffic Safety
- Project Manager
- Field Maintenance
- Environmental
- Design Coordinator / Design Reviewer

* Required attendance

Take on Field Review

- Sign In sheet for document
- Major Maintenance Plan
- SHOPP 10-Year Plan
- CAPM PR (copies for the team)
- Pavement Condition Survey
- Project Estimate
- STIP
- Highway Log
- Design Information Bulletin 81

Special Considerations Issues

- Non Motorized Traffic Needs
- Utilities
- Environmental Issues (Potential Delays)
- Vegetation Control
- Project Limits (vs. PCS project limits)