CHAPTER B

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B.00 Introduction

The information contained in this chapter is covered by the "B" Family, Rigid Roadbed.

Detailed charging practice instructions for the “B” Family are contained in Maintenance Manual Volume 2.

B.01 Definitions

The roadbed is that portion of the roadway, including ramps and public road approaches, that extends from curb line to curb line or shoulder line to shoulder line, including dikes. Divided highways are considered to have two roadbeds.

A rigid roadbed is a roadbed surfaced with concrete pavement. Concrete pavement surfaced with less than two (2) inches of asphaltic concrete (AC) is also considered a rigid roadbed.

B.02 Maintenance Levels

The general objective of roadbed maintenance is to preserve roadbed facilities by applying pavement preservation practices that provide a roadway that is safe and in a good state of repair. Maintenance of the roadbed covers the restoration and repair of both surface and underlying layers.

Typical items to be considered in roadbed maintenance are slippery pavement, proper drainage, cracking, shoulder dropoff, slab warp, spalling, slab settlement, heave or distortion, bridge approach settlement, base failure, joint separation, checking, joint sealing, and abrupt vertical surface differential.

Roadbed deficiencies that immediately affect safety should be given first priority in roadbed maintenance. Typical defects in this category are slippery pavement, excessive bridge approach slab settlement, and abrupt vertical variations..

Second priority should be given to the correction of roadbed defects having a long-range effect on riding quality and capital investment. Typical examples of defects in this category are pavement cracks and spalls.

Information about recent pavement condition for all routes is available from the pavement management system, known as PaveM. The database has information from an automated pavement condition survey together with a manual survey that collects data about distress types, severities, and extents.

The following summaries identify typical examples of defects and required levels of maintenance.

(A) Slippery Pavement

Pavement surface texture is subject to adverse change as a result of aging, wear, etc. Routine surveillance of pavement texture should be made and suspected problem areas reported promptly.

Obvious slippery areas should be corrected to the extent feasible under the prevailing conditions. When additional corrective action is necessary, it should be initiated or scheduled promptly.

Suspected slippery areas should be promptly reported for further investigation.

(B) Cracks

Cracked pavement allows water and foreign material to enter the structural section and may cause ultimate failure.

Individual cracks 1/4-inch wide or wider and any other areas with extensive finer cracking should be repaired before the rainy season to protect the structural section.

(C) Settlement, Heave and Distortion

This type of roadbed defect often results in poor riding quality and excessive impact loading of bridges and slabs. It does not always involve failure of the structural section. Typical causes are fill-settlement, unstable cuts, expansive soils, and unconsolidated basement soil. This type of defect may not cause any problem at low speed but would be objectionable at high speed.

Surface irregularities and vertical edges create a rough riding quality. Many surface variations are not as obvious to the driver at high speeds as they are at low speeds.

Correction for surface irregularities should be scheduled when the localized roughness reaches 1½ inches in a length of 50 feet, or when the riding quality is objectionable, such as when the international roughness index (IRI) exceeds 170 inches/mile.

Differential changes in elevation of individual concrete pavement slabs also result in poor rideability and accelerate pavement deterioration due to increased impact loading. When surface deviations exceed ½ inch between adjacent slabs, corrections should be scheduled. A repair should be scheduled when an abrupt vertical differential between the traveled way and paved shoulder results in poor riding quality.

Bridge approach slab settlement is a problem requiring routine surveillance. A void often exists under an approach slab long before the slab settles. Slab settlement can often be prevented by early detection and filling of voids.

An exploration should be made within one (1) year after construction to assist in early detection of voids under bridge approach slabs. Voids that are discovered should be filled. Since some voids occur several years after construction, a continuing visual inspection is necessary for signs of voids under approach slabs such as springiness or separations at the edge of concrete pavement.

(D) Spalling

A transverse spall that exceeds four (4) inches in length in the direction of travel or one that adversely affects comfort should be repaired. Longitudinal spalls that adversely affect riding quality should be repaired.

(E) Joint Separation

Joint separation allows water to reach underlying structural layers. This often results in a rocking slab with subsequent pumping of underlying materials through the joint and ultimate slab failure.

Joint separation between concrete pavement and adjacent AC shoulders is detrimental as it allows surface runoff to penetrate the structural section and often causes shoulder failure. In addition, it provides space for growth of objectionable vegetation.

Concrete pavement joints and shoulder joint separation between concrete pavement and AC shoulders that exceed 1/8 inch should be filled.

(F) Dikes and Berms

AC dikes and earth berms control roadbed runoff, and protect slopes from erosion. Extensive damage to the roadway may result when these are not maintained as built.

Damaged dikes and berms which will allow runoff to erode the roadway should be repaired promptly, or temporary repairs should be made until permanent repairs can be scheduled.

Damaged dikes and berms not falling under the above category should be routinely repaired in conjunction with other maintenance operations to minimize traffic disruption.

Asphaltic concrete dikes and penetration-treated berms in areas where asphaltic material is subject to rapid oxidation or freezing conditions should be inspected annually and sealed upon evidence of raveling, cracking, or other surface deterioration.

B.03 Definition of Traveled Way

The traveled way includes the portion of the roadway that is for the movement of vehicles, excluding shoulders. It includes the area between the inside of curbs where curbs exist, county road approaches, and city street intersections between right of way lines.

B.04 Policy for Performing Roadbed Maintenance Work

Refer to Chapter "A", Section A.03 for the policy for performing roadbed maintenance work.

B.05 Surface Types

Rigid Type Surfacing includes all concrete pavement and concrete with less than two (2) inches AC overlay.

As listed in the California State Highway Log, the following surface is rigid pavement:

Surface Types (Rigid)	
CODE	TYPE
ST	Surface Type
C	Concrete (less than 2 inches AC surface)

B.06 Types of Rigid Roadbed Failures

Rigid Roadbed will fail by any one or a combination of the following:

(A) Cracking. May be due to either failure of the base or temperature expansion and contraction.

(B) Slab sinking. Caused by base failure or movement of the earth mass beneath the pavement structure.

(C) Raised joints. Generally caused by slab curling or faulting at the joints. Faulting refers to vertical displacement of concrete pavement slabs at joints.

(D) Rutting. Caused in concrete pavement by the continued use of metal coming in contact with the pavement surface, such as vehicles using tire chains.

(E) Spalls. The loss of concrete material from the pavement surface, resulting in a hole. Spalls are typically caused by weak concrete material, incompressible material in joints or cracks, and freeze-thaw cycles.

B.07 Rigid Pavement Repairs Using Asphalt Materials

Asphalt plant mixed material may be used for many surface repairs to rigid pavement. They will generally be used in cases of sunken slabs or extensive slab breakage. Before making any asphalt repairs to rigid pavements, the surface must be well cleaned and tacked with a paving asphalt or emulsion to ensure a good bond between the concrete surface and the hot mix asphalt (HMA) or pre-mix overlay.

When making asphalt concrete repairs to concrete pavement, base repairs may not be necessary. It is only in an extreme case such as pavement blowups that a rigid pavement structure should be replaced in its entirety with an asphalt type pavement. AC can be used to replace small areas of broken concrete because curing concrete requires time that interferes with traffic, but rapid strength concrete (RSC) is preferred for extended performance.

B.08 Concrete Patching with Concrete

Where it is not practical to repair a concrete surface with asphalt material, longer-life repairs should be made by removing broken sections and replacing them with RSC. High early strength Type III is often used, but there are also several proprietary rapid-setting products available for patching.

Where fresh concrete is to be placed against old concrete, and when spalled joints are being repaired, a more effective joint can be obtained by using an adhesive consisting of modified epoxy resin applied to the edges of the old concrete immediately before the fresh concrete is placed. When repairing concrete pavement with new concrete, allow ample time for the material to set and cure before opening the section to traffic. With RSC, this will generally be between 2 and 24 hours.

B.09 Concrete Joint and Crack Seal

Longitudinal and transverse joints should be resealed if the existing seal has failed. Contact the District Material Laboratory if a faulting condition develops at transverse joints. The Lab will study the condition and make recommendations. Any random cracks should be filled before the winter rains.

Cracks or joints in concrete pavements may be filled with any of a variety of commercially available crack fillers.

Do not overfill cracks, as a build-up of filled material results in bumps that are noticeable to traffic.

Joints between the concrete and asphalt shoulders are generally filled with a mixture of emulsion and rejuvenator topped off with sand.

Refer to the "Flexible Pavement Joint and Crack Sealing" section in Chapter “A” of this manual, as this work is similar whether the pavement is flexible or rigid.

B.10 Subsealing and Jacking Concrete Pavement

Subsealing or jacking, also known as mudjacking, is used to fill voids in the base under concrete slabs without removing the pavement surface. In addition to base repair, sunken slabs may be raised to grade by jacking. Subsealing and jacking replace lost or sunken base material by pumping a portland cement grout underneath the slab through holes drilled into the slab at required intervals. Special pumping equipment is needed for this purpose.

The grout should have a low shrinkage factor, good strength, and the ability to flow through the equipment and spread under the pavement. A grout consisting of 1 part portland cement, 3 parts pozzolan, and 1.4 to 2.4 parts water should be used.

Subsealing or jacking are specialized processes generally performed by specific crews.

B.11 Concrete Slab Subsealing with Asphalt

Cavities under sunken or moving slabs may be filled by subsealing with asphalt. This practice has not been used often in past years. However, if it is determined that this method should be used, consult the district's Materials Lab for specification and advice regarding this maintenance practice.

B.12 Concrete Grinding

Irregular surfaces in portland cement concrete pavement are often corrected by grinding. This works well for correcting the riding qualities of a pavement that has faulted. Grinding projects are generally done by contract. When it is felt that grinding is the solution to correcting irregularities in concrete pavement surfacing, the problem should be brought to the attention of the Deputy District Director, Maintenance. Extensive grinding work is generally considered as rehabiliation, and is not a maintenance charge; however, isolated small areas may be classified as maintenance.

B.13 Work on Asphalt Shoulders

Due to the hazards of traffic, work on paved asphalt shoulders should be confined to one side of the highway at a time. Workers shall be given protection while working on paved shoulders as outlined in Chapter “8” of this manual.

B.14 Road Approaches to Public Roads

Refer to Chapter “A”, Section A.21 of this manual for definition of Road Approaches to Public Roads.

B.15 Non-Motorized Travelers on State Highways

Refer to Chapter "A", Section A.22 of this manual, "Non-Motorized Travelers on State Highways", for more detailed information about maintenance procedures on highways where non-motorized travel is permitted.