PAVEMENT TECH NOTES

Pavement Tapers and Transition Guide

December 31, 2008

Abstract:

The following information is being provided as guidance to assist Design Engineers in designing pavement transition tapers. The transition tapers presented in this guide meet the Caltrans standards and requirements for pavement transition tapers. This guide only addresses permanent pavement transition tapers used on overlay and other pavement projects. It does not include transition tapers for temporary pavements or detours. Additional information on pavement transition tapers can be found in the Standard Special Provisions (SSP) 15-670.

1. Backgrounds and Purpose

Pavement transition tapers are a common design detail for HMA overlays and other projects where new pavement surface has a higher profile than existing pavement surface or curbs. The goal of transition tapers is to provide a smooth ideally unnoticeable transition from a pavement overlay section or other type of pavement work to the existing section. This guidance provides information on the best design practices for transition tapers that meet geometric, operational, constructability, as well as other pavement surface and drainage standard practices. This guidance should not be considered as covering every possible situation that can be encountered on projects throughout the State. Design Engineers should still exercise good engineering judgment when developing transition taper details for a specific project.

2. Requirements and Considerations

a. Transition tapers are intended to provide a reasonable cost alternative to engineering a profile for every transition. However, in some cases, an engineered profile may be more cost-effective than a transition. For example, when replacing pavement underneath an over-crossing/bridge (see Figure 3), an engineered profile can be less expensive and easier to construct than a pavement transition, especially for very flat tapers (400:1 or flatter). When designing tapers underneath over-crossings or into bridges, the Design Engineers should compare the cost and constructability of very flat tapers (400:1 or flatter) vs. engineered profiles.

b. The minimum thickness of the pavement structure (existing + surface course overlay) for transition tapers into or under bridges must meet the minimum pavement design life requirements for the project as discussed in Topic 612 of the Highway Design Manual (HDM). This is intended to prevent creating isolated “weak spots” in the pavement that may require additional maintenance and repair in the future. On rehabilitation and reconstruction projects, where the pavement structure of the taper does not meet the pavement design life, the pavement structure or part of it will need to be removed and reconstructed. Deviations from this requirement or District decision not to reconstruct the pavement sections underneath bridges will require a mandatory design exception from Headquarters Office of Pavement

Design. A mandatory design exception is specifically needed for pavement design lives of 20 years or more (See HDM Table 612.2). Since pavement preservation projects [preventive maintenance & CApital Preventive Maintenance (CAPM)] are not designed for structural capacity, it is usually not necessary to replace the pavement surface course approaching or under bridge structure unless when needed to match existing profile.

c. Where a new pavement structure or an overlay is tapering into an existing pavement that is not part of the project, the minimum thickness of the surface course layer in the taper must be no less than that of the adjoining existing pavement. Note that when tapering into an existing pavement that was previously overlaid (preservation or rehabilitation), the new taper should be at the same section as the previous taper to avoid creating a "dip" or "weak spot" in the pavement.

d. Grinding rigid pavement to create a taper is not recommended because it can shorten the life of the rigid pavement. However, because it is not always practical to remove and replace rigid pavement for every overlay, the following guidance should be followed regarding tapers for rigid pavement.

    1) For preventive maintenance projects (thin HMA overlays of 0.10' or less), the taper should follow the taper details for OGFC overlay over flexible pavement found in this guide or reduce thickness of overlay to 0.08' at end of taper and roll down edge to minimize raveling.
    2) For CAPM projects, either taper the overlay down using the same details used for OGFC or replace the rigid pavement slab.
    3) For rehabilitation projects, do not grind the rigid pavement to accommodate a taper. Instead, remove rigid pavement within the taper section and replace with a new pavement structure that will meet the design life for the project as defined in Topic 612 of the HDM.

    The following two conditions should be met when grinding rigid pavement:

    - Use a diamond grinder and not a planing machine.
    - Never grind more than 1 inch or reduce the thickness of the rigid pavement slab to less than 0.65 feet.

    If neither of these conditions can be attained with the taper detail, then remove and replace the rigid pavement slabs and the underlying base as needed for the transition taper section to match the existing pavement surface and meet the design life for the project as defined in Topic 612 of the HDM.

e. Prior to placement of an overlay, the existing surface in each taper should be notched as shown in the following figures.

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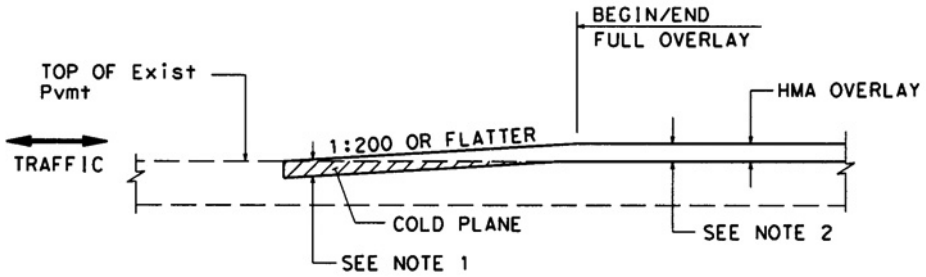
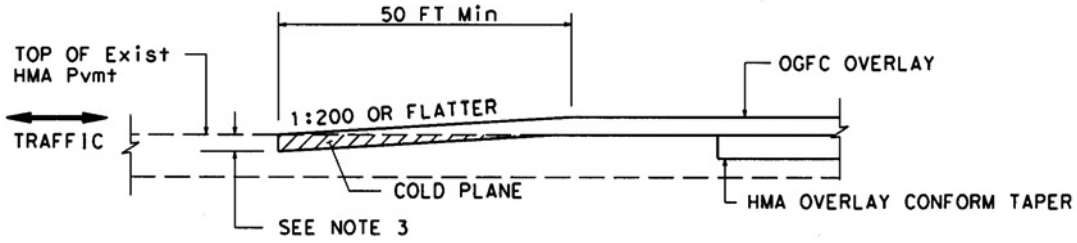
NOTES:

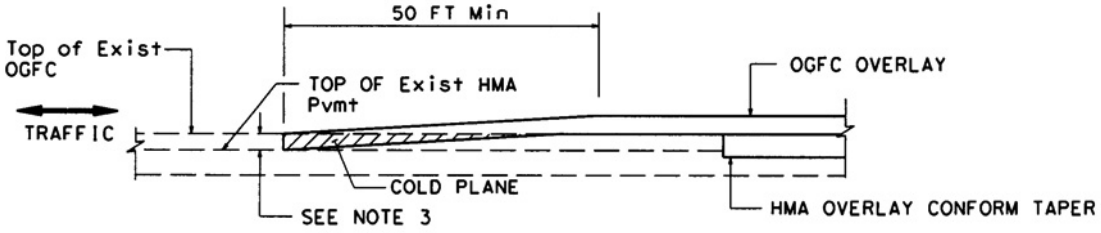
1. MINIMUM THICKNESS SHOULD MATCH THE THICKNESS OF THE TOP LIFT.
2. SEE HDM FOR MINIMUM THICKNESS.
3. SAME THICKNESS AS OGFC OVERLAY OR 0.10' WHICHEVER IS LESS.
4. DO NOT USE HMA TO BRING THE SHOULDERS UP TO GRADE WHEN TRAVELED WAY IS OGFC.



TRANSVERSE HMA TAPER TO EXISTING HMA PAVEMENT



TRANSVERSE OGFC TAPER TO EXISTING HMA PAVEMENT



TRANSVERSE OGFC TAPER TO EXISTING OGFC PAVEMENT

TRANSVERSE TRANSITION TAPERS

FIGURE 1

NO SCALE

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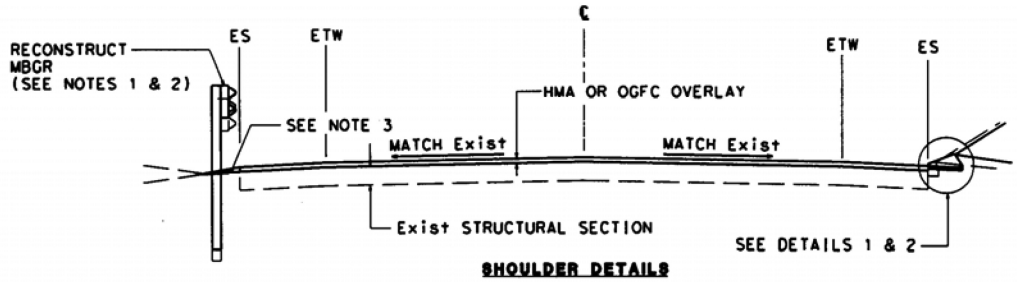
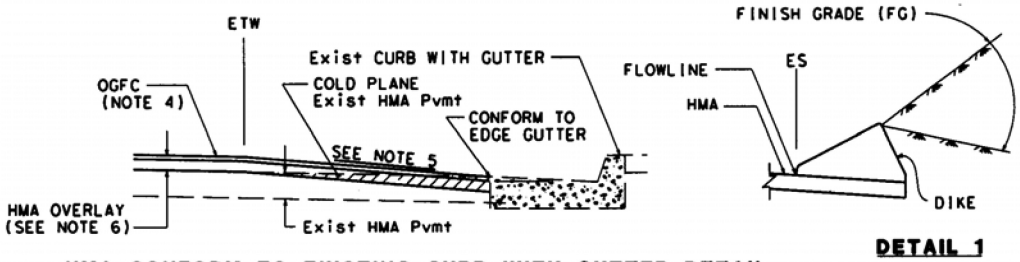
NOTES:

1. ADDITIONAL DESIGN AND SAFETY CRITERIA MAY APPLY FOR METAL BEAM GUARD RAILING (MBGR). FOR FURTHER INFO, SEE TRAFFIC MANUAL OR DISTRICT TRAFFIC.
2. WHEN GRINDING OR PAVING NEXT TO MBGR OR OBSTACLE, RECONSTRUCTING MBGR WILL BE NECESSARY TO ACCOMMODATE GRINDING MACHINES AND COMPACTION EQUIPMENT.
3. CONTACT DISTRICT LANDSCAPE AND MAINTENANCE REGARDING THE APPROPRIATE TREATMENT FOR WEED ABATEMENT.
4. OGFC APPLIES ONLY WHEN USED AS A SURFACE COURSE. OMIT DETAILS FOR THIS COURSE WHEN OGFC IS NOT USED.
5. SEE HDM TOPIC 302 FOR MAXIMUM ALLOWABLE CROSS-SLOPES.
6. MINIMUM HMA THICKNESS SHOULD BE THREE TIMES MAXIMUM AGGREGATE SIZE (WHICH IS A MINIMUM OF 0.15 FT FOR ½ INCH AGGREGATE).
7. FOR ADDITIONAL INFORMATION ON DIKES, SEE HDM TOPIC 303, AND STANDARD PLAN A788.
8. VERIFY WITH HYDRAULICS TO SEE IF DIKE NEEDS TO BE RAISED TO MAINTAIN CAPACITY OF GUTTER.
9. VERIFY WITH DISTRICT HYDRAULICS IF ADDITIONAL DRAINAGE IS REQUIRED AT THE CONFORM ON THE SHOULDER OR AT BRIDGE APPROACH SLABS IN ORDER TO AVOID PONDING.

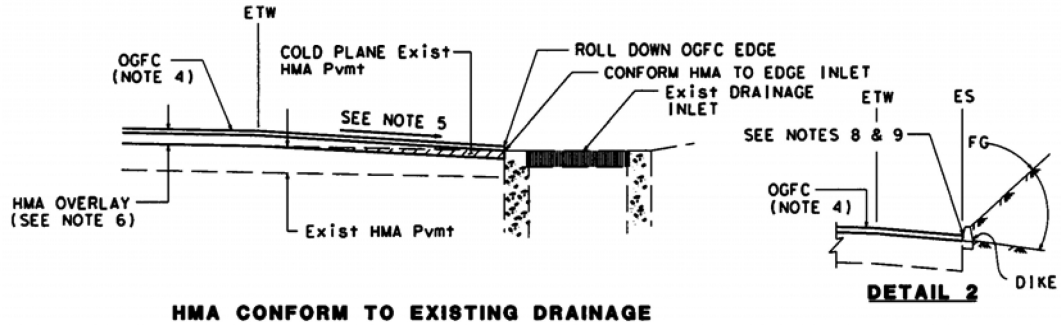


SHOULDER DETAILS



HMA CONFORM TO EXISTING CURB WITH GUTTER DETAIL

DETAIL 1
SEE NOTE 7



HMA CONFORM TO EXISTING DRAINAGE

DETAIL 2

LONGITUNDINAL TAPERS AT SHOULDERS, CURBS, DIKES, INLETS, AND METAL BEAM GUARD RAILING

FIGURE 2
NO SCALE

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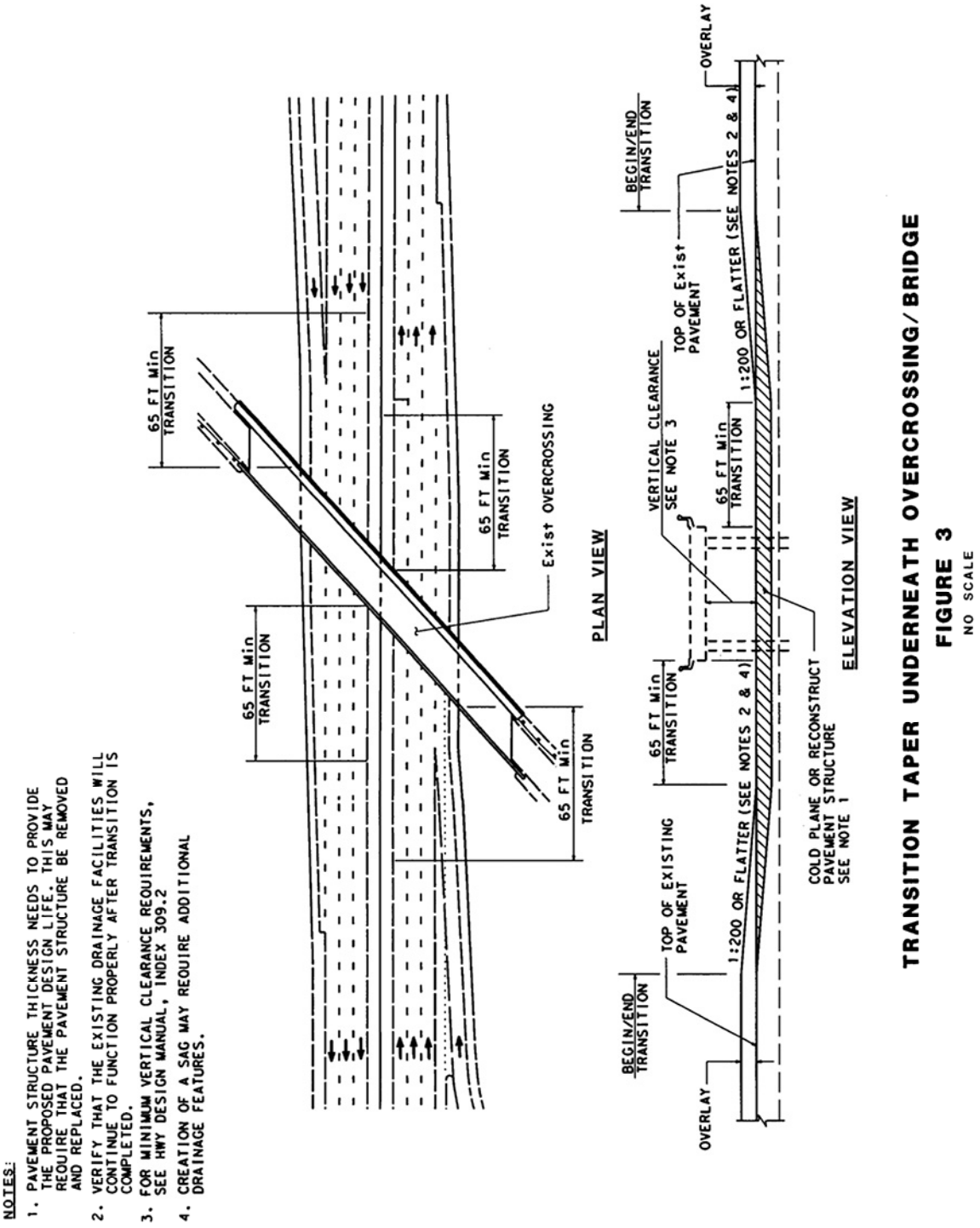

TRANSITION TAPER UNDERNEATH OVERCROSSING/BRIDGE

FIGURE 3

NO SCALE