8-5 OVERLAYS ON EXISTING BRIDGE DECKS

Overlays on existing bridge decks may become necessary for a number of reasons. The deck may require rehabilitation. There may be a lack of cover of the deck reinforcement. Overlays are used to improve rideability and in some cases are the best alternative to improve skid resistance. The recommendations of this memo also apply to partial deck replacement where there is no increase in deck thickness.

Bridge deck overlays are usually made with portland cement concrete (PCC) or polyester concrete. In either case the deck surface must be thoroughly cleaned by abrasive cleaning. In the case of a PCC overlay, 6 mm of deck concrete removal is required.

Placement of an overlay may require the existing barrier railing be modified or replaced to maintain minimum barrier height requirements and impact resistance of the barrier and slab.

Live load capacity of the structure should be checked whenever an overlay is placed on an older bridge.

Overlays that do not cover the entire deck area must conform into the existing deck. Tapered sections deteriorate quickly and must be avoided.

Asphalt concrete overlays are to be avoided. The Office of Structure Maintenance and Investigation (OSM&I) maintains a bare deck policy to facilitate the inspection of the deck. AC overlays inhibit the evaluation of the bridge deck so that deck deterioration that could be stopped by preventive maintenance may result in costly rehabilitation. There may be extenuating circumstances where an AC overlay should be allowed. Approval for the placement of AC overlays on bridge decks must be obtained from either the OSM&I North or South Investigation Branch Chiefs.

Based on experience and economics, the following table shows the selection criteria for either portland cement concrete (PCC) or polyester concrete when a bridge deck overlay is used.

Memo converted to metric.

Overlay Thickness	Material	Surface Preparation	Advantages	Disadvantages	Special Considerations
19 to 75 mm	Polyester concrete	Abrasive blast cleaning	Open to traffic in in approx. 4 hrs., Impermeable	Moisture sensitive during placement, High cost	10 mm maximum aggregate size
75 mm or greater	PCC	Approx. 6 mm deck concrete removal	Low cost	7 day cure before open to traffic, Rail height modification	7 sack mix with 26 mm maximum aggregate size

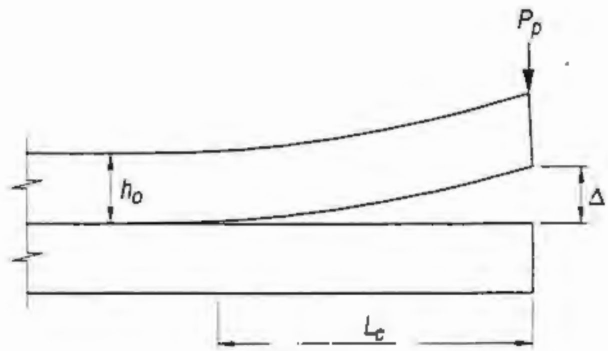
When overlays are placed on bridge decks in Area III, the deck concrete should be tested for chloride content. When the existing deck concrete has chlorides greater than 2 kg/m^3, the excessive chlorides must be either removed or neutralized. There are currently two methods available for dealing with excessive chlorides: Removal of the concrete with chlorides in excess of 2 kg/m^3 prior to placing the overlay or cathodic protection. If a cathodic protection system is chosen to stop the corrosion of the reinforcing steel, it will likely control the overlay design strategy. Contact the Corrosion Technology Section of the Office of Materials Engineering and Testing Services (METS) at (916) 227-7007 for information on cathodic protection.

A 1987 research project "Structural Concrete Overlays in Bridge Deck Rehabilitation" by F. Seible, et. al.; determined that shear dowels through the interface are generally not required when the old concrete face is adequately rough and clean. Section 5.5.1 of that report does give a basis for determining when interface dowels throughout the overlay area are required.

When the overlay is designed to become a part of the deck slab structural section, perimeter dowel reinforcement will probably be necessary and general shear dowels are seldom needed.

Perimeter dowel reinforcement is recommended along free edges of the bridge where the potential for overlay curl due to environmental effects exists. The required perimeter force to prevent overlay curl can be reduced in cases where additional edge dead loads (curbs, parapets etc.) are present.

The following formula, developed in the above noted research project, can be used to determine the required reinforcement to prevent edge curl.



The nominal curl length is computed with h_o in [mm] as

$$L_c \cong 8.93\sqrt{h_o} \quad \text{[mm]}$$

and the required perimeter force per unit length with h_o, L_c in [mm] as

$$P_p = 2\,760\frac{h_o^2}{L_c} - 9.05\times10^{-3}h_o L_c \quad \text{[N/m]} \quad \text{or } 10.11h_o^{3/2} \quad \text{[N/m]}$$

Perimeter dowel reinforcement is designed based on an allowable dowel stress of $f_{da} = 0.4f_{dy}$ as

$$A_{dp} = \frac{P_p}{f_{da}} \quad \text{[mm}^2\text{/m]}$$

The Concrete Section of the Office of Materials Engineering and Testing Services (METS) can be contacted at (916) 227-7272 for further information on state of the art overlay materials.

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