# 4.0 DESIGN DETAILS

## 4.1 General

Thickness of the various overlays should be carefully considered when planning a deck overlay project. The different types of overlays require various thicknesses to provide equivalent degrees of protection.

For new decks, bridge appurtenances such as drains (scuppers), joints and approach slabs will have to be detailed to the proper elevation. If more than one overlay material is allowed to be bid, dimensions must provide for the alternate thicknesses.

For existing decks, when an overlay greater than 1/4" thick is proposed, a decision will have to be made whether to raise existing drains, joints and approach slab; scarify to the appropriate depths at each location; or, provide additional thickness of the appropriate material (e.g., steel plate on top of an existing joint or asphalt at the approach slab).

4.2 Bridge Joints

For overlays with thickness up to 1/4", place tape over the joint to serve as a bond breaker, pave over the joint, and then saw cut the overlay material adjacent to the joint after it is cured and remove it (see Figure 1).

For overlays greater than 1/4" thick, remove sufficient deck concrete adjacent to the joint, a minimum of 12" wide, to ensure the design thickness of the overlay material, or 1" minimum, is achieved. The top surface of the overlay shall be sloped at a maximum of 1/8" in 12"( See Figure 2).

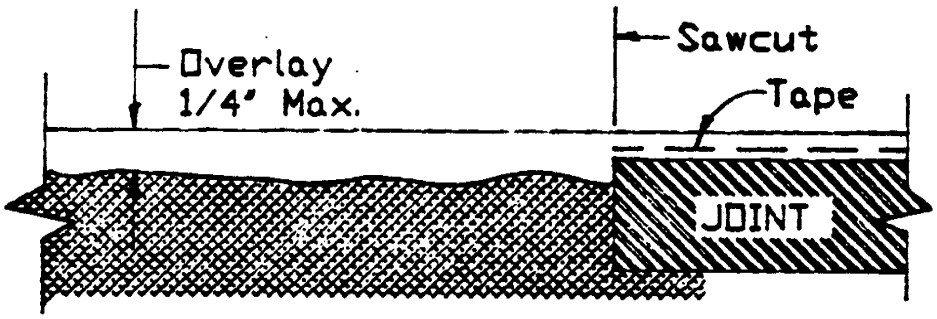


FIGURE 1

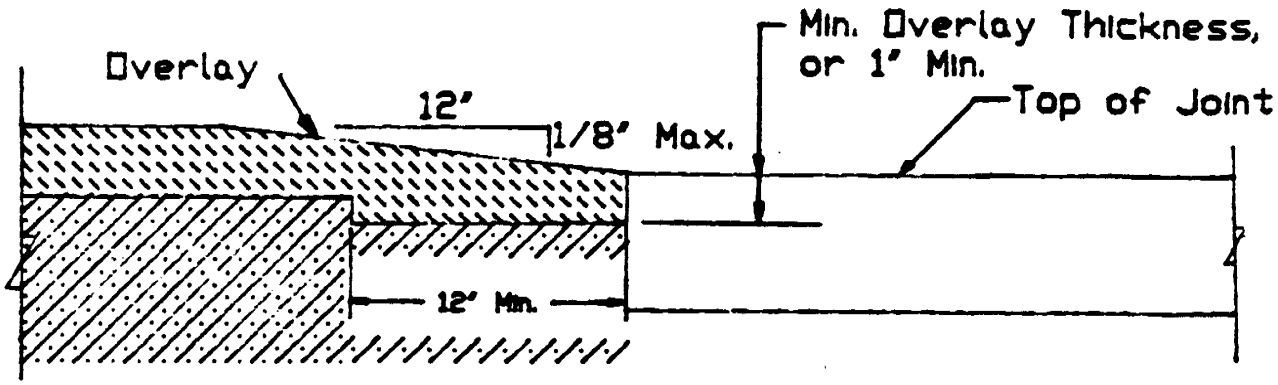


FIGURE 2

For high speed routes, where an overlay will be placed on both sides of the joint (i.e. over a pier) consideration should be given to joint removal and resetting to top of overlay elevation to maintain rideability.

4.3 Bridge Drains (Scuppers)

Bridge drains can be handled the same way as joints, as shown in Figures 1 and 2 above. When utilizing existing deck drains it may be necessary to hand shape and finish these areas since it is essential that the area drains properly without ponding after the addition of the new overlay.

4.4 Cross Slope

It is essential that overlays be placed with proper crown or cross slope to offer good drainage and/or super-elevation. To obtain proper drainage, a minimum cross-slope of 1/4" per foot is recommended (moderate rainfall areas. See AASHTO Geometric Guide).

# 5.0 CONSTRUCTION REQUIREMENTS

## 5.1 Job Conferences

### 5.1.1 Prebid Conference

A prebid conference is strongly recommended, particularly if new and/or unusual materials, equipment or procedures are proposed. The possibility of substitutions and/or innovative materials, methods and procedures may be reviewed. The applicability of Value Engineering substitutions should be discussed.

Of particular importance, is the need to stress the degree of Quality Control to be expected, and Quality Assurance procedures to be implemented.

### 5.1.2 Preconstruction Conference

Planning and communication is vital to the successful construction of any deck overlay. A preconstruction conference attended by the principal personnel involved including representatives from the owner, inspection forces, contractor, involved subcontractors, material suppliers and/or manufacturers (when required) should be scheduled well in advance of the initiation of overlay placement.

As a minimum, the following items should be discussed:

- Work schedule
- Applicable specifications, special notes
- Applicable laws, permit, license requirements
- List of suppliers, delivery details

- o Role of manufacturers' representatives (if applicable)
- o Knowledge level of contractor forces and inspection personnel; need for special training
- o Maintenance of adequate traffic movement
- o Protection of traffic from construction hazard
- o Environmental controls
- o Overlay construction details (surface preparation, placing, finishing, texturing, curing)
- o Testing requirements
- o Acceptance criteria
- o Contingency plans (inclement weather, equipment failure, etc.)
- o Safety requirements
- o Methods of measurement and basis of payment
- o Record keeping requirements

## 5.2 Surface Preparation

### 5.2.1 General

The integrity and ultimate performance of a deck overlay is in large part determined by the nature of deck surface preparation. It is imperative that care be taken, specifications followed, and surface preparation decisions made by qualified personnel.

In general, when preparing an existing deck for placement of an overlay, all deteriorated, delaminated and spalled concrete must be removed (excavated) and the surface properly cleaned and prepared before placing the overlay. When depth of delaminated,

contaminated or unsound concrete extends down to the reinforcing steel, and the steel is tightly bonded, no further concrete removal is required. When the steel is debonded (loose) the concrete should be removed using small chipping (30 lb. max) hammers, or hydrodemolition, to a minimum depth of 3/4" below the reinforcing steel, and the steel surface thoroughly cleaned before placing the overlay.

Where the depth of removed concrete extends below the elevation of the bottom of the finished overlay, the excavated areas can be filled with normal bridge deck concrete, or the overlay material, at the contractor's option, if an LMC, LSDC, SFC or LW/C overlay is to be used. If the excavated areas are "prefilled" with concrete, the surface of the filled area shall be prepared for the overlay in the same manner as the remainder of the deck.

When an overlay is to be part of a new bridge deck (two-stage construction), it should not be placed until the stage one concrete has attained at least 90 percent of design strength (f'c). No vehicular traffic or construction equipment shall be allowed on the stage one deck concrete until placement of the overlay, unless the surface is again properly prepared in accordance with stage two requirements.

5.2.2. Scarification

This work consists of removing the top surface of structural bridge deck concrete. Scarification, or grinding, removes the

top layer of potentially contaminated concrete for existing decks. It may also be required to correct surface texture or rideability problems with a new deck. Removal is done by hydrodemolition or mechanical equipment to a depth of 1/4" min. to 1/2" max. unless otherwise shown on the plans. All removed material is to be transported from the work site and disposed of in a manner approved by the Engineer. In urban areas, control of dust must be considered and may dictate available means of scarification. Water from hydrodemolition may require treatment prior to disposal. Unless otherwise noted, scarification to depths greater than 1/4" shall be filled with overlay material at the contractor's expense.

Appendix C provides a sample concrete removal specification when using hydrodemolition.

5.2.3 Blast Cleaning

5.2.3.1 First stage blasting is done to thoroughly clean all receiving surfaces of curing compound, carbonation or other contaminants that will affect bonding of the overlay. All exposed reinforcing steel, or other steel, which will be in contact with the overlay concrete is to be cleaned of all grease, dirt, concrete mortar and injurious rust. Injurious rust includes all scale, loose rust deposits, or all rust not firmly bonded to the steel. Rust deposits, which in the Engineer's opinion, cannot be removed by blasting are considered firmly bonded and acceptable.

New concrete should have laitance and partially loosened chips of concrete removed by blasting.

All debris from the blasting operation must be removed and disposed of properly.

First stage blasting and cleaning operations can be commenced in an area after all necessary concrete removal has been completed. Should more than 48 hours elapse between the first stage blasting and cleaning operations, and placement of the overlay, second stage blasting and cleaning is required, regardless of the apparent condition of the concrete surface.

First and second stage blasting can be accomplished by sandblasting, shotblasting, or high pressure (100 psi min.) water blasting.

5.2.3.2 Second stage blasting and cleaning. If in the Engineer's opinion, contaminants, which might interfere with bond, are present on the prepared surface, or more than 48 hours has elapsed since completion of first stage blasting, second stage blasting and cleaning must be performed as directed by the Engineer immediately prior to placement of the overlay.

5.2.3.3 Air Blasting. In order to insure that the prepared surface is clean prior to overlay placement, the area must be thoroughly air blasted by an oil-free blast just ahead of the overlay placement operations.

5.2.4 Bonding

Bond between the hardened concrete base and the overlay material is obtained by different means in each overlay material.

5.2.4.1 Portland Cement Based Overlays

After the surface has been prepared, but after the last blast cleaning, the surface should be prewetted at least three hours prior to placing the overlay to create a saturated surface dry condition (saturated base with no free water or dampness on the surface) at the time the bonding rout is applied. A polyethylene cover can be used to retain moisture in the concrete base. Other contaminants must be kept off the surface until the grout is applied. Prior to application of the bonding grout excess water should be removed and the surface dried by air blasting with oil-free compressed air.

Immediately before placing overlay concrete, a thin coating of "creamy" grout must be vigorously and thoroughly broomed or brushed into the saturated surface dry surface to properly bond the materials together. For LSDC and LW/C overlays, the grout consists of equal parts of sand and cement with sufficient water to form a slurry. In the case of LMC, the bonding grout is either broomed in from the mix itself, or mixed separately and deposited on the deck immediately ahead of the placement operation and thoroughly broomed into the dry prepared surface. This LMC grout consists of 3 parts sand, 1 part portland cement, 0.3 parts latex and 0.25 parts water (by weight).

All surfaces to be in contact with the overlay concrete, including the deck, curb, longitudinal and transverse joints are to be coated with the bonding grout.

Bonding grout is broomed into the surface with push brooms. At all joints, and in areas around or below reinforcing steel, brooming is done with straight brooms. Care must be exercised to insure that all prepared surface areas receive a thorough even coating, and that no excess bonding grout is permitted to collect in pockets. This is done to ensure that the bonding grout is evenly absorbed into the prepared surface.

The bonding grout must not be allowed to dry prior to placement of any portion of the overlay.

5.2.4.2 Polymer Concrete Overlays

The bonding agent, or primer coat, shall be placed according to, and, at the manufacturer's recommended application rate. These materials differ widely and are subject to the manufacturer's recommendations for the following areas:

a) Method of application - brush, roller or spray

b) Rate of application - approximately 100 sq ft. per gallon

c) Broadcasting sand over the primer coat