
AASHTO-AGC-ARTBA Joint Committee

Subcommittee On New Highway Materials

Task Force 30 Report (In Two Parts)

"Guide Specifications for Concrete Overlays of Pavements and Bridge Decks"



AASHTO-AGC-ARTBA Joint Committee

Subcommittee On New Highway Materials

Task Force 30 Report

PART I

"Guide Specifications for Concrete Overlays of Pavements"



INTRODUCTION

This document is disseminated upon the sponsorship of the Joint Committee of the American Association of State Highway and Transportation Officials, the Associated General Contractors of America and the American Road and Transportation Builders Association (the Joint AASHTO-AGC-ARTBA Committee) in the interest of information exchange, based on the combined technical expertise of the authors. As such, the opinions and conclusions implied or expressed herein do not necessarily reflect the official views or policies of the Joint Committee or its member organizations.

This report was approved for publication by the three member organizations comprising the Joint Committee, and was published on behalf of the Joint Committee by AASHTO.

All rights to this report are reserved to the Joint Committee. However, permission to make copies thereof can be obtained with the understanding that credit will be given to the Joint Committee. For permission to make copies write to AASHTO at the following address:

American Association of State Highway
and Transportation Officials
444 N. Capitol St. N.W., Suite 225
Washington, D.C. 20001

Fax (202) 624-5806

August, 1990

FOREWORD

These guide specifications were developed by a Joint Committee of the American Association of State Highway and Transportation Officials (AASHTO), The Associated General Contractors (AGC), and the American Road and Transportation Builders Association (ARTBA). The Joint Committee, AASHTO-AGC-ARTBA, formed Task Force 30 to address the need for guide specifications on proper design and construction of concrete overlays. This Task Force was divided into two subgroups, one to address pavement overlays (Roads Subgroup), and one to address bridge deck overlays (Bridge Subgroup).

PART I of the guide specifications addresses concrete overlays for pavements. **PART II** addresses concrete overlays for bridge decks. Each may be ordered separately depending on the user's preference.

The Task Force members of the Roads Subgroup and their affiliation are as follows:

Stan LaHue, *Chairman, American Concrete Pavement Association*
John Hallin, *Secretary, FHWA, Pavements Division*
Wade Betensen, *Utah Department of Transportation*
Bernie Brown, *Iowa Department of Transportation*
Bill Cape, *James Cape & Sons, Company*
Robert Chapin, *Chapin & Chapin, Inc.*
Ray Collins, *Koos Construction Company*
Leet E. Denton, *Denton Construction Company*
Don Detwiler, *New Enterprise Stone & Lime Company*
Edward Egan, *Allstate Paving, Inc.*
Dan Flowers, *Arkansas State Highway and Transportation Department*
Ray Forsyth, *California Department of Transportation*
Wade Gramblin, *Pennsylvania Department of Transportation*
Richard Hankins, *Oklahoma Department of Transportation*
Ed Hughes, *Hunt Contracting Company*
Mike Jaskaniec, *Wisconsin Department of Transportation*
John Jones, *Duit Construction Company*
Mike Lackey, *Kansas Department of Transportation*
Aramis Lopez, *FHWA, Pavements Division*
James Mays, *T.L. James Company*
Jim Mikaulanec, *Central Paving Corporation*
Earl Scyoc, *West Virginia Department of Highways*

TABLE OF CONTENTS

Foreword	I-i
Table of Contents	I-ii

Guide Specifications for Bonded Portland Cement Concrete Overlay

B.01 Introduction	I-1
B.02 Description	I-1
B.03 Material	I-1
B.03.1 Cement	I-1
B.03.2 Aggregate	I-1
B.03.3 Admixture	I-1
B.03.4 Water	I-1
B.03.5 Joint Filler	I-1
B.03.6 Reinforcing Steel	I-1
B.03.7 Curing Material	I-1
B.03.8 Grout	I-1
B.04 Equipment	I-2
B.04.1 Surface Removal Equipment	I-2
B.04.1.1 Cold Milling Equipment	I-2
B.04.1.2 Shotblasting Equipment	I-2
B.04.2 Secondary Cleaning Equipment	I-2
B.04.2.1 Sandblasting Equipment	I-2
B.04.2.2 High-Pressure Water with Abrasive Equipment	I-2
B.04.2.3 High-Pressure Waterblasting Equipment	I-2
B.04.3 Final Cleaning Equipment	I-2
B.04.4 Sawing Equipment	I-2
B.04.5 Batching and Mixing Equipment	I-2
B.04.6 Placing and Finishing Equipment	I-2
B.04.7 Grout Mixing Equipment	I-2
B.04.8 Vibration Equipment	I-3
B.05 Pre-Overlay Repair	I-3
B.05.1 Slab Stabilization	I-3
B.05.2 Full-Depth Repair	I-3
B.05.3 Partial-Depth Repair	I-3
B.05.4 Random Crack Treatment	I-3

B.05.5 Unsealed Joints	I-3
B.06 Surface Preparation (Removal and Cleaning)	I-3
B.06.1 Asphaltic Materials	I-3
B.06.2 Depth	I-3
B.06.3 Reinforcing Steel	I-3
B.06.4 Longitudinal Slab Edges	I-4
B.07 Placing and Finishing Overlay Concrete	I-4
B.07.1 Final Cleaning	I-4
B.07.2 Joint Identification	I-4
B.07.3 Bond Development	I-4
B.07.3.1 Grout Preparation and Use	I-5
B.07.3.2 Grout Application	I-5
B.07.4 Placement	I-5
B.07.5 Steel Reinforcement	I-5
B.07.6 Texturing	I-5
B.07.7 Curing	I-5
B.08 Joints	I-5
B.08.1 Transverse Joints	I-6
B.08.1.1 Design Thickness 4" or Less	I-6
B.08.1.2 Design Thickness >4"	I-6
B.08.2 Expansion and Pressure Relief Joints	I-6
B.08.3 Longitudinal Joints	I-6
B.09 Testing and Opening to Traffic	I-6
B.09.1 Slump	I-6
B.09.2 Percent Entrained Air	I-6
B.09.3 Bond Strength	I-6
B.09.4 Compressive Strength	I-6
B.09.5 Defective Concrete	I-6
B.09.6 Rideability	I-6
B.10 Method of Measurement	I-7
B.10.1 Bonded Overlay, Furnish Only	I-7
B.10.2 Bonded Overlay, Placement Only	I-7
B.10.3 Pre-overlay Repair	I-7
B.10.4 Surface Removal, Portland Cement Concrete Cold Milling	I-7
B.10.5 Surface Removal, Shotblasting	I-7
B.10.6 Secondary Cleaning (Sandblasting/Waterblasting/Waterblasting with Abrasive)	I-7
B.10.7 Reinforcing Steel	I-7
B.11 Basis of Payment	I-7
B.11.1 Bonded Overlay, Furnish Only	I-7
B.11.2 Bonded Overlay, Placement Only	I-7
B.11.3 Pre-overlay Repair	I-7
B.11.4 Surface Removal, Portland Cement Concrete Cold Milling	I-8

B.11.5 Surface Removal, Shotblasting	I-8
B.11.6 Secondary Cleaning (Sandblasting/Waterblasting)	I-8
B.11.7 Reinforcing Steel	I-8

Guide Specifications for Unbonded Portland Cement Concrete Overlay

U.01 Introduction	I-9
U.02 Description	I-9
U.03 Material	I-9
U.03.1 Cement	I-9
U.03.2 Aggregate	I-9
U.03.3 Admixture	I-9
U.03.4 Water	I-9
U.03.5 Joint Filler	I-9
U.03.6 Reinforcing Steel	I-9
U.03.7 Curing Material	I-9
U.03.8 Bituminous Materials	I-9
U.03.9 Lime	I-10
U.04 Equipment	I-10
U.04.1 Cold Milling Equipment	I-10
U.04.2 Sawing Equipment	I-10
U.04.3 Batching and Mixing Equipment	I-10
U.04.4 Placing and Finishing Equipment	I-10
U.04.5 Vibration Equipment	I-10
U.05 Pre-Overlay Repair	I-10
U.05.1 Joint Deterioration	I-10
U.05.2 Broken Slabs	I-10
U.05.3 Unstable Slabs	I-10
U.05.4 Blowups	I-10
U.06 Interlayer	I-11
U.06.1 High-Severity Faulting	I-11
U.06.2 Medium to Low-Severity Faulting	I-11
U.06.3 Faulting Not Present	I-11
U.07 Whitewash	I-11
U.07.1 Lime Slurry	I-11
U.07.2 Curing Compound	I-11
U.08 Placing and Finishing Overlay Concrete	I-11
U.08.1 Texturing	I-12
U.08.2 Curing	I-12
U.09 Joints	I-12
U.09.1 Transverse Joints	I-12
U.09.2 Longitudinal Joints	I-12

U.10 Testing and Opening to Traffic	I-12
U.10.1 Slump	I-12
U.10.2 Percent Entrained Air	I-12
U.10.3 Compressive Strength	I-13
U.10.4 Thickness	I-13
U.10.5 Defective Concrete	I-13
U.10.6 Rideability	I-13
U.11 Method of Measurement	I-13
U.11.1 Unbonded Overlay, Furnish Only	I-13
U.11.2 Unbonded Overlay, Placement Only	I-13
U.11.3 Pre-overlay Repair	I-13
U.11.4 Surface Removal, Portland Cement Concrete Cold Milling	I-13
U.11.5 Asphalt Concrete Hot-Mix Interlayer Material	I-13
U.11.6 Slurry Seal Interlayer Material	I-13
U.11.7 MC-250 Cutback Asphalt with Sand Interlayer Material	I-13
U.11.8 Reinforcing Steel	I-13
U.11.8.1 Plain Doweled	I-14
U.11.8.2 Mesh Reinforced	I-14
U.11.8.3 Continuously Reinforced	I-14
U.12 Basis of Payment	I-14
U.12.1 Unbonded Overlay, Furnish Only	I-14
U.12.2 Unbonded Overlay, Placement Only	I-14
U.12.3 Pre-overlay Repair	I-14
U.12.4 Surface Removal, Portland Cement Concrete Cold Milling	I-14
U.12.5 Asphalt Concrete Hot-Mix Interlayer Material	I-14
U.12.6 Slurry Seal Interlayer Material	I-14
U.12.7 MC-250 Cutback Asphalt with Sand Interlayer Material	I-14
U.12.8 Reinforcing Steel	I-14
U.12.8.1 Plain Doweled	I-15
U.12.8.2 Mesh Reinforced	I-15
U.12.8.3 Continuously Reinforced	I-15

Guide Specifications for Portland Cement Concrete Overlay over Existing Asphalt Concrete Pavement (Whitetopping)

W.01 Introduction	I-16
W.02 Description	I-16
W.03 Material	I-16
W.03.1 Cement	I-16
W.03.2 Aggregate	I-16
W.03.3 Admixture	I-16
W.03.4 Water	I-16

W.03.5 Joint Filler	I-16
W.03.6 Reinforcing Steel	I-16
W.03.7 Curing Material	I-16
W.03.8 Bituminous Materials	I-16
W.03.9 Lime	I-16
W.04 Equipment	I-17
W.04.1 Cold Milling Equipment	I-17
W.04.2 Sawing Equipment	I-17
W.04.3 Batching and Mixing Equipment	I-17
W.04.4 Placing and Finishing Equipment	I-17
W.04.5 Vibration Equipment	I-17
W.04.6 Hot-Mix Paving Equipment	I-17
W.05 Pre-Overlay Repair	I-17
W.05.1 Pothole	I-17
W.05.2 Deterioration	I-17
W.05.3 Rutting	I-17
W.06 Cross Slope/Grade Correction	I-17
W.07 Whitewash	I-17
W.07.1 Lime Slurry	I-18
W.07.2 Curing Compound	I-18
W.08 Placing and Finishing Overlay Concrete	I-18
W.08.1 Texturing	I-18
W.08.2 Curing	I-18
W.09 Joints	I-18
W.09.1 Transverse Joints	I-19
W.09.2 Longitudinal Joints	I-19
W.10 Testing and Opening to Traffic	I-19
W.10.1 Slump	I-19
W.10.2 Percent Entrained Air	I-19
W.10.3 Compressive Strength	I-19
W.10.4 Thickness	I-19
W.10.5 Defective Concrete	I-19
W.10.6 Rideability	I-19
W.11 Method of Measurement	I-19
W.11.1 PCC over AC Overlay, Furnish Only	I-19
W.11.2 PCC over AC Overlay, Placement Only	I-19
W.11.3 Pre-overlay Repair	I-20
W.11.4 Surface Removal, Portland Cement Concrete Cold Milling	I-20
W.11.5 Asphalt Concrete Leveling Course	I-20
W.11.6 Reinforcing Steel	I-20
W.11.6.1 Plain Doweled	I-20
W.11.6.2 Mesh Reinforced	I-20
W.11.6.3 Continuously Reinforced	I-20

W.12 Basis of Payment	I-20
W.12.1 PCC over AC Overlay, Furnish Only	I-20
W.12.2 PCC over AC Overlay, Placement Only	I-20
W.12.3 Pre-overlay Repair	I-20
W.12.4 Surface Removal, Portland Cement Concrete Cold Milling	I-20
W.12.5 Asphalt Concrete Leveling Course	I-21
W.12.6 Reinforcing Steel	I-21
W.12.6.1 Plain Doweled	I-21
W.12.6.2 Mesh Reinforced	I-21
W.12.6.3 Continuously Reinforced	I-21

**AASHTO-AGC-ARTBA
TASK FORCE #30
GUIDE SPECIFICATIONS
FOR
BONDED PORTLAND CEMENT CONCRETE OVERLAY**

B.01 INTRODUCTION. These guide specifications are recommended for use after they have been revised to reflect local conditions.

B.02 DESCRIPTION. This work consists of placement and bonding of a Portland Cement Concrete Overlay on an existing Portland Cement Concrete Pavement with or without reinforcement, in accordance with the details and locations shown on the plans. This work may also include associated patching, subdrainage and widening work.

B.03 MATERIAL. Materials shall conform to the following Standard Specifications:

B.03.1 Cement	AASHTO M-85	Portland Cement
B.03.2 Aggregate	AASHTO M-6 AASHTO M-80	Fine Aggregate Coarse Aggregate
B.03.3 Admixture	AASHTO M-194	Chemical Admixtures
B.03.4 Water	AASHTO T-26	
B.03.5 Joint Filler	AASHTO M-173 AASHTO M-282 AASHTO M-33, M-153 AASHTO M-213, M-220 Federal Specification	Hot-Poured Elastic Type Joint Sealer Hot-Poured Elastomeric Type Joint Sealer Preformed Joints Preformed Joints TT-S-1543 Class A: Silicone
B.03.6 Reinforcing Steel	AASHTO M-31 AASHTO M-42 AASHTO M-55 AASHTO M-225 AASHTO M-254 AASHTO M-284	Deformed & Plain Billet- Steel Bars Deformed & Plain Rail-Steel Bars Welded Steel Wire Fabric Deformed Steel Wire Corrosion Resistant Coated Dowel Bars Epoxy Coated Bars
B.03.7 Curing Material	AASHTO M-148	Liquid Membrane-Forming Compounds
B.03.8 Grout.	Grout for bonding new concrete to previously placed concrete shall be cement-water (neat cement) or another approved agent. The material shall meet all requirements of the contracting agency.	

B.04 EQUIPMENT. Equipment and tools necessary for handling materials and performing the work will be subject to approval by the Engineer. The equipment must be at the job site sufficiently ahead of the start of operations to be examined for approval.

B.04.1 Surface Removal Equipment shall be of the following type or suitable substitute, if the substitute can be demonstrated to the satisfaction of the Engineer.

B.04.1.1 Cold Milling Equipment shall be a power-operated, mechanical scarifier capable of uniformly scarifying or removing the old surface to specified depths and cross-section in a satisfactory manner. The contractor shall supply a means by which to collect and dispose of the dust and other particulate matter produced from this equipment.

B.04.1.2 Shotblasting Equipment shall be designed for this use and it shall propel steel shot against the pavement surface. The equipment must contain a means for collection of used shot so that it may be recycled. The contractor shall provide a means of collecting and disposing of dust and other particulate matter produced from this procedure.

B.04.2 Secondary Cleaning Equipment shall be at least one of the following type, and shall be used following cold-milling surface removal procedures:

B.04.2.1 Sandblasting Equipment shall be capable of loosening and removing all particulate matter from the surface of the pavement after "surface removal" procedures, and should have dust control devices where required.

B.04.2.2 High-Pressure Water with Abrasive Equipment shall have capability of blasting water with sand or other abrasives. This equipment shall be capable of removing all particulate matter and surface contaminants.

B.04.2.3 High-Pressure Waterblasting Equipment shall be capable of producing pressure in excess of 6000 psi and shall have the capability of cleaning the surface free of oil, dirt, paints, and other contaminants.

B.04.3 Final Cleaning Equipment shall be capable of removing dust and other particulate matter just ahead of paving operations. Airblowing equipment, mechanical sweepers or a second pass with shotblasting equipment can be used for this purpose. This procedure shall follow "Secondary Cleaning" where cold-milling is used in the "Surface Removal" procedure, or shall follow "Surface Removal" where shotblasting equipment is employed.

B.04.4 Sawing Equipment shall be capable of sawing concrete to the required depth.

B.04.5 Batching and Mixing Equipment shall meet the requirements of the contracting agency. Sufficient mixing capacity shall be provided to permit the intended pour to be placed without interruption.

B.04.6 Placing and Finishing Equipment shall meet the requirements of the contracting agency. The contractor shall construct the pavement in a manner and with a system that will provide a smooth riding surface.

B.04.7 Grout Mixing Equipment shall meet the requirements of the contracting agency. At the contractor's option, grout mixing equipment shall be of the following type: small paddle mixers on the project site, or a colloidal-mixing machine. The colloidal mixing machine shall operate at a minimum speed of 800 rpm and a maximum speed of 2000 rpm.

B.04.8 Vibration Equipment shall be used on all mechanical placement equipment. The number and frequency of vibration shall be as specified by the contracting agency. Hand vibration equipment shall be used on all handwork.

B.05 PRE-OVERLAY REPAIR. Pre-Overlay repair shall consist of all the repair procedures required to bring the pavement to a condition suitable for overlay. The standard specifications for patching and repair procedures of the contracting agency shall apply, except where modified under this specification and by approval of the Engineer. Material removed during pre-overlay repair shall be disposed of by the contractor in an appropriate place on the job-site or removed at his expense. This work shall be completed prior to commencement of surface removal and surface cleaning work.

B.05.1 Slab Stabilization shall be performed to fill voids detected during the condition survey and indicated on the plans. This procedure where required shall precede all other pre-overlay repair procedures.

B.05.2 Full-Depth Repair shall consist of removal and replacement of the existing concrete pavement full-depth at the locations specified on the plans and as determined by the Engineer.

B.05.3 Partial-Depth Repair shall consist of the removal of all loose and unsound concrete material. Where the depth of removal is less than 2", the area removed shall be filled during the paving operation. Where the partial-depth removal exceeds 2", the contractor shall fill the area with an approved material prior to placing the overlay. All areas requiring partial-depth removal shall be determined by the engineer and marked on the pavement prior to commencement of pre-overlay repair procedures.

B.05.4 Random Crack Treatment. Where random cracks have been determined by the Engineer to be working cracks and require treatment to prevent movement, these cracks may be addressed with full-depth repairs as outlined in section B.05.2 of this specification, or by placement of steel reinforcement above the crack. Where reinforcement bars are used, Cold Milling shall be employed over the crack to a minimum depth of 2". Tiebars shall be placed and fastened within the milled area above the crack, in accordance with the details.

B.05.5 Unsealed Joints. Existing pavement joints must be sealed to keep the bonding agent, overlay concrete and other incompressibles from penetrating the unsealed joint reservoirs and causing compressive stress problems upon thermal expansion.

B.06 SURFACE PREPARATION (REMOVAL AND CLEANING). Surface preparation shall include the entire surface to be overlaid. Material removed in the surface preparation operations shall be disposed of in an appropriate place on the job-site, or removed by the contractor at his expense.

B.06.1 Asphaltic Materials on the existing pavement, including maintenance overlays, patches and joint sealant, shall be removed. Removal may be by cold-milling or other equipment demonstrated to and approved by the Engineer.

B.06.2 Depth. The existing surface shall be removed with appropriate removal equipment. Removal by cold-milling or scarification shall be to a depth of 1/4 inch or as directed by the Engineer. Removal by shotblasting shall be to a depth of 1/8" or as directed by the Engineer. In either case, the removal and cleaning procedures shall be to such an extent as to remove all dirt, oil and other foreign materials, as well as any laitence or loose material, from the surface.

B.06.3 Reinforcing Steel Encountered during cold milling for surface removal or transition sections, where extruding, shall be cut free so that it does not interfere with further removal

procedures or concrete placement operations. To avoid further disruption through contact with reinforcement steel, the contractor shall adjust his equipment in accordance with the recommendations of the Engineer.

B.06.4 Longitudinal Slab Edges against which new concrete is to be placed shall be cleaned by sandblasting. This specifically includes any longitudinal lane edge where adjacent lanes are paved separately.

B.07 PLACING AND FINISHING OVERLAY CONCRETE. The contractor shall take every reasonable precaution to secure a smooth-riding surface. Prior to placement operations, he shall review his equipment, procedures, personnel, and previous results with the Engineer, and the inspection procedures will be reviewed to assure coordination. Precautions shall include the following:

- A. Assurance should be made that concrete can be produced and placed within the specified limits, continuously and with uniformity.
- B. The proper thickness and cross section, as shown on the plans shall be maintained. Should problems arise in obtaining the minimum design thickness due to surface irregularities or crown, the contractor shall either: remove irregularities with cold-milling equipment or adjust placement equipment. In either case the contractor must ensure that the minimum design thickness requirement is met across the entire paving width.
- C. The contractor shall advise the Engineer of the procedure being used to mark and relocate the existing joints, so that overlay joints are sawed in the appropriate locations.

The concrete shall be placed, on grade without segregation of the material and with approved equipment, to the grade line established by the Engineer. The concrete to be used shall be as directed or approved by the contracting agency. This operation shall include all items to place, finish, texture, cure, saw and seal the bonded concrete overlay.

The standard specifications of the contracting agency for PORTLAND CEMENT CONCRETE PAVEMENT apply with the following modifications:

- B.07.1 Final Cleaning.** Prior to placement of the overlay concrete, the entire surface and edges to be overlaid shall be cleaned with airblowing or other approved equipment. No airblowing is needed on a surface properly cleaned using shotblasting equipment, except as a cautionary measure when danger of contamination exists between the shotblasting operation and paving operations. After this cleaning, no traffic will be permitted on the cleared surface except that necessary for overlay construction. It is not intended or desired that the existing concrete, prepared for resurfacing, be pre-saturated before the new concrete is placed. The prepared surface shall be dry to allow some absorption of the fresh concrete mixture or bonding grout, where used.
- B.07.2 Joint Identification.** The exact location of each transverse contraction, longitudinal and transverse expansion joint in the existing pavement, including the joints in each full-depth patch, shall be identified on both sides of the pavement by a reliable method.
- B.07.3 Bond Development.** The method used to obtain a good bonding between the overlay and existing pavement shall be based on recommendations of the contracting agency. If testing can show that adequate bond strength (minimum 200 psi) can be achieved without applying a bonding agent prior to overlay placement, grouting may be eliminated. Where the no grout

option is employed, the contractor shall use extra caution in maintaining a clean and dry surface ahead of the paving operation.

Where grouting is specified, the procedures outlined in this specification shall apply.

B.07.3.1 Grout Preparation & Use. Grout shall be prepared with Portland cement and water, using a water:cement ratio not to exceed 0.62 (7 gallons of water per bag of cement). The grout shall be agitated prior to and during use and the cement-to-water contact time shall not exceed 90 minutes before it is placed.

B.07.3.2 Grout Application. After the pavement surfaces have been prepared and cleaned, and immediately before placing the overlay concrete, a thin coat of the bonding grout shall be applied to the dry pavement surface. Application can be through brooming, squeegeing, or pressure spraying. Pressure spraying equipment for application of the grout is subject to the approval of the Engineer. When brooming or squeegeing, grout shall be scrubbed into the surface. Regardless of application method, the entire surface shall receive a thorough, even coating and excess grout shall not be permitted to collect in pockets. The rate of progress in applying grout shall be limited so that the grout does not become dry before it is covered with new concrete. During delays in the paving operations, should the surface of the grout indicate any drying, additional grout shall be applied as directed by the Engineer. In areas where the grout becomes thoroughly dried, the dried grout shall be removed and fresh grout applied. Removal shall be by sandblasting or another procedure approved by the Engineer.

B.07.4 Placement. The concrete shall be placed full-depth and to the specified width, so as to provide for the thickness and cross section shown on the plans. Placement is to include both the widening, if required, and the filling of depressed areas at partial-depth patches.

B.07.5 Steel Reinforcement. Where steel reinforcement is placed for random crack control, the reinforcement shall be properly supported and held in place to assure a minimum cover of 2" below the finished surface of the overlay. The time of placement of the reinforcement units shall be such that it does not interfere with paving operations. Where the prepared surface is not required for placement and distribution of concrete ahead of the paving operation, the reinforcement can be placed well ahead of the grouting operation. Where the prepared surface is required for placement of concrete, reinforcement must be placed in conjunction with the grouting operation. In this case, the grout shall be applied to the recessed area prior to the placement and fastening of the rebar units.

B.07.6 Texturing. When a tight uniform surface has been achieved, the surface shall be textured using a burlap drag, an artificial turf drag and transverse tining. The standard recommendations of the contracting agency should be applied.

B.07.7 Curing. Immediately after the surface has been textured, the concrete shall be cured using a white-pigmented curing compound, applied at the rate of one gallon per 100 sq. ft. The curing compound shall be applied to the surface and exposed edges in such a manner that the material does not run or puddle. The compound should not be sprayed onto the prepared surface for an adjacent lane to be paved. Any curing compound found on a prepared surface, resulting from direct spray, overspray or otherwise, shall be removed by sandblasting prior to placement of the overlay or bonding grout over that surface.

B.08 JOINTS. All joints shall be sawed, cleaned, and sealed in accordance with the details as shown on the plans.

B.08.1 Transverse joints shall be sawed in the resurfacing directly over existing joints and joints formed by full-depth repairs made during pre-overlay repair procedures and previous maintenance activities. All transverse joints shall be sawed as soon as possible without causing excessive raveling. The depth of sawing to be used by the contractor is subject to the design thickness of the overlay concrete.

B.08.1.1 Design thickness 4" or less. The contractor shall maintain a depth of saw cut $1/2$ " greater than the design thickness of the overlay concrete as shown on the plans, including depressions created in the existing surface.

B.08.1.1 Thickness greater than 4". Where the design overlay thickness exceeds 4", joints shall be sawed no less than $1/3$ the overlay thickness.

B.08.2 Expansion & Pressure relief joints in the existing pavement shall be specially marked. The expansion joint shall be pre-cut in the plastic concrete, to allow for any slab movement until sawing can be started. As soon as sawing is possible, the contractor shall saw two full-depth cuts on each side of the pre-cut joint that follow the edges of the underlying expansion joint, as shown on the details. The concrete between the sawcuts shall be removed by the contractor and disposed of in an appropriate place on the job site.

B.08.3 Longitudinal joints shall be sawed to a depth of $1/2$ the design overlay thickness as shown on the plans, and shall be cut directly above the existing joint.

B.09 TESTING AND OPENING TO TRAFFIC. The following procedures will be used.

B.09.1 Slump. The slump of concrete, tested at time of placement, measured in accordance with AASHTO T 119, shall not exceed 2 $1/2$ inches.

B.09.2 Percent Entrained Air. The entrained air content of the fresh, unvibrated concrete, at the time of placement, as determined by AASHTO T152, shall be 6 $1/2$ percent, plus or minus 1 $1/2$ percent.

B.09.3 Bond Strength. The bond strength at the interface between old and new concrete shall be tested in accordance with "Method of Test for Determining the Shear Strength of Bonded Concrete." Test Method No. Iowa 406, June, 1978, as developed by the Office of Materials, Iowa Department of Transportation. A minimum value of 200 psi is recommended.

B.09.4 Compressive Strength. The pavements shall not be opened to traffic until cylinder test specimens of the overlay concrete have attained a compressive strength of 3000 psi. The joints must be cleaned and filled with joint material prior to opening to traffic. Concrete compressive cylinders are to be tested in accordance with ASTM C 39.

B.09.5 Defective Concrete. Any concrete which does not meet the aforementioned requirements of this specification or which exhibits excessive cracking, delamination and distress shall be removed and replaced by the contractor at the direction of the contracting agency.

B.09.6 Rideability. The profile index of the overlay surface shall be tested according to the procedures, and shall meet the requirements of the contracting agency for new concrete pavement construction.

NOTE: The contracting agency should make allowances for unusual conditions, such as: meeting existing grades, profiles, road classifications, and poor track line, etc.

B.10 METHOD OF MEASUREMENT The quantity of the various work items involved in the construction of Portland cement concrete bonded overlay will be measured by the engineer in accordance with the following provisions:

- B.10.1 Bonded Overlay, Furnish Only.** The amount of overlay concrete and miscellaneous concrete per type of mix design and admixture specified, shall be measured in cubic yards, using the count of batches incorporated.
- B.10.2 Bonded Overlay, Placement Only.** The area of portland cement concrete overlay, placement only, shall be computed in square yards from the surface measured longitudinally and the nominal plan width. Irregular areas shall be measured separately in square yards.
- B.10.3 Pre-overlay Repair.** The quantities for pre-overlay repair techniques, including: full-depth repair and slab stabilization, shall be measured in accordance to the standard specifications of the agency for this type of work.
- B.10.4 Surface Removal, Portland Cement Concrete Cold Milling.** The areas of cold milling removal shall be computed in square yards from measurements of the locations as per depth class.
- B.10.5 Surface Removal, Shotblasting.** The amount of pavement surface prepared using this equipment, in accordance with the Specifications and under direction by the engineer, shall be measured in square yards from surface measure.
- B.10.6 Secondary Cleaning. (Sandblasting/Waterblasting/Waterblasting with Abrasive).** The amount of pavement surface cleaned, in accordance with the Specifications and under direction by the engineer, shall be in square yards from surface measurements.
- B.10.7 Reinforcing Steel.** The amount of reinforcing steel placed shall be computed by measurement of bar length placed and size and computed in pounds.

B.11 BASIS OF PAYMENT Payment for all items included under this specification shall conform to the following:

- B.11.1 Bonded Overlay, Furnish Only.** For the number of cubic yards of portland cement concrete incorporated, payment will be made at the contract price per cubic yard per class.

This will be full compensation for furnishing all raw materials, and for proportioning, mixing and delivery of concrete to the paving machine.

- B.11.2 Bonded Overlay, Placement Only.** For the number of square yards of portland cement concrete bonded overlay, constructed, (placement only), the contractor will be paid the contract price per square yard. This will be full compensation for furnishing all labor, equipment, and materials to place, finish, texture, and cure the concrete, including the placement of grout and sawing and sealing the joints, in accordance with the plans and specifications.

The partial depth repair quantities will not be measured separately, but are included in this item.

- B.11.3 Pre-overlay Repair.** Payment for pre-overlay repair items, including: full-depth repair and slab stabilization, shall be in accordance to the standard specifications of the agency for this type of work.

- B.11.4 Surface Removal, Portland Cement Concrete Cold Milling.** For the square yards of pavement scarified to remove asphalt overlay and concrete, in accordance with the details of the contract, the contractor will be paid the contract price per square yard. This will be full compensation for removal and disposal of material.
- B.11.5 Surface Removal, Shotblasting.** For the number of square yards of pavement cleaned by shotblasting the contractor will be paid the contract price per square yard. This will be full compensation for preparation of existing pavement, furnishing labor and equipment, and cleaning debris from pavement as caused by the operation.
- B.11.6 Secondary Cleaning. (Sandblasting/Waterblasting).** For the number of square yards of pavement cleaned by sandblasting, or waterblasting the contractor will be paid the contract price per square yard. This will be full compensation for preparation of existing pavement, stockpiling material, furnishing labor and equipment, providing dust control, if required, and cleaning debris from pavement as caused by the operation.
- Should the quantities vary by more than 25 percent of the project estimate, the contract unit price will be adjusted by mutual agreement of the contracting agency and the contractor.
- B.11.7 Reinforcing Steel.** For the number of pounds of reinforcing steel incorporated into the project, the contractor will be paid the contract price per pound. This will be full compensation for providing and properly placing the required steel as shown on plans and details.

**AASHTO-AGC-ARTBA
TASK FORCE #30
GUIDE SPECIFICATIONS
FOR
UNBONDED PORTLAND CEMENT CONCRETE OVERLAY**

U.01 INTRODUCTION. These guide specifications are recommended for use after they have been revised to reflect local conditions. **Portland Cement Concrete Standard Specifications shall be used with the following modifications and/or recommendations.**

U.02 DESCRIPTION. This work consists of placement of a separation interlayer and Portland Cement Concrete Overlay on an existing Portland Cement Concrete Pavement with or without reinforcement, in accordance with the details and locations shown on the plans. This work may also include associated patching, subdrainage and widening work.

U.03 MATERIAL. Materials shall conform to the following Standard Specifications:

U.03.1 Cement	AASHTO M-85	Portland Cement
U.03.2 Aggregate	AASHTO M-6 AASHTO M-80	Fine Aggregate Coarse Aggregate
U.03.3 Admixture	AASHTO M-194	Chemical Admixtures
U.03.4 Water	AASHTO T-26	
U.03.5 Joint Filler	AASHTO M-173 AASHTO M-282 AASHTO M-33, M-153 AASHTO M-213, M-220 Federal Specification	Hot-Poured Elastic Type Joint Sealer Hot-Poured Elastomeric Type Joint Sealer Preformed Joints Preformed Joints TT-S-1543 Class A: Silicone
U.03.6 Reinforcing Steel	AASHTO M-31 AASHTO M-42 AASHTO M-55 AASHTO M-225 AASHTO M-254 AASHTO M-284	Deformed & Plain Billet- Steel Bars Deformed & Plain Rail-Steel Bars Welded Steel Wire Fabric Deformed Steel Wire Corrosion Resistant Coated Dowel Bars Epoxy Coated Bars
U.03.7 Curing Material	AASHTO M-148	Liquid Membrane-Forming Compounds

U.03.8 Bituminous Materials: Bituminous materials used for interlayer treatment or patching, shall meet the standard requirements of the specifying agency for these materials. Hot-mix asphalt materials used for the interlayer shall meet the mix design specifications of the specifying agency and can employ conventionally graded aggregates with a maximum aggregate size depending on minimum thickness of the layer. A slurry seal, which meets the requirements of the specifying agency, may also be used. Where allowed, an asphalt with

sand cover may be specified, and shall be an MC-250 meeting the requirements of AASHTO M-82.

U.03.9 Lime

Whitewash

U.04 EQUIPMENT. Equipment and tools necessary for handling materials and performing the work shall conform to state specifications, and shall be subject to approval by the Engineer.

U.04.1 Cold Milling Equipment shall be a power-operated, mechanical scarifier capable of uniformly scarifying or removing the old surface to depths as required in a satisfactory manner. The contractor shall supply a means by which to collect and dispose of the dust and other particulate matter produced from this equipment.

U.04.2 Sawing Equipment shall be capable of sawing concrete to the required depth.

U.04.3 Batching and Mixing Equipment shall meet the requirements of the specifying agency. Sufficient mixing capacity shall be provided to permit the intended pour to be placed without interruption.

U.04.4 Placing and Finishing Equipment shall meet the requirements of the specifying agency. The contractor shall construct the pavement in a manner and with a system that will provide a smooth riding surface.

U.04.5 Vibration Equipment shall be used on all mechanical placement equipment. The number and frequency of vibration shall be as specified by the specifying agency. Hand vibration equipment shall be used on all handwork.

U.04.6 Interlayer Placement Equipment shall conform to the standard specifications and be capable of applying the material to the specified quantities.

U.05 PRE-OVERLAY REPAIR. When applying an unbonded overlay, serious deterioration in the existing pavement must be repaired or stabilized to prevent further deterioration after overlay placement.

The following distress should be addressed when an unbonded overlay is to be placed:

U.05.1 Joint Deterioration. Where there is high severity spalling, D-Cracking, and delamination at the surface of the existing pavement joints, loose material should be removed and the deteriorated area then filled and compacted with an asphalt concrete mix. If during removal it is determined that the deterioration extends through the slab, the area should be removed and replaced full-depth with concrete.

U.05.2 Broken Slabs. In areas where slabs are shattered, are pumping, and have lost significant load transfer, the pavement should be replaced full-depth. However, if the broken slab is supported well, no repair is necessary.

U.05.3 Unstable Slabs. Where slabs are rocking and voids have been detected, they must be stabilized through undersealing.

U.05.4 Blowups. Blowups that might occur during construction due to excessive heat retention by the separation interlayer should be repaired full-depth with concrete.

U.06 INTERLAYER. The new pavement shall be separated from the existing pavement by means of a separation interlayer of the material as specified on the plans. The type and thickness of the separation interlayer will depend on the condition of the existing slabs. More deteriorated slabs require thicker layers. Selection of the interlayer material must also consider the need to eliminate vertical offsets (faulting) in the existing pavement which may restrict free movement of the overlay. The following guidelines shall apply:

U.06.1 High-Severity Faulting. Where joint and crack faulting is critical (greater than 0.25"), spalling is evident, and slabs are highly deteriorated, an asphalt concrete layer shall be constructed to a minimum thickness of one inch.

U.06.2 Medium to Low-Severity Faulting. Where faulting and deterioration are not as severe, a thinner AC layer, 1/2" minimum, or a slurry seal material 1/8" nominal thickness, can be used. This layer must be able to cover the present deterioration and prevent it from reaching the overlay slab.

U.06.3 Faulting not present. Where joint and crack faulting is not existent or insignificant, a slurry seal material 1/8" nominal thickness, or an asphalt with sand cover may be specified. Where an asphalt with sand cover is used, the asphalt (MC-250) shall be applied at the rate of 0.25 gallons per square yard and shall be covered with sand in an amount sufficient to prevent tracking by construction traffic.

U.07 WHITEWASH. When the temperature of the paving surface is expected to exceed 110° F, a whitewash consisting of lime slurry mix or white pigmented curing compound shall be used over the surface of an asphalt concrete separation layer. Where placement of reinforcement or dowel baskets is required prior to paving operations for Continuously Reinforced or Jointed pavements, the whitewash shall be applied at least one day prior to installation of the reinforcement. Where placement of reinforcement is not required prior to paving operations, the whitewash shall be applied at least one day before new concrete may be placed to allow for the paving surface to cool. A second application of whitewash may be required ahead of paving to ensure uniform coverage, if the coloring has been severely faded by rain, or a majority of the surface area has been worn off by construction vehicles. Some tracking by construction traffic is not detrimental. Where a second coat is applied, CAUTION should be maintained to avoid contact of the whitewash with reinforcement.

U.07.1 Lime Slurry. The lime slurry mixture shall consist of hydrated lime and water. The proportions used in the whitewash mixture and the rate of application shall be such that a uniform color, not darker than uncoated concrete after curing, will be produced on the surface.

U.07.2 Curing Compound. Curing compound for use as a whitewash shall be wax-based and conform to AASHTO specification M-148 (type 2). The compound shall be applied to the area to be surfaced with PCCP at a rate of one gallon per 200 square feet.

U.08 PLACING AND FINISHING OVERLAY CONCRETE. The contractor shall take every reasonable precaution to secure a smooth-riding surface. Prior to placement operations, he shall review his equipment, procedures, personnel, and previous results with the Engineer, and the inspection procedures will be reviewed to assure coordination. Precautions shall include the following:

- A. Assurance should be made that concrete can be produced and placed within the specified limits, continuously and with uniformity.
- B. The proper thickness and cross section, as shown on the plans shall be maintained. Should problems arise in obtaining the minimum design thickness due to surface irregularities or crown, the contractor shall either: remove irregularities with cold-milling equipment or

adjust placement equipment. In either case the contractor must ensure that the minimum design thickness requirement is met across the entire paving width.

The concrete shall be placed, on grade without segregation of the material and with approved equipment, to the grade line established by the Engineer. The concrete to be used shall be as directed or approved by the contracting agency. This operation shall include all items to place, finish, texture, cure, saw and seal the unbonded concrete overlay.

The standard specifications of the specifying agency for JOINTED PORTLAND CEMENT CONCRETE PAVEMENT or CONTINUOUSLY REINFORCED CONCRETE PAVEMENT apply with the following modifications:

U.08.1 Texturing. When a tight uniform surface has been achieved, the surface shall be textured using transverse tining, preceded by a burlap drag or an artificial turf drag. The standard recommendations of the contracting agency should be applied.

U.08.2 Curing. Immediately after the surface has been textured, the concrete shall be cured using a white-pigmented curing compound, applied at the standard rate. The curing compound shall be applied to the surface and exposed edges in such a manner that the material does not run or puddle.

U.09 JOINTS. All joints shall be sawed, cleaned, and sealed in accordance with the recommendations for the sealer specified prior to opening to traffic.

Matching of transverse joints in the unbonded overlays with the joints in the existing pavement is not recommended. The placement of joints in the overlay should be mismatched from existing joints and working cracks by at least three feet where possible.

U.09.1 Transverse joints shall be sawed in the resurfacing as soon as possible without causing excessive raveling.

The depth of sawing to be used by the contractor shall be no less than 1/3 the nominal minimum thickness as shown on the plans. At locations where the surface thickness varies greater than 1" over the nominal thickness, special attention should be given to the depth of sawing used.

In areas where the pavement is greater than the nominal thickness due to grade corrections etc., and dowel bar insertion is used on slipform paving equipment, the depth of sawing shall not be greater than the depth of reinforcement, minus 1/2" plus the dowel bar radius.

U.09.2 Longitudinal joints shall be sawed to a depth of 1/3 the design overlay thickness as shown on the plans, and shall be cut parallel to the finished edge of the concrete pavement.

U.10 TESTING AND OPENING TO TRAFFIC. The following procedures will be used.

U.10.1 Slump. The slump of concrete, tested at time of placement, measured in accordance with AASHTO T 119, shall not exceed 3 inches for concrete placed by vibration or 4 inches for concrete placed by hand.

U.10.2 Percent Entrained Air. The entrained air content of the fresh, unvibrated concrete, at the time of placement, as determined by AASHTO T152, shall be 6 1/2 percent, plus or minus 1 1/2 percent.

- U.10.3 Compressive Strength.** The pavements shall not be opened to traffic until cylinder test specimens of the overlay concrete has attained a compressive strength of 3000 psi. The joints must be cleaned and filled with joint material prior to opening to traffic. Concrete compressive cylinders are to be tested in accordance with ASTM C 39.
- U.10.4 Thickness.** The thickness of the concrete overlay shall be as determined by the contracting agency and shall meet the gradeline as established by the Engineer.
- U.10.5 Defective Concrete.** Any concrete which does not meet the aforementioned requirements of this specification shall be removed and replaced by the contractor at the direction of the contracting agency.
- U.10.6 Rideability.** The profile index of the overlay surface shall be tested according to the procedures, and shall meet the requirements of the contracting agency for new concrete pavement construction. Consideration must be given by the contracting agency to insure the contractor will be operating on an adequate track line.

U.11 METHOD OF MEASUREMENT The quantity of the various work items involved in the construction of Portland cement concrete unbonded overlay will be measured by the engineer in accordance with the following provisions:

- U.11.1 Unbonded Overlay, Furnish Only.** The amount of overlay concrete and miscellaneous concrete per type of mix design and admixture specified, shall be measured in cubic yards, using the count of batches incorporated.
- U.11.2 Unbonded Overlay, Placement Only.** The area of portland cement concrete overlay, placement only, shall be computed in square yards from the surface measured longitudinally and the nominal plan width. Irregular areas shall be measured separately in square yards.
- U.11.3 Pre-overlay Repair.** The quantities for pre-overlay repair techniques, including: full-depth repair and slab stabilization, shall be measured in accordance to the standard specifications of the agency for this type of work.
- U.11.4 Surface Removal, Portland Cement Concrete Cold Milling.** The areas of cold milling removal shall be computed in square yards from measurements of the locations as per depth class.
- U.11.5 Asphalt Concrete Hot-Mix Interlayer Material.** For the asphalt concrete hot-mix material laid to provide the separation interlayer, measurement shall be made in the number of tons of material placed in accordance with the specifications.
- U.11.6 Slurry Seal Interlayer Material.** Slurry seal material quantities shall be computed in square yards from the surface measured longitudinally and the nominal plan width. Irregular areas shall be measured separately in square yards.
- U.11.7 MC-250 Cutback Asphalt with Sand Interlayer Material.** The MC-250 Cutback asphalt with sand cover material quantities shall be computed in square yards from the surface measured longitudinally and the nominal plan width. Irregular areas shall be measured separately in square yards. This includes quantities for the sand cover.
- U.11.8 Reinforcing Steel.** The method of measurement of reinforcing steel is dependant on the type of overlay pavement placed.

U.11.8.1 Plain Doweled. The dowel bars placed in conjunction with a jointed-plain concrete pavement shall not be measured separately.

U.11.8.2 Mesh Reinforced. The mesh reinforcing steel or dowels placed in conjunction with a jointed reinforced concrete pavement shall not be measured separately.

U.11.8.3 Continuously Reinforced. The amount of reinforcing steel placed in conjunction with a continuously reinforced concrete pavement shall be computed by measurement of the square yards of concrete resurfacing specified or required to be reinforced with no allowances for necessary laps and splices.

U.12 BASIS OF PAYMENT Payment for all items included under this specification shall conform to the following:

U.12.1 Unbonded Overlay, Furnish Only. For the number of cubic yards of Portland cement concrete incorporated, payment will be made at the contract price per cubic yard per class.

This will be full compensation for furnishing all raw materials, and for proportioning, mixing and delivery of concrete to the paving machine.

U.12.2 Unbonded Overlay, Placement Only. For the number of square yards of Portland cement concrete unbonded overlay, constructed, (placement only), the contractor will be paid the contract price per square yard. This will be full compensation for furnishing all labor, equipment, and materials to place, finish, texture, and cure the concrete, including the placement of grout and sawing and sealing the joints, in accordance with the plans and specifications.

The reinforcement quantities for plain-doweled and mesh reinforced-doweled overlay pavements, are included in the cost of this item.

U.12.3 Pre-overlay Repair. Payment for pre-overlay repair items, including: full-depth repair and slab stabilization, shall be in accordance to the standard specifications of the agency for this type of work.

U.12.4 Surface Removal, Portland Cement Concrete Cold Milling. For the square yards of pavement scarified in accordance with the details of the contract, the contractor will be paid the contract price per square yard. This will be full compensation for removal and disposal of material.

U.12.5 Asphalt Concrete Hot-Mix Interlayer Material. For the number of tons of asphalt concrete hot-mix material laid to provide the separation interlayer, the contractor shall be paid the contract unit price per ton.

U.12.6 Slurry Seal Interlayer Material. For the number of square yards of slurry seal material used to provide the separation interlayer, the contractor shall be paid the contract unit price per square yard.

U.12.7 MC-250 Cutback Asphalt with Sand Interlayer Material. For the number of square yards of MC-250 Cutback asphalt with sand cover material used to provide the separation interlayer, the contractor shall be paid the contract unit price per square yard.

U.12.8 Reinforcing Steel. The basis of payment for reinforcing steel is dependant on the type of overlay pavement placed.

- U.12.8.1 Plain Doweled.** Payment for dowel bars placed in conjunction with a jointed-plain concrete pavement is incidental to the cost of Unbonded Overlay, Placement Only.
- U.12.8.2 Mesh Reinforced.** Payment for mesh reinforcing steel or dowels placed in conjunction with a jointed reinforced concrete pavement is incidental to the cost of Unbonded Overlay, Placement Only.
- U.12.8.3 Continuously Reinforced.** Payment for reinforcing steel placed in conjunction with a continuously reinforced concrete overlay shall be for the number of square yards of concrete resurfacing placed at the contract unit price per square yard. This will be full compensation for providing and properly placing the required steel as shown on plans and details.

**AASHTO-AGC-ARTBA
TASK FORCE #30
GUIDE SPECIFICATIONS FOR
PORTLAND CEMENT CONCRETE OVERLAY
OVER EXISTING ASPHALT CONCRETE PAVEMENT
(WHITETOPPING)**

W.01 INTRODUCTION. These guide specifications are recommended for use after they have been revised to reflect local conditions. **Portland Cement Concrete Standard Specifications shall be used** with the following modifications and/or recommendations.

W.02 DESCRIPTION. This work consists of placement of a Portland Cement Concrete Overlay on an existing Asphaltic Concrete Pavement, in accordance with the details and locations shown on the plans. This work may also include associated patching, subdrainage and widening work.

W.03 MATERIAL. Materials shall conform to the following Standard Specifications:

W.03.1 Cement	AASHTO M-85	Portland Cement
W.03.2 Aggregate	AASHTO M-6 AASHTO M-80	Fine Aggregate Coarse Aggregate
W.03.3 Admixture	AASHTO M-194	Chemical Admixtures
W.03.4 Water	AASHTO T-26	
W.03.5 Joint Filler	AASHTO M-173 AASHTO M-282 AASHTO M-33, M-153 AASHTO M-213, M-220 Federal Specification	Hot-Poured Elastic Type Joint Sealer Hot-Poured Elastomeric Type Joint Sealer Preformed Joints Preformed Joints TT-S-1543 Class A: Silicone
W.03.6 Reinforcing Steel	AASHTO M-31 AASHTO M-42 AASHTO M-55 AASHTO M-225 AASHTO M-254 AASHTO M-284	Deformed & Plain Billet- Steel Bars Deformed & Plain Rail-Steel Bars Welded Steel Wire Fabric Deformed Steel Wire Corrosion Resistant Coated Dowel Bars Epoxy Coated Bars
W.03.7 Curing Material	AASHTO M-148	Liquid Membrane-Forming Compounds
W.03.8 Bituminous Materials:	Bituminous hot-mix materials used for a leveling course, shall meet the standard requirements of the contracting agency for these materials. This includes the mix design specifications.	
W.03.9 Lime		Whitewash

W.04 EQUIPMENT. Equipment and tools necessary for handling materials and performing the work shall conform to state specifications, and shall be subject to approval by the Engineer.

W.04.1 Cold Milling Equipment shall be a power-operated, mechanical scarifier capable of uniformly scarifying or removing the old surface to depths as required in a satisfactory manner. The contractor shall supply a means by which to collect and dispose of the dust and other particulate matter produced from this equipment.

W.04.2 Sawing Equipment shall be capable of sawing concrete to the required depth.

W.04.3 Batching and Mixing Equipment shall meet the requirements of the contracting agency. Sufficient mixing capacity shall be provided to permit the intended pour to be placed without interruption.

W.04.4 Placing and Finishing Equipment shall meet the requirements of the contracting agency. The contractor shall construct the pavement in a manner and with a system that will provide a smooth riding surface.

W.04.5 Vibration Equipment shall be used on all mechanical placement equipment. The number and frequency of vibration shall be as specified by the contracting agency. Hand vibration equipment shall be used on all handwork.

W.04.6 Hot-Mix Paving Equipment shall conform to the standard specifications and be capable of applying the material to the specified quantities and parameters.

W.05 PRE-OVERLAY REPAIR. When applying an Portland Cement Concrete overlay over Asphalt Concrete Pavement, usually some pre-overlay repair is necessary.

The following distresses should be addressed prior to placing a Portland Cement Overlay over an asphalt pavement:

W.05.1 Pothole. All potholes in the existing pavement should be filled and compacted with an asphalt concrete patching mix.

W.05.2 Deterioration. Localized deterioration areas and old maintenance patches which are experiencing excessive shoving, loss of support and/or depressions, should be repaired or replaced.

W.06 CROSS SLOPE/GRADE CORRECTION. Where cross slope and/or grade corrections are required, some cutting or leveling of the existing pavement surface should be performed. Cold-milling may be required in the trackline where slipform pavers are used, to control the profile and maintain a uniform surface.

Where severe deformation exists on the existing asphaltic concrete pavement from rutting or humping, steps must be performed to ensure that at least the minimum required overlay thickness is maintained across the entire paving width. Cold-milling to remove high spots may be used to provide a uniform paving plane. A bituminous leveling course may be substituted for this purpose.

W.07 WHITEWASH. When the temperature of the paving surface is expected to exceed 110° F, a whitewash consisting of lime slurry mix or white pigmented curing compound shall be used over the prepared surface of the existing Asphalt Concrete Pavement. Where placement of reinforcement or dowel baskets is required prior to paving operations for Continuously Reinforced or Jointed pavements, the whitewash shall be applied at least one day prior to installation of the reinforcement. Where placement of reinforcement is not required prior to paving operations, the whitewash shall be applied at

least one day before new concrete is placed to allow the paving surface to cool. A second application of whitewash may be required ahead of paving to ensure uniform coverage, if the coloring has been severely faded by rain, or a majority of the surface area has been worn off by construction vehicles. Some tracking by construction traffic is not detrimental. Where a second coat is applied, CAUTION should be maintained to avoid contact of the whitewash with reinforcement.

W.07.1 Lime Slurry. The lime slurry mixture shall consist of hydrated lime and water. The proportions used in the whitewash mixture and the rate of application shall be such that a uniform color, not darker than uncoated concrete after curing, will be produced on the surface.

W.07.2 Curing Compound. Curing compound for use as a whitewash shall be wax-based and conform to AASHTO specification M-148 type 2. The compound shall be applied to the area to be surfaced with PCCP at a rate of one gallon per 200 square feet.

W.08 PLACING AND FINISHING OVERLAY CONCRETE. The contractor shall take every reasonable precaution to secure a smooth-riding surface. Prior to placement operations, he shall review his equipment, procedures, personnel, and previous results with the Engineer, and the inspection procedures will be reviewed to assure coordination. Precautions shall include the following:

- A. Assurance should be made that concrete can be produced and placed within the specified limits, continuously and with uniformity.
- B. The proper thickness and cross section, as shown on the plans shall be maintained. Should problems arise in obtaining the minimum design thickness due to surface irregularities or crown, the contractor shall either: remove irregularities with cold-milling equipment or adjust placement equipment. In either case the contractor must ensure that the minimum design thickness requirement is met across the entire paving width.

The concrete shall be placed, on grade without segregation of the material and with approved equipment, to the grade line established by the Engineer. The concrete to be used shall be as directed or approved by the contracting agency. This operation shall include all items to place, finish, texture, cure, saw and seal the whitetop concrete overlay.

The standard specifications of the contracting agency for JOINTED PORTLAND CEMENT CONCRETE PAVEMENT or CONTINUOUSLY REINFORCED CONCRETE PAVEMENT apply with the following modifications:

W.08.1 Texturing. When a tight uniform surface has been achieved, the surface shall be textured using transverse tining, preceded by either a burlap drag or an artificial turf drag. For low-speed pavements the standard recommendations of the contracting agency should be applied.

W.08.2 Curing. Immediately after the surface has been textured, the concrete shall be cured using a white-pigmented curing compound, applied at the standard rate. The curing compound shall be applied to the surface and exposed edges in such a manner that the material does not run or puddle.

W.09 JOINTS. All joints shall be sawed, cleaned, and sealed in accordance with the recommendations for the sealer specified prior to opening to traffic.

W.09.1 Transverse joints shall be sawed in the resurfacing as soon as possible without causing excessive raveling.

The depth of sawing to be used by the contractor shall be no less than 1/3 the nominal minimum thickness as shown on the plans. At locations where the surface thickness varies greater than 1" over the nominal thickness, special attention should be given to the depth of sawing used.

In areas where the pavement is greater than the nominal thickness due to grade corrections etc., and dowel bar insertion is used on slipform paving equipment, the depth of sawing shall not be greater than the depth of reinforcement, minus 1/2" plus the dowel bar radius.

W.09.2 Longitudinal joints shall be sawed to a depth of 1/3 the design overlay thickness as shown on the plans, and shall be cut parallel to the finished edge of the concrete pavement.

W.10 TESTING AND OPENING TO TRAFFIC. The following procedures will be used.

W.10.1 Slump. The slump of concrete, tested at time of placement, measured in accordance with AASHTO T 119, shall not exceed 3 inches for concrete placed by vibration or 4 inches for concrete placed by hand.

W.10.2 Percent Entrained Air. The entrained air content of the fresh, unvibrated concrete, at the time of placement, as determined by AASHTO T152, shall be 6 1/2 percent, plus or minus 1 1/2 percent.

W.10.3 Compressive Strength. The pavements shall not be opened to traffic until cylinder test specimens of the overlay concrete have attained a compressive strength of 3000 psi. The joints must be cleaned and filled with joint material prior to opening to traffic. Concrete compressive cylinders are to be tested in accordance with ASTM C 39.

W.10.4 Thickness. The thickness of the concrete overlay shall be as determined by the contracting agency and shall meet the gradeline as established by the Engineer.

W.10.5 Defective Concrete. Any concrete which does not meet the aforementioned requirements of this specification shall be removed and replaced by the contractor at the direction of the contracting agency.

W.10.6 Rideability. The profile index of the overlay surface shall be tested according to the procedures, and shall meet the requirements of the contracting agency for new concrete pavement construction. Consideration must be given by the contracting agency to insure the contractor will be operating on an adequate track line.

W.11 METHOD OF MEASUREMENT The quantity of the various work items involved in the construction of Portland cement concrete resurfacing over existing asphalt concrete pavement will be measured by the engineer in accordance with the following provisions:

W.11.1 PCC over AC Overlay, Furnish Only. The amount of overlay concrete and miscellaneous concrete per type of mix design and admixture specified, shall be measured in cubic yards, using the count of batches incorporated.

W.11.2 PCC over AC Overlay, Placement Only. The area of portland cement concrete overlay, placement only, shall be computed in square yards from the surface measured longitudinally and the nominal plan width. Irregular areas shall be measured separately in square yards.

- W.11.3 Pre-overlay Repair.** The quantities for pre-overlay repair techniques, including: full-depth repair, Partial-depth repair and cold patching, shall be measured in accordance to the standard specifications of the agency for this type of work.
- W.11.4 Surface Removal, Portland Cement Concrete Cold Milling.** The areas of cold milling removal shall be computed in square yards from measurements of the locations as per depth class.
- W.11.5 Asphalt Concrete Leveling Course.** For the asphalt concrete hot-mix material laid to provide the leveling course, measurement shall be made in the number of tons of material placed in accordance with the specifications.
- W.11.6 Reinforcing Steel.** The method of measurement of reinforcing steel is dependant on the type of overlay pavement placed.
- W.11.6.1 Plain Doweled.** The dowel bars placed in conjunction with a jointed-plain concrete pavement shall not be measured separately.
- W.11.6.2 Mesh Reinforced.** The mesh reinforcing steel or dowels placed in conjunction with a jointed reinforced concrete pavement shall not be measured separately.
- W.11.6.3 Continuously Reinforced.** The amount of reinforcing steel placed in conjunction with a continuously reinforced concrete pavement shall be computed by measurement of the square yards of concrete resurfacing specified or required to be reinforced with no allowances for necessary laps and splices.

W.12 BASIS OF PAYMENT Payment for all items included under this specification shall conform to the following:

- W.12.1 PCC over AC Overlay, Furnish Only.** For the number of cubic yards of Portland cement concrete incorporated, payment will be made at the contract price per cubic yard per class.
- This will be full compensation for furnishing all raw materials, and for proportioning, mixing and delivery of concrete to the paving machine.
- W.12.2 PCC over AC Overlay, Placement Only.** For the number of square yards of Portland cement concrete overlay over existing asphalt concrete pavement, constructed, (placement only), the contractor will be paid the contract price per square yard. This will be full compensation for furnishing all labor, equipment, and materials to place, finish, texture, and cure the concrete, including the placement of grout and sawing and sealing the joints, in accordance with the plans and specifications.
- The reinforcement quantities for plain-doweled and mesh reinforced-doweled overlay pavements, are included in the cost of this item.
- W.12.3 Pre-overlay Repair.** Payment for pre-overlay repair items, including: full-depth repair, partial-depth repair and col patching, shall be in accordance to the standard specifications of the agency for this type of work.
- W.12.4 Surface Removal, Portland Cement Concrete Cold Milling.** For the square yards of pavement scarified in accordance with the details of the contract, the contractor will be paid the contract price per square yard. This will be full compensation for removal and disposal of material.

W.12.5 Asphalt Concrete Leveling Course. For the number of tons of asphalt concrete hot-mix material laid to provide the leveling course, the contractor shall be paid the contract unit price per ton.

W.12.6 Reinforcing Steel. The basis of payment for reinforcing steel is dependant on the type of overlay pavement placed.

W.12.6.1 Plain Doweled. Payment for dowel bars placed in conjunction with a jointed-plain concrete pavement is incidental to the cost of PCC over AC Overlay, Placement Only.

W.12.6.2 Mesh Reinforced. Payment for mesh reinforcing steel or dowels placed in conjunction with a jointed reinforced concrete pavement is incidental to the cost of PCC over AC Overlay, Placement Only.

W.12.6.3 Continuously Reinforced. Payment for reinforcing steel placed in conjunction with a continuously reinforced concrete overlay shall be for the number of square yards of concrete resurfacing placed at the contract unit price per square yard. This will be full compensation for providing and properly placing the required steel as shown on plans and details.

AASHTO-AGC-ARTBA Joint Committee

Subcommittee On New Highway Materials

Task Force 30 Report

PART II

"Guide Specifications for Concrete Overlays of Bridge Decks"



FOREWORD

These guide specifications were developed by a Joint Committee of the American Association of State Highway and Transportation Officials (AASHTO), The Associated General Contractors (AGC), and the American Road and Transportation Builders Association (ARTBA). The Joint Committee, AASHTO-AGC-ARTBA, formed Task Force 30 to address the need for guide specifications on proper design and construction of concrete overlays. This Task Force was divided into two subgroups, one to address pavement overlays (Roads Subgroup), and one to address bridge deck overlays (Bridges Subgroup).

PART I of the guide specifications addresses concrete overlays for pavements. **PART II** addresses concrete overlays for bridge decks. Each may be ordered separately depending on the user's preference.

The Task Force members of the Bridges Subgroup and their affiliation are as follows:

Clellon Loveall, *Chairman, Tennessee Department of Transportation*
Robert Nickerson, *Secretary, FHWA, Bridge Division*
Kenneth Boedecker, Jr., *W. R. Grace Company*
Bernard Brown, *Iowa Department of Transportation*
Robert Chapin, *Chapin & Chapin, Inc.*
Arthur Dinitz, *Transpo Industries, Inc.*
Charles S. Gloyd, *Washington Department of Transportation*
Louis Kuhlman, *DOW Chemical Company*
Torbjorn Larsen, *Florida Department of Transportation*
James Murphy, *New York State Department of Transportation*
James Roberts, *California Department of Transportation*
Fred Sutherland, *Virginia Department of Transportation*

PREFACE

Concrete bridge decks are used on almost 75 percent of the nation's bridges. As of 1987, the National Bridge Inventory (NBI) shows a total of 575,000 (includes 80,000 culverts) bridges, representing 2.3 billion square feet of bridge deck, in existence. The NBI also notes that 10 percent, or some 200 million square feet of these decks are rated a 4 or less, meaning the deck is structurally inadequate, highly deteriorated or contaminated with roadway salt.

Thus, these 200 million square feet of concrete bridge decks would qualify for competition of the scarce highway rehabilitation dollars. At a very modest cost of only \$10.00 per square foot, this represents \$2 billion of work.

Many of these decks will require total replacement and appropriate design and construction techniques that will assure quality materials with new technology to provide a service life at least equal to the bridge's design life. In some cases, the protection strategy chosen by the bridge owner to preclude premature deterioration, or for other reasons, will include the use of a concrete overlay placed over the base concrete deck.

Many deficient decks can have their service life extended cost effectively to equal the remaining service life of the rest of the structure by introduction of a concrete overlay. Also, in certain high volume traffic conditions, due to the need to absolutely minimize the time a bridge, or one lane of a bridge, is out of service, a concrete overlay will be appropriate, with the recognition that total deck replacement, or overlay replacement, may be required again before the bridge itself is removed from service for whatever reason.

This manual is intended to provide guidance to the bridge owner on proper techniques to use from the initial step of deciding what to do, to the final step of measuring the in-place product and evaluating its acceptability. The manual was written by leading experts in the field, representing both State Highway Agencies and private sector engineers. Design engineers, material suppliers and contractors had input into the manual's development. Utilizing the criteria stated herein should ensure minimizing the area of bridge decks that will deteriorate to an unacceptable condition over their service life. Because of the higher dollar investment, and the impact on the travelling public caused by premature bridge deck failures, it is imperative that a quality product be provided.

It is also recognized that individual State practices, or specific environmental conditions, may warrant modification of selected portions of these criteria. However, these modifications should be exercised with care because of the interdependency of the many variables on the quality and performance of a good concrete overlay. Individual State specifications can be developed from these criteria.

TABLE OF CONTENTS

Foreword	II-i
Preface	II-ii
Table of Contents	II-iii

Section

1.0 Introduction	II-1
1.1 Purpose of Overlays	II-1
1.2 Deck Condition Survey	II-2
1.3 Quality Control/Quality Assurance	II-7
2.0 Warrants for Overlays	II-8
2.1 Cost Effectiveness	II-8
2.2 New Construction	II-9
3.0 Types of Overlays and Specifications	II-10
3.1 Materials	II-10
3.2 Latex Modified Concrete (LMC)	II-11
3.3 Low Slump Dense Concrete (LSDC)	II-12
3.4 Low Water Cement Ratio Concrete (LW/C)	II-12
3.5 Polymer Concrete (PC)	II-14
3.6 Microsilica Modified Concrete (SFC)	II-20
4.0 Design Details	II-23
4.1 General	II-23
4.2 Bridge Joints	II-24
4.3 Bridge Drains (Scuppers)	II-25
4.4 Cross Slope	II-25
5.0 Construction Requirements	II-26
5.1 Job Conference	II-26
5.2 Surface Preparation	II-27
1) General	II-27
2) Scarification	II-28
3) Blast Cleaning	II-29
4) Bonding	II-31
5.3 Placement Conditions	II-33
1) Ambient Conditions	II-33
2) Batching Equipment	II-36
3) Transport Equipment	II-42