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ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

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J.R. Lambert, Deputy Chief Eng.(Facility Design Div.)

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An updated version of the Pavement Restoration Techniques listing is attached.

Designers should use this information when considering various alternates for pavement restoration projects.

This report provides a listing of pavement restoration techniques based on the Department's experience to date. Its purpose is to provide State of the Art information in one place with capsuled background information and the Department policy for the use of these repair procedures.

You will note a column captioned "STATUS, REMARKS, ESTIMATED SERVICE LIFE (ESL)". ESL has been included where appropriate. It is our best estimate of how long a repair or technique will last before requiring major work or reconstruction. ESL was included to assist designers when comparing cost of various alternates. If your experience and/or local conditions indicate a different ESL is more appropriate than that presented, a statement explaining this difference should be incorporated into the project's Pavement Evaluation and Treatment Selection Report.

Also under the same column, a status is given for each specification or treatment. The following definitions apply to the various status categories.

Statewide Standard - A treatment and/or specification in the Standard Specifications or a treatment and special specification allowed for general use in the Estimate Handling System.

Project Special - A treatment and special specification that is handled on a project by project basis (PIN only in the Estimate Handling System). Specification is in development and evaluation phase; parameters for use, benefits derived, cost effectiveness, construction procedures and/or other aspects may still be under consideration. Check for latest version because these specifications usually go through a revision and refinement process.

Experimental Feature - Formal research and reporting to be conducted in accordance with "Work Plan and Reporting Guide for Experimental Features" as published by the Engineering Research and Development Bureau. May involve a combination of specifications.

The use of non-standard (Project Special or Experimental Feature) pavement restoration techniques requires submission of the specification(s) to the Specifications and Standards Section of the Design Quality Assurance Bureau well in advance of the PS&E submittal for the purpose of assigning by PIN to the Estimate Handling System. The submission should include a brief summary of the pavement condition and a description of how and why the specification is to be utilized.

PAVEMENT RESTORATION TECHNIQUES: 1992

(FIRST PUBLISHED IN DECEMBER 1982 AND REVISED IN MARCH 1984 AND APRIL 1988)

Prepared By

FACILITIES DESIGN DIVISION
AND
TECHNICAL SERVICES DIVISION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
1220 WASHINGTON AVE.
ALBANY, NEW YORK 12232

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INTRODUCTION

This updates the report entitled PAVEMENT RESTORATION TECHNIQUES which was published by the Technical Services Division in December 1982 and revised in March 1984 and April 1988. It is a summary guide of state-of-the-art techniques and treatments used for pavement maintenance, rehabilitation and reconstruction.

Some treatments described in this report can be accomplished with standard items, while others require the use of items considered by the Department to be either experimental or project specials. It is expected that many of these non-standard items will become standard after more experience is gained with their use. In the meantime, however, the use of these items requires submission to the Design Quality Assurance Bureau on a project by project basis. A summary of the condition of the pavement and an explanation of why the item is required should be included.

Portland cement concrete (PCC) and asphalt concrete (AC) pavements require various treatments to maintain, rehabilitate, or reconstruct the pavement depending upon the condition of the pavement and the level of service desired. Many standard types of treatments are currently in use and many more are in various stages of development. This summary is a listing of treatments based on the Department's experience to date. The purpose of this listing is to provide a "catalog" of treatments, useful background information and policy for the use of these techniques.

To select the proper treatment, a pavement evaluation and treatment selection report should be prepared in accordance with volumes I and II of the Pavement Rehabilitation Manual and the latest directives issued by the Design Quality Assurance Bureau on the Project Level Pavement Design Process.

Information presented on PCC and AC pavements includes 1) treatment (including specification numbers), 2) application, 3) remarks (including experience information and estimated service life, ESL). For PCC pavements overlaid with asphalt concrete, the pavement can be generally considered as an AC pavement. However, special considerations may have to be made.

Remarks provided in the listing are based on current statewide experience. Costs should be reviewed for each project.

Technical Services Division personnel are available to provide additional information on any listed treatment(s).

PORTLAND CEMENT CONCRETE PAVEMENT

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Resealing transverse joints in portland cement concrete pavement, 63 ft. pavement slabs-silicone sealant, Item 18502.701002. *Resealing protects load transfer devices (LTDs), forestalls infiltration of incompressible material and water.*	Use on resealing contracts where existing sealers have failed and the existing pavement will not be resurfaced.	Statewide standard. Resealing is done by contract. For warrants and/or guidelines see EI 90-1 and EB 90-11. ESL: 8 years.
Resealing transverse joints in portland cement concrete pavement, 20 ft. pavement slabs-silicone sealant, Item 18502.702002. *Resealing protects LTDs, forestalls infiltration of incompressible material and water.*	Use on resealing contract where existing sealers have failed and the existing pavement will not be resurfaced.	Statewide standard. Resealing is done by contract. For warrants and/or guidelines see EI 90-1 and EB 90-11. ESL: 8 years.
Resealing longitudinal joints in portland cement concrete pavement, Item 18502.7401. *Resealing protects tie bars from corrosion, forestalls infiltration of incompressible material and water.*	Use on resealing contracts where existing sealers have failed and the existing pavement will not be resurfaced.	Statewide standard. Resealing is done by contract. For warrants and/or guidelines see EI 90-1 and EB 90-11. ESL: 8 years.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Sealing cracks in portland cement concrete pavement-silicone sealant, Item 18502.7601. *Appropriate where the existing pavement will not be resurfaced.*	Use to seal cracks that have opened sufficiently to receive water and fines.	Statewide standard. Resealing is done by contract. For warrants and/or guidelines see EI 90-1 and EB 90-11. ESL: 8 years.
Full diamond grinding and texturing of concrete pavement, Item 18502.5010. *This item consists of diamond grinding the entire lane(s) to remove faulted joints.*	Use where faulted joints have become objectionable (greater than 3/16"). Wheeltrack ruts can be removed and pavement cross slope changed. Pavement friction is increased due to texture left after grinding.	Statewide standard. With approximately 2000 trucks/day faulting will recur at a rate of 1/16" per year. ESL: Objectionable faulting (1/4") will recur within 5 years under the above traffic conditions if load transfer is not restored.
Partial diamond grinding and texturing of concrete pavement, Item 18502.5020.	Use where grinding is confined to the faulted joints. A 2 ft length is ground for each 1/16" of faulting.	Statewide standard. Rideability is poorer than continuous diamond grinding, PCC and AC overlays and/or new pavements. ESL: Objectionable faulting (1/4") will recur within 5 years under the previously stated traffic conditions if load transfer is not restored.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Production cold milling of portland cement concrete pavement, Item 490.20. *Provides shaping and removal of existing PCC pavement surfaces.*	Use on large, high production milling operations of more than 15,000 sq. yds. where continuous or near continuous milling is anticipated and where larger milling machines (6 ft diam. width and larger) are suitable.	Statewide standard. Equipment readily available. See EI 89-8.
Miscellaneous cold milling of portland cement concrete, Item 490.40. *Provides shaping and removal of existing PCC pavement surfaces.*	Use where milling is limited, intermittent and/or restricted in area, generally less than 15,000 sq. yds.	Statewide standard. Equipment readily available. See EI 89-8.
Cement concrete pavement pressure relief joints, Item 15502.4511.	Use to protect bridges from migrating pavement, a result of transverse joint infiltration.	Statewide standard. Pressure relief joints with reinforced concrete sleeper slabs are provided at newly constructed structures. Periodic maintenance may be required to restore rideability. See EI 82-65 and EI 87-16.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Pressure relief joints in existing cement concrete pavement, Item 15502.4598. *Pressure relief is provided by full depth asphalt concrete.*	Use to stabilize a pavement (that is particularly prone to blowups) prior to resurfacing. Use to replace existing expansion joints at bridge approach slabs either side of a structure.	<u>PAVEMENT</u> Use has declined in recent years as the full depth AC pressure relief joints have a tendency to bump, rut and/or shove from thermal expansion and traffic after 5 years. Maintenance is then required to repair the deficiency and restore rideability. <u>STRUCTURES</u> The expansion joint between the pavement and approach slab is replaced with a 5 ft wide pressure relief joint. As with pavement, maintenance is required.
Surface preparation for rapid setting concrete pavement repairs, Item 18502.0705. Furnish and placement of rapid setting concrete pavement repairs, Item 18502.0706.	Use for partial depth repair of spalled or deteriorated areas of PCC pavements not receiving an overlay. Curing time to traffic use, 1 hour.	Statewide standard. See EI 91-32. ESL: 10 years.
Prefabricated composite edge drain, Item 17605.2402.	Use to provide drainage at the edge of existing PCCP. Untried on ACP at this printing. For assistance contact the Soil Mechanics Bureau.	Project special. Appropriate for existing PCCP to be resurfaced. This item should not be placed below a widening interface.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Cement concrete for pavement repairs, Item 18502.6028. *After removal, a calcium chloride accelerated portland cement concrete is placed in the prepared void.*	Use for full depth removal and replacement of concrete pavement segments. Curing time to traffic use, 4 hours. The existing pavement is removed, steel dowels are installed in holes drilled in the existing slabs, an expansion joint load transfer device is placed where necessary and the accelerated concrete is placed.	Statewide standard. Sawcutting, excavation, drilling, dowels, and load transfer devices are paid for separately. ESL: Equal to the service life of the existing pavement up to 30 years.
Inverted T pavement repair using calcium chloride accelerated concrete, Item 10502.600201.	The existing pavement is undercut, an inverted T section of reinforced accelerated concrete provides load transfer. Curing time to traffic use, 4 hours.	Project special. Sawcutting and joint sealing are paid for separately. Not recommended in frost prone areas. Frost heaves disrupt pavement, since slabs are not restrained from vertical movement.
Dowel retrofit load transfer devices for transverse joints in PCC pavement, Item 18502.3409. *Standard epoxy coated dowels are placed in sawcut slots across joint and bonded in place with polymer concrete.*	Use to reestablish load transfer at transverse joints. Joints must have no or low-severity spalling.	Experimental feature. Usage minimal due to candidate pavement's poor condition and relatively high cost of the item.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Cracking and seating existing concrete pavement, Item 18203.9904. *A pavement breaker and 50 ton roller are used to crack and seat the pavement.*	Use to retard transverse joint reflection cracks and slab cracks through an asphalt overlay. Use where PCCP is deteriorated to the point that the only other feasible rehabilitation alternative is reconstruction. A crack and seated PCCP should be overlayed with a minimum of 5" of AC.	Statewide standard. For warrants and guidelines see EI 90-33 and EI 90-9.
Rubblizing existing portland cement concrete pavement, Item 18502.7590. *A resonant frequency machine is used to rubblize pavement to aggregate size particles.*	Use where PCCP deterioration is similar to that warranting cracking and seating but where widing, longitudinal and/or transverse joint separation or the presence of underground utilities nullifies the crack and seat alternative.	Project special. For warrants and guidelines see EI 90-33 and EI 90-9.
Groove PCC pavement, Item 15502.5001. *Longitudinal grooving.*	Use to reduce wet weather hydroplaning on tangents and curved sections lacking adequate macrotexture but where microtexture is satisfactory.	Statewide standard. Longitudinal grooves cost less than transverse grooves and can be placed with less traffic disruption. ESL: Varies depending on traffic and concrete properties. For further information contact the Materials Bureau.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Transverse grooving of PCC pavement, Item 18502.5002.	Use to reduce wet weather hydroplaning on tangents and curved sections lacking adequate macrotexture but where microtexture is satisfactory.	Project special. Transverse grooves improve drainage in flat sections by taking advantage of existing pavement cross-slope and channeling water to the pavement edge. May be advantageous to use in place of longitudinal grooving when a contract also calls for transverse grooving of structural slabs. ESL: Varies depending on traffic and concrete properties. For further information contact the Materials Bureau.
Bonded PCC pavement overlay, Item 03502.07. *A Class D concrete, three inches thick is bonded to a prepared surface with a cement-sand grout.*	Use for overlaying (or inlaying) an existing PCCP. Curing time to traffic use, 96 hours.	Experimental feature. Performance experience adequate, for details contact the Materials Bureau. ESL: 20 years.
Partial bonded PCC pavement overlay. *A minimum 6 inch thick mesh reinforced concrete pavement with load transfer is constructed on the existing pavement. No deliberate attempt is made to achieve bond.*	Use to overlay a moderately deteriorated PCCP.	Experimental feature. No recent experience in N.Y. For details contact the Materials Bureau. ESL: Varies, existing distress will dictate service life.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Unbonded PCC pavement overlay. *A minimum 6 inch thick mesh reinforced concrete pavement with load transfer is constructed over a bond breaker (1" thick asphalt concrete) over the existing pavement.*	Use to overlay an extensively deteriorated PCCP. A bond breaker is used to prevent reflection cracks.	Experimental feature. No recent experience in N.Y. For details contact the Materials Bureau. ESL: Same as new concrete pavement, 30 years.
Repair of spalled areas, joints and/or cracks in portland cement concrete pavement, Item 18502.4466.	Asphalt concrete is used to repair partial depth spalls occurring at joints or in slabs prior to AC resurfacing. Deteriorated PCC is removed by milling or other means prior to AC patching.	Statewide standard.
Asphalt overlay over PCCP. 3 inch minimum thickness. Various standard items. *A 1 1/2 inch thickness of dense binder and 1 1/2 inch thickness of top course is placed on a patched, filled, tack coated and leveled pavement.*	Use to overlay a moderately deteriorated PCCP.	Statewide standard. ESL: 15 years.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Sawing and sealing joints in bituminous concrete overlays, Item 18403.2502. *Reservoirs and deeper sawcuts are constructed and sealed over existing transverse joints to control and seal reflection cracks.*	Use for first time overlays, where existing transverse joints are well defined, to control reflection cracks.	Statewide standard. Reflective cracking is controlled. Deterioration at joint areas is minimized and delayed. As a result, overlay service life is achieved. See EI 85-43.
Additional depth sawing and sealing bituminous concrete pavement joints, Item 18502.2599. *Additional depth sawcutting, through the new and existing AC overlays, acts as a control joint.*	Use in second overlay over PCC pavement where the first overlay has developed reflective cracks.	Statewide standard. For further information contact the Materials Bureau.
Asphalt overlay for structural restoration of PCCP. Various standard items. *Dense graded asphalt concrete mixes are placed on a patched, filled, tack coated, shimmed and leveled pavement.*	Use to overlay a structurally deficient PCCP.	Statewide standard. Contact Soil Mechanics and Materials Bureaus for assistance in thickness design and corrections necessary prior to resurfacing. ESL: 15 years.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Full depth PCC slab replacement with dense graded asphalt concrete base or binder and top, Items 403.11 or 403.13 and 403.1701. *Structurally unsound PCCP slabs or segments are replaced full depth with new dense AC prior to resurfacing.*	Use as an alternative to PCC replacement on moderate to low volume roadways where this less expensive repair will perform adequately. This repair is not recommended where high volumes of trucks can cause shoving, poor rideability and requires corrective maintenance after a few years.	Statewide standard. For this treatment to be cost effective the cause of the problem must be corrected. ESL: 2 years with AADT of 100,000 +. 5 years with AADT of 40,000.
Cement concrete pavement, reinforced Class F, Item 502.05. *Structurally unsound PCCP slabs are replaced full depth with new reinforced PCCP slabs.*	Use where individual pavement slabs have failed because of localized failure. Curing time to traffic use, 72 hours.	Statewide standard. For this treatment to be cost effective the cause of the problem must be corrected. For assistance contact the Soil Mechanics and Materials Bureaus. ESL: Equal to the service life of the existing pavement up to 30 years.
Modified Class F reinforced concrete for pavement repairs. Item 01502.6088. *Class F concrete curing is accelerated with heated mix water and insulation.*	Use where individual pavement slabs have failed because of localized failure. Curing time to traffic use, 24 hours.	Statewide standard. For this treatment to be cost effective the cause of the problem must be corrected. For assistance contact the Soil Mechanics and Materials Bureaus. ESL: Equal to the service life of the existing pavement up to 30 years.

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
PCCP Reconstruction. Various standard items. Remove and replace entire pavement.	Use for complete replacement of the existing pavement in kind or as a flexible pavement.	Statewide standard. ESL: PCCP - 30 years. ACP - 15 years.

ASPHALT CONCRETE PAVEMENT

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Asphalt concrete overlay. Various standard items.	<u>STRUCTURAL</u> Single or multiple layer(s) of sufficient thickness to provide adequate increase in total pavement thickness for design traffic. <u>RIDE/PREVENTIVE MAINTENANCE</u> Single or multiple layer(s) to restore acceptable ride, cover minor cracking, ravelling, etc.	Statewide standard. Contact Soil Mechanics and Materials Bureaus for assistance in thickness design and corrections necessary prior to resurfacing. ESL: 15 years.
Heavy duty asphalt concrete, Type 3HD, Item 18403.1316.	See previous entry.	Project special. These three heavy duty asphalt concrete items were developed to address pavement rutting on high volume roadways. Mixes have been used at several locations the past 2 years. Warrants and guidelines for use will be issued by EI. For further information contact the Materials Bureau.
Heavy duty asphalt concrete, Type 6FHD, Item 18403.1716.		
Heavy duty asphalt concrete, type 7FHD, Item 18403.1916.		

TREATMENT	APPLICATION	STATUS, REMARKS & ESTIMATED SERVICE LIFE (ESL)
Asphalt concrete Type 10F open graded surface course, Item 15403.2003.	Use to reduce wet weather hydroplaning in areas with a history of abnormally high skidding accidents.	Statewide standard. For warrants and guidelines see EI 90-15. For further information contact the Materials Bureau.
Asphalt concrete Type 10FX open graded surface course, Item 15403.2004.		
Asphalt concrete in-place surface rehabilitation, Item 19403.509X.	Use to hot in-place recycle existing asphalt pavement.	Project special.
Virgin asphalt concrete admixture - top course, Item 19403.519X.	Self contained multi-step process of heating, scarifying, remixing, reshaping and compacting asphalt pavement.	Item 19403.519X or Item 19403.539X may be needed in conjunction with Item 19403.509X.
Virgin asphalt concrete admixture - binder course, Item 19403.539X.	Recycles top 1" - 1 1/2" of existing pavement as a binder course or wearing course.	For current status and specification numbers contact the Materials Bureau.
Cold in-place recycling of pavements, Item 18490.600191.	Use to recycle and reshape the existing surface of low volume roads. Recycled material must be covered with a new wearing course.	Project special. ESL: 15 years. For further information contact the Materials Bureau.