

# CHAPTER 7 PAVED SURFACES

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## 7.1 INTRODUCTION

The maintenance of paved surfaces is one of the most visible activities performed by the Department of Transportation, whether by contract or by Department Forces. The Department is judged by the condition of the highway surface. Therefore, it is important that surface maintenance be performed to a uniformly high standard statewide.

The ideal for surface maintenance is to have all pavements on the state system upgraded to a load carrying capacity and surface condition that would virtually eliminate potholes and depressions and provide a smooth and safe ride.

To accomplish this, it is essential that the service life of the good and fair roads be extended by timely and quality maintenance, i.e., liquid skin patching, seal coating, joint and crack sealing, mechanized patching, concrete patching, drainage repair and cleaning, and shoulder cutting.

### PURPOSE

The purpose of Chapter 7 is to consolidate and clarify policies and procedures related to the maintenance and preservation of pavement surfaces.

### OBJECTIVE

The objective of Chapter 7 is to ensure uniform quality maintenance practices statewide for similar pavement problems without losing sight of local conditions.

### RESPONSIBILITIES

**Assistant District Executive (Maintenance)** - Coordinates the District's compliance with this policy and reviews the planning, scheduling and performance of the work. The Assistant District Executive or representative performs quality assurance checks on Department Force work to verify that work reported is being checked and meets the high quality standards established by this policy.

**District Equipment Manager** - Ensures that all aspects of equipment maintenance are carried out in accordance with [Equipment Maintenance and Management Policies Manual \(Publication 117\)](#) and applicable "M" Letters. Repair priorities must be given to pothole patching equipment so that it will be ready by March 1.

**Highway Maintenance Manager** - Plans, organizes, schedules and trains personnel for roadway maintenance work. With the help of the Assistant Highway Maintenance Managers, they inspect the work crews and check the quality of work accomplished. Takes managerial action necessary to ensure quality standards are met.

**Assistant Highway Maintenance Manager** - Inspects roads and schedules the work, concentrating on high priority roads. Trains the Foremen and their crews to do the job in accordance with the latest standards. Personally inspects all routes assigned. Records any defects that require maintenance and lists any corrections needed on Form M-681 (see chapter 3 of this publication, Publication 23, to access this form). Ensures that the proper combination of crews, materials and equipment are scheduled and used to perform all surface repairs. Confirms that foreman and crews are doing the proper work, as per the Maintenance Quality Assurance forms and [Publication 113, Highway Foreman Manual](#).

**Highway Foreman** - Supervises the work force and organizes equipment to execute the work in an efficient and productive manner. Participates in the inspection and collection of roadway condition data and is familiar with the performance and quality standards and carries out the work accordingly. Ensures that personnel and equipment are productive at all times. Communicates general road conditions of routes traveled to the Assistant Highway Maintenance Manager. While waiting for materials or other items, secondary activities shall be performed.

### STANDARD OF CARE FOR PAVEMENT

A systematic method of monitoring pavement distress and completion of needed repairs must be established in each District for all freeways and interstates. Every County Maintenance Organization with interstate responsibility is required to assess their interstate pavement network on a quarterly basis. One assessment will be performed and reported in each of the following months: January, April, July, and October. Two of

these assessments will be prior to the Maintenance Performance Division's Bi-Annual interstate reviews (June and November), and the other two reviews will be pavement specific windshield surveys. All pavement distresses easily identified via the windshield surveys must be communicated to the Assistant District Executive for Maintenance, and will include a schedule of repair. If the County believes that it is beyond their capability to make the needed repairs, this must be made clear to the Assistant District Executive for Maintenance. These pavement distresses shall be communicated by the District and County to the Central Office. The communication will be in the form of an e-mail addressed to the Chief of the Maintenance Performance Division and the Chief of the Pavement Management Unit. Central Office will evaluate the pavement distress for severity level and investigate potential solutions and may be taken to the Interstate Steering Committee. Pavement distress discovered during the quarterly windshield surveys will be provided by the Assistant District Executive for Maintenance to the Chief of the Pavement Management Unit for use during the Biennial Interstate rides conducted prior to the Interstate Program update. Information related to the Biennial Interstate rides can be found in [Publication 242, Pavement Policy Manual](#), Chapter 13.

If an area is determined to be severely distressed with surface deterioration that is repeatedly occurring, then County, District and Central Office staff will meet to develop a maintenance plan and to determine the best course of action for the identified area. The maintenance plan will include a schedule for monitoring distresses and performing repair work. The Assistant District Executive for Maintenance will review the plan and then submit the plan to the BOMO Director for review and approval. The County Manager will be responsible to ensure that the approved maintenance plan is being followed. District and Central Office staff will also be responsible for monitoring the distressed areas. The maintenance plan will remain in effect until a permanent repair takes place.

### **PAVEMENT MANAGEMENT**

Pavement management is a standardized process to institute goals, establish policy, perform long-range planning, allocate resources, develop programs, deliver projects, and employ a systematic approach for maintaining roadways, forecasting needs, and performing cost/benefit analysis. Pavement management allows for programming maintenance and rehabilitation strategies at the optimum time and to quantify needs over a projected time.

For the purpose of business planning to establish performance metrics and report information, four networks have been established and are listed below from highest to lowest priority for routine maintenance and repair:

- Business Planning Network 1: Interstate
- Business Planning Network 2 : National Highway System (NHS), non-Interstate
- Business Planning Network 3: Non-NHS routes with Average Daily Traffic (ADT) equal to or greater than 2,000
- Business Planning Network 4: Non-NHS routes with ADT less than 2,000

### **PREVENTIVE MAINTENANCE AND PAVEMENT PRESERVATION**

A preventive maintenance program is a systematic approach to planning and performing a series of preventive maintenance treatments over time. One treatment will improve the quality of the pavement surface and extend the pavement life, but the true benefits of pavement maintenance are realized when there is a consistent schedule for performing the preventive maintenance.

Preventive maintenance is generally planned and cyclical in nature. Its intent is to repair early pavement deterioration, delay pavement failures, and reduce the need for corrective maintenance and service activities. Although this type of maintenance is not performed to improve the load-carrying capacity of a pavement, it extends the pavement useful life and level of service.

Due to material requirements and planning efficiencies, the following activity target completion dates have been defined:

Activity	Target Completion Date
Crack sealing	1 to 2 years prior to resurfacing, excluding full width mill and resurfacing projects
Pipe replacement	1 year prior to resurfacing
Surface treatment of 19mm Binder	For surface treatment of 19 mm Binder to adhere, exposure to 3 months of warm weather must occur. (Overlay can be placed immediately following placement of 19mm binder.) 19mm Binder must not remain open for longer than 18 months, and should be sealed within 1 year.
Surface treatment of RAP Recycling	For surface treatment of RAP Recycling to adhere, exposure to 1 month of warm weather must occur. (Overlay can be placed immediately following placement of RAP Recycling.) RAP Recycling must not remain open for longer than 18 months, and should be sealed within 1 year.

For the purpose of planning and establishing cycle preventative maintenance and preservation activities, treatment type networks are defined. These networks have been established in the Roadway Management System (RMS): H – High Level Bituminous, L – Low Level Bituminous, R – Recycling, C- Concrete, and U- Unpaved. High level roadways are generally considered the resurfacing network whereas Low level roadways are considered the seal coat network. Recycling network roadways are those maintained via cold in place recycled pavement and seal coats. Districts may manually edit the “H, “L,” and “R” treatment network indicators based on facility usage or other factors that affect how routes are maintained. Indicators cannot be manually changed to or from “C” or “U”.

Critical elements of a successful pavement preservation program are:

1. selecting the roadway
2. determining the type and cause of distresses
3. identifying and applying the correct treatment(s)
4. determining the correct time, funding, manpower, and equipment to complete the work
5. observing performance

The program can then be adjusted according to the results.

Pavement management and preservation policies and procedures can be found in [Publication 242, Pavement Policy Manual](#). Pavement treatment cycles can be found in [Publication 242, Pavement Policy Manual](#), Chapter 11.

## 7.2 TYPES OF PAVED SURFACES

### RIGID PAVEMENTS

Rigid pavements are those constructed of Portland Cement Concrete (PCC). Concrete is a rigid material that is strong in compression and weak in tension. Concrete pavement acts as a beam when carrying a moving load. The load carrying capacity of a concrete pavement is a function of the strength of the concrete, the strength of the subgrade and the thickness of the concrete slab. Refer to [Publication 242, Pavement Policy Manual](#), Chapter 8: Rigid Pavement Design.

#### Plain PCC Pavement

Plain PCC pavement is a pavement constructed with Portland Cement and aggregates without reinforcing steel. Shrinkage is controlled by the use of short joint spacing, which is normally 15' to 20'. Load transfer units are used in the transverse joints and tie bars are used in the longitudinal joint.

### **Reinforced PCC Pavement**

Reinforced PCC pavement is a pavement constructed with Portland Cement, aggregates and reinforcing steel. Reinforcing steel, in the form of welded wire fabric, is used to control shrinkage cracking and does not add to the structural strength of the pavement. Transverse joint spacing may vary from 15' to 61.5', and may or may not be skewed depending on when the pavements were built. Load transfer units are used in transverse joints and tie bars are used in the longitudinal joints.

### **Continuously Reinforced PCC Pavement**

Continuously reinforced PCC pavement is a pavement constructed with Portland Cement, aggregates and a heavy mat of steel reinforcing bars or welded wire fabric. This pavement is constructed without transverse joints except at structures or where it joins another pavement type. Shrinkage cracks are controlled by the heavy steel mat. The slab will develop cracks 2' -3' apart. Normally these cracks are tight and should not be sealed.

Failures in continuously reinforced pavements should not be repaired by Department Forces without the advice and guidance of the District Pavement Engineer/Manager.

## **BITUMINOUS PAVEMENTS**

Bituminous surface pavements are those where an established base is surfaced with one or more layers of a mixture of graded aggregate and asphalt. The layers can vary in thickness from 1/2" liquid bituminous surface treatment course to a 5 1/2" binder course. Refer to [Publication 242, Pavement Policy Manual](#), Chapter 9: Full-Depth Flexible Pavement Design.

### **Central Plant Mix Pavements**

Central plant mixed pavements are those constructed of a mixture of graded aggregate and/or reclaimed asphalt pavement (RAP) that is coated with asphalt (usually hot) in a central plant that may be permanently installed or portable.

### **Traveling Plant Mix Pavements**

Traveling plant mixes or stabilization plant mixes are those constructed of a mixture of graded aggregate and/or reclaimed asphalt pavement (RAP) that is coated with asphalt in a traveling plant and placed directly upon a prepared surface.

### **Surface Treated and Seal Coated Pavements**

A seal coated pavement consists of a single application of hot liquid asphalt applied to a properly prepared surface and covered immediately by a single layer of aggregate. The thickness of the treatment is about the same as the nominal size of the aggregate.

A surface treated pavement is the placement of a double layer of seal coats. The aggregate size of the top layer is usually smaller than the bottom layer.

Micro-surfaced and Slurry Sealed pavements consist of cold-mix asphalt containing additives such as polymer and/or fast-setting chemicals and can be used as an alternative to seal coats or surface treatments.

## **7.3 BITUMINOUS PAVEMENT MAINTENANCE**

### **ROUTINE MAINTENANCE**

Routine surface maintenance activities are those that are done primarily by Department Forces to maintain the integrity of the pavement on which surface improvement is required and programmed. They are included in the Long Term Plan and are scheduled.

### **STANDARDS OF CARE FOR POTHOLE PATCHING AND SURFACE REPAIR**

Paved surfaces on our network must be maintained to meet our standards of care. Pothole Repairs are to be completed on a priority basis by the following dates:

Pothole Patching	Maintenance Activity	Activity Target Completion Date
Interstate Highways	Springtime Repairs	End of April
Non-Interstate NHS Highways	Springtime Repairs	Memorial Day
Non-NHS Highway	Springtime Repairs	End of June

All roads are to be checked and repaired prior to the start of winter operations, October 31st, to ensure there are no potholes.

## POTHOLE REPAIR

Pothole repairs shall be made throughout the year, whether a pothole is observed by the Department or reported through the Customer Care Center or 1-800-FIX-ROAD. Therefore, it is important that appropriate resources are in place so that pothole repairs can be scheduled and completed in a timely manner, in conjunction with all other maintenance tasks. County Maintenance Organization plans shall contain a pothole repair schedule and repair work is to be completed in accordance with [Publication 113, Highway Foreman Manual](#), Maintenance Performance Standards. When scheduling pothole repair work, roads with the highest Average Daily Traffic (ADT) should be prioritized first, followed by lower volume roads and other maintenance work such as shoulder cutting and grading, bridge maintenance, surface treatment and guiderail work.

### Manual Pothole Patching

Manual pothole repair is to be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standards 711-7121-01, "Manual Patching - Standard" and 711-7121-05 "Manual Patching, Mechanized Cutting". Patching a bituminous surface following a pipe replacement shall be done in accordance with Performance Standard 711-7324-05, "Manual Patching, Trench Restoration – Pipe Trenches." Pothole repairs needed during unscheduled, non-standard working hours, such as on weekends, holidays, or during periods of extended severe winter weather are considered emergency patching. The Performance Standard 711-7121-02, "Patching – Manual (Non-Standard)" pothole repair shall be used in such cases.

There must be at least one Foreman in each Assistant Highway Maintenance Manager's area who is designated and equipped to quickly respond to complaints of isolated potholes. Priority is to be given to the high traffic roads. Crews are to patch according to standard and shall be provided with complete and comprehensive work area protection and all required equipment and materials to complete Activity 711-7121-01. Emergency pothole repairs that do not allow sufficient time for appropriate planning can be charged to 711-7121-02, however, use of this activity is expected to be limited to emergencies, typically done in winter months.

All pothole repair equipment shall be serviced and repaired during the winter months and be ready for use no later than March 1st of each year. All Department equipment shall be scheduled before utilizing rented equipment. When required to supplement Department equipment, bids for rented equipment must be obtained in sufficient time to have it available by March 1st.

All bituminous materials (including tack) shall conform to the applicable requirements of [Publication 27](#) (Bulletin 27), [Publication 37](#) (Bulletin 25) and [Publication 408, Specifications](#).

Special Bituminous Patching Materials (including tack) are listed in the Miscellaneous Section of [Publication 35](#) (Bulletin 15), Approved Construction Materials.

State Route (SR) specific mechanical cutting may be waived, with approval by the District Executive or Assistant District Executive (Maintenance), if any of the following conditions are met:

- The roadway is programmed for mechanized patching, leveling with a bituminous overlay within the

same construction season, as long as the patch material is to be removed by milling or other means of excavation prior to the application of a bituminous overlay.

- Low-volume SR's (<2,000 ADT) with high density pothole situations and programmed within 2 years, as long as the patch material will be removed by milling or other means of excavation prior to the application of a bituminous overlay.
- Every effort should be made to perform standard repair. In cases where cutting is waived, the patches will be viewed as temporary with permanent repair work scheduled in Plant Maintenance. This must be limited to spot repairs where motorist safety is the primary goal.
- Roads Impacted by Heavy Industry traffic (Marcellus Shale, mining or quarry operations, timber, etc.) where unforeseen pavement distress is occurring.

### Spray Patching

Spray patching pothole repair is to be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7121-04, "Spray Patch, Manual or Mechanized."

Spray patching is the manual / mechanized repair of potholes using liquid bituminous and aggregate in limited areas. This includes removing loose material, cleaning, and applying liquid bituminous and aggregate onto paved surfaces, including rigid pavements. The liquid bituminous and aggregate is sprayed through a hose/wand and can be applied manually or with the use of specialized equipment.

If a county does not have this specialized equipment, suitable arrangements must be made through the Assistant District Executive for Maintenance to obtain and control equipment. Chapter 18 of this publication (Publication 23, Maintenance Manual) outlines policies and procedures for obtaining specialized equipment that is not owned by the Department.

### CRACK SEALING

Crack sealing shall be done in accordance with [Publication 408, Specifications](#) and [Publication 113, Highway Foreman Manual](#) Performance Standard 711-7128-01, "Crack Sealing – Bituminous Surface."

Crack sealing is crucial to preserving and extending the life of bituminous paved surfaces because it helps prevent water from entering the pavement. When water is introduced to a pavement, further cracking and more extensive damage, such as potholes and base failures, will occur. Crack sealing involves blowing out the debris in the crack or using a saw or router to create a reservoir, then filling with an approved prepackaged material. This activity shall be completed 1 year prior to scheduled overlays, with exception to full width mill and overlay projects.

Only well-defined cracks, 1/4" to 1" in width shall be sealed. Areas which have multiple cracks or cracks less than 1/4" wide should be skin patched. Cracks that vary in width within the prescribed parameters must be sealed along their entire length. Care must be taken not to overlap, run together, or cause a dense amount of sealant to accumulate on the pavement. It is very important to ensure cracks are thoroughly cleaned and dried prior to applying sealant. A hot compressed air lance must be used to dry all damp cracks. Care must be taken to not burn, scorch or damage the pavement.

Routing is a best practice and recommended for transverse cracks and single random cracks when the pavement is less than 5 years old and is not scheduled for resurfacing for at least 2 years. Do not route areas that contain a significant amount of old sealant material. Create a reservoir for sealant material with the router that has the approximate dimensions of 1/2" wide and minimum 1/2" deep. The pavement layer on which cracks are being sealed must be a minimum of 1 1/2" in depth.

Only approved prepackaged sealants are acceptable for use. Refer to [Publication 35](#) (Bulletin 15) for a list of approved materials. Sealant products will not adhere properly if the crack is not clean and dry. It is important to heat and apply the sealant in compliance with the manufacturer specifications, both for quality performance and safety concerns. The temperature limits as listed on the outside of the shipping package or product data sheet must be adhered to at all times.

Cracks must be uniformly filled and sealed. Cracks must be sealed by placing the applicator wand in or

directly over the crack and carefully placing the proper amount of sealant to just fill the crack. Apply the material using a wand applicator. In all circumstances the material must be wiped flush with the pavement surface, leaving a thin film of sealant 1/32" to 1/16" thick and from 1" to 3" wide. Sealant placed in excess of these dimensions must be removed. Do not place sealant when the air temperature is below 40 F or above 90 F, unless approved by the Assistant District Executive for Maintenance.

### SKIN PATCHING

Skin Patching shall be done in accordance with [Publication 113, Highway Foreman Manual Performance Standards 711-7127-01, "Skin Patch – Liquid Bituminous, Manual"](#) or 711-7127-02, "Skin Patch – Liquid Bituminous Mechanized."

Skin patching is the application of a layer of liquid bituminous material and a layer of aggregate to seal limited areas of minor cracking, weathering or raveling. It can be done manually or mechanically. All bituminous materials shall conform to applicable requirements of [Publication 37](#) (Bulletin 25).

All surfaces to be skin patched must be clean of all loose and foreign material. Air, surface, and aggregate temperature must be 60 F or above and rising. Approval for skin patching during cooler weather must be obtained from the District Executive if negative impacts to the pavement or public safety exceed the benefits of waiting for warmer conditions. Skin patching shall not be applied if rain is expected within 24 hours.

Mechanized skin patching will follow the procedure as described below under "Bituminous Treatments, Liquid Bituminous", including weather limitations.

The use of spray patching equipment to address alligator cracking and isolated edge deterioration is also recommended.

### SURFACE TREATMENTS

Liquid bituminous treatments shall be done in accordance with [Publication 408, Specifications](#) and [Publication 113, Highway Foreman Manual Performance Standard 711-7124-01, "Seal Coat, Liquid Bituminous – Mechanized."](#)

A liquid bituminous seal coat is a single application of liquid bituminous material and aggregate. A liquid bituminous surface treatment is the sealing of minor cracking, weathering and raveling over large areas with two applications of a layer of liquid bituminous material and a cover layer of aggregate for each bituminous layer. It should be done before major distress occurs in the pavement. It is a highly effective method of extending the life of bituminous pavements.

All bituminous materials shall conform to applicable requirements of [Publication 37](#) (Bulletin 25). Use Type A Coarse Aggregate AASHTO NO. 8 meeting the requirements of [Publication 408, Specifications](#) Section 703.2. Material finer than No. 200 sieve shall not exceed 1.0 percent. Compatibility testing shall be completed before placement.

If milled asphalt material is used for chip seal aggregate, it is only to be placed on roads with ADT <1000 (two-way) unless the material used is milled, retained, segregated, inventoried and managed in a manner that the Skid Resistance Level (SRL) is known, verifiable and acceptable for the ADT of the route on which it is placed. Note that if the milled asphalt material is comprised of both wearing and binder courses, the SRL cannot be assumed.

Liquid bituminous treatments shall not be used when traffic exceeds 20,000 ADT.

Roadway and shoulder surface treatments are to be completed within the following time restrictions:

Bituminous material should be applied when the entire surface is in a condition to allow satisfactory material

May 1 to September 15	May 1 to October 1
All counties in Districts 1, 2, 3, 4, 9, 10, 11 and 12	All counties in District 6 and District 8
District 5 Counties: Carbon, Monroe, Schuylkill	District 5 Counties: Berks, Lehigh, and Northampton

penetration and adhesion. The material shall be applied when the air, surface, and aggregate temperatures are above 60 F. Do not apply emulsified asphalt if rain is imminent or if freezing temperatures are expected within 24 hours after application. A design shall be prepared and approved by District Materials Engineer/Manager or designee for each route to be treated. The design method in Appendix E of [Publication 27](#) (Bulletin 27) or equivalent computer program shall be used. The design is to be on the job at all times.

Equipment Verification: Prior to the start of any work, Distributors, Chip Spreader and Rubber Tire Rollers shall be verified as outlined in [Form M-214A-F](#), Seal Coat Surface Treatment Equipment Verification Process. Included in [Form M-214A-F](#) are verification documents for each of the three pieces of equipment. Additionally, design application rates for liquid bituminous and aggregates shall be developed by the county, and approved by the District Materials Manager or Designee, as outlined in [Publication 27](#) (Bulletin 27) or equivalent before work begins. Copies of these documents shall be on site and available for review. All completed M-214 forms must be kept on file in the county office for a minimum of 1 year. [Form M-214F](#), Daily Reporting – Seal Coats and Surface Treatments, must be completed daily and shall be placed in county files (electronic or hard copy is acceptable) for a minimum of 7 years.

The bituminous material shall be applied within the specified temperature limits and at a rate within +10% of the design rate, unless field conditions dictate otherwise.

Immediately after application (within 5 minutes) of the bituminous material, begin rolling the aggregate with rubber-tire rollers. Provide a sufficient number of rollers to roll the width of aggregate spread within 5 minutes after the start of rolling. Overlap each pass by one foot with the adjacent roller. Make a minimum of two roller passes over the aggregate between the wheel paths. Roll each pass at a speed of less than or equal to 10 miles per hour to prevent turning over aggregate. Any final rolling shall be done with a rubber tire roller, as specified in [Publication 408, Specifications](#), Section 108.05(c) 3.f. A ground contact pressure of 40-50 psi is required for all rubber tire rollers.

Evaluate the completed seal coat surface one day after completion of the seal coating operations and after final sweeping has been completed. If the surface of the seal coat appears grey with no darkening of the wheel paths and/or the aggregate is less than 50 percent embedded in the asphalt, consider the application of a fog seal as specified in Section 472 Bituminous Fog Seal on New Seal Coat Applications.

Vehicular traffic on the newly completed surface shall be restricted until adequate stability and adhesion have been obtained and the material is sufficiently cured to prevent distortion, flushing of bituminous materials to surface or loss of aggregate. Traffic should be controlled by the use of a pilot vehicle and flaggers or a detour. [Publication 213, Temporary Traffic Control](#) Guidelines, shall be adhered to.

By day's end, hills, curves, and intersections shall be swept of excess aggregate. The entire roadway shall be swept clear of excess aggregate within 24 hours or sooner of the operation and shall be verified. W21-5-1 (Fresh Oil and Chips) signs shall only be removed after an inspection for excess aggregate is completed by a manager or supervisor.

If lane lines or centerlines are covered or destroyed during the day's operations, install temporary "No Pavement Markings" signs (W21-16) throughout the affected area, at the beginning and at intervals not exceeding ½ mile, before terminating work each day. Remove these signs when permanent pavement markings are reinstalled.

Seal coats and surface treatments over newly constructed 19 mm Superpave or FB surfaces may encounter the following problems:

- Excessive Aggregate Whipoff - A newly constructed 19 mm Superpave or FB course is usually open and porous. A substantial amount of the bituminous material is, therefore, absorbed by the FB surface, leaving an insufficient amount to retain the cover aggregate. This results in aggregate whip-off loss just after construction. Due to the openness of the mixes, pipe trench restoration and base repair locations that were finished to grade with 19 mm or 25 mm Superpave may require a higher application rate or a skin patch prior to surface treatment or seal coat.
- Flushing or Bleeding in Wheel Tracks - Since newly constructed 19 mm Superpave or FB surfaces have

not been compacted by traffic, it is possible that NO. 8 cover aggregate could become partially embedded into the surface under traffic. This reduces the protruding thickness of aggregate and the initial application rate of bituminous material later proves to be excessive and cause flushing, especially in wheel paths.

It is recommended that 19 mm Superpave, RAP recycling, and FB surfaces be subjected to three months of warm weather before the application of a surface treatment or seal coat. The surface treatment or seal coat shall be applied within 18 months.

When a liquid bituminous treatment is placed on an existing hot plant mix pavement that is older than one year, the road should be closed to traffic until complete curing is obtained, unless a pilot car is used to control traffic. This work is restricted to the months of June, July and August. Liquid bituminous surface treatment projects are to be programmed on the Notification screen in SAP.

### POST-CONSTRUCTION ISSUE REMEDIATION

Loss of Cover Aggregate is an issue in which the loss of aggregate exposes the underlying bituminous material and presents a flushed surface. The loss of cover aggregate can result from (a) inadequate application rate of bituminous material, (b) inadequate traffic control before the bituminous material cures, (c) use of dusty aggregates, (d) use of excessively damp aggregate (e) improper ratio of aggregate and bituminous material, (f) incompatibility of stone and emulsion, (g) material was placed on a rutted surface and the bituminous material ran to the rutted area and away from the higher areas.

Additionally, flushing or exposed underlying bituminous material may be caused by (a) not following the design application rate in the field, (b) improper evaluation of existing surface condition, (c) neglecting to follow equipment verification procedures as outlined in [Form M-214A-E](#), Seal Coat Surface Treatment Equipment Verification Process (d) the cover aggregate is thin and elongated and not cubical in shape, or (e) material was applied to a previously flushed pavement.

Loss of aggregate cover and flushing are safety concerns and should be addressed as soon as possible. Since the flushing can range from marginal (just a smear on the aggregate) to truly excessive (significant amount of bitumen which can be scraped off the aggregate of the old surface), these measures should be attempted on a trial basis only after an engineering judgment of the situation has been made. The following remedial treatment measures are available as suggested options.

1. For marginal flushing apply clean dry coarse sand on a hot day and roll it immediately. For excessive flushing apply dry NO. 8 aggregate or clean 1/4" size aggregate on a hot day and roll it immediately. Aggregate retention may be improved if heated material is used.
2. Apply precoated NO. 8 aggregate (preferably using PG 64-22) on a hot day and roll it immediately. If heated aggregate is used, the temperature range with PG 64-22 should be in the 300F - 350F range.
3. Apply a bituminous overlay over the flushed pavement.

### MAINTENANCE PAVING

Paving shall be done in accordance with [Publication 113, Highway Foreman Manual](#) Performance Standard 711-7135-01 "Mechanized Paver Finisher Paving."

Paving is the application of hot or warm bituminous plant mix material in a uniform lift of approximately 3/4" to 1 1/2" in compacted depth over the full roadway width and placed on a prepared surface over extended lengths of roadway in excess of 500 feet. The intent of paving is to achieve a finished wearing course and additional surface applications are not normally anticipated in the immediate future. Department Force or contract work in this activity is limited to applying FJ-1 or FJ-1C to a compacted depth of 1"; or 9.5 mm Fine-Graded (FG) Superpave mixes applied to a compacted depth of 1"; or 9.5 mm Superpave Mix applied to a compacted depth of 1 1/2".

Cool or cold weather will adversely affect the performance and compaction of paving; hence, the air and surface temperature shall be 40F and rising and the work shall be restricted to the time periods according to [Publication 408, Specifications](#), Section 409.3(b).

To achieve adequate density, rolling patterns must be established and compaction must begin as soon as possible after placement of the hot mix/warm mix and be completed before the mat cools to 175 F. Density testing shall be ongoing as the operation progresses to ensure that rolling patterns are sufficient.

FJ-1 and FJ-1C material is restricted to high type bituminous surfaces, with speed restrictions of 40 MPH or less in primarily urban type areas. This work is to be accomplished in accordance with [Publication 408, Specifications](#), Section 422. 9.5 mm Superpave FG material is used on high type bituminous surface roadways and is applied in accordance with [Publication 408, Specifications](#) Section 410.

Prior to the application of hot or warm bituminous plant mix wearing courses, all surface defects must be carefully studied and repaired. Charge roadway preparation work (such as pothole patching, skin patching, sealing cracks in excess of 1/4" wide, base failure repairs, etc.) to the appropriate assembly code. Particular attention should be given to removing wheel path ruts of 1/2" or greater with a scratch or leveling course.

Notches are required to be cut at the limits of the project and intersecting roads per the Maintenance Manual, Chapter 7 and a tack coat applied for all applications in accordance with Section 460 of [Publication 408, Specifications](#).

This work shall be scheduled on the M-213 program.

Before terminating work each day, all centerlines, lane lines and edge lines covered or destroyed during paving activity shall be replaced, in accordance with [Publication 408, Specifications](#), Section 901.3, on roadways that satisfy either of the following:

- Roadway has an Average Daily Traffic (ADT) of 6,000 vehicles or greater.
- Two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

Replacement of pavement markings covered or destroyed by paving are optional on roadways that do not meet either of the conditions listed above. If the pavement markings will be replaced on these roadways at a later date, install No Pavement Markings (W21-16) signs at intervals not exceeding ½ mile in each direction of travel. The roadway must be repainted no more than 14 days after paving completion and the No Pavement Markings signs removed after standard pavement markings have been applied. Any changes made to signing or line placement must be approved by the District Traffic Unit to ensure conformance with applicable law, regulation, and policy. Standard pavement markings are shown in [Publication 111, Traffic Control](#) and the Federal Manual on Uniform Traffic Control Devices (MUTCD).

Compaction density testing is required on all Leveling and Paving courses that are greater than or equal to 1" in depth or greater than or equal to 110 pounds per square yard per inch. Use of a non-nuclear or nuclear testing gauge must be on-site and used to measure density throughout the project. A minimum of 92% density must be achieved and verified by using the testing gauge during the course of the operation, and field adjustments made to achieve maximum possible density. If the target density is not achieved, establish a new optimum rolling pattern, documenting it on [Form TR-4276C](#), Optimum Rolling Pattern. Documentation must be on site and include roller size and type, as well as rolling pattern and the optimum number of passes identified according to the type of roller. Testing gauge must be recalibrated annually as well as at the time of any repair if needed. Proof of recalibration must be maintained and available upon request.

When maintenance paving or leveling courses are placed, it is necessary to evaluate the drop off condition of the pavement edge. Pavement edges not in compliance with Publication 23, Chapter 5, require the deployment of signs and warning devices in accordance with [Publication 408, Specifications](#), Section 901, while there is a drop off condition. Shoulder back up must be placed within 14 days of the last day of paving on a project.

### TRAVELING BITUMINOUS PLANT MIX (MIXER PAVER)

This activity is the placement of a traveling plant mixed bituminous material having a compacted depth of 1" (approximately 110 pounds per square yard) for FB-1 Wearing Course and having a compacted depth of 2" (approximately 220 pounds per square yard) for FB-1 Binder Course.

All bituminous materials shall conform to the requirements of [Publication 37](#).

PG 64-22 . . . . .Asphalt Cement

PG 58-28 . . . . .Asphalt Cement

PG 52-28 . . . . .Asphalt Cement

PG-46-40 . . . . .Asphalt Cement

MS-2 . . . . .Emulsified Asphalt

CMS-2 . . . . .Emulsified Asphalt

SS-1 . . . . .Emulsified Asphalt

HFMS-2h . . . . .Emulsified Asphalt

Aggregates shall meet the requirements for fine aggregate Type A, [Publication 408, Specifications](#), Section 703.1.

This activity shall be done in accordance with Section 439, "BITUMINOUS WEARING COURSE FB-1", and Section 440, "BITUMINOUS BINDER COURSE FB-1" of [Publication 408, Specifications](#).

While the FB-1 surface is still tacky and before opening to traffic it is mandatory to spread fine aggregate at the rate of 3-5 pounds per square yard, roll and then sweep remaining loose fine aggregate.

The use of FB-1 Wearing Course or Binder Course is restricted to flexible or rigid base roads carrying light to medium traffic (<1,500 ADT).

It is recommended that 19 mm Superpave and FB surfaces be subjected to three months of warm weather compaction before the application of a surface treatment or seal coat. The surface treatment or seal coat should be applied within one year.

Programmed traveling bituminous plant mix projects shall be documented on the notification screen. For additional information refer to [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7123-01 "Bituminous Surface Mixer Paver".

### MICRO-SURFACING

Micro-surfacing shall be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7124-03, "Slurry Seal & Ralumac & Novachip".

Micro-surfacing is a thin surface paving system composed of polymer-modified emulsion, crushed aggregate, mineral filler, water, and field control additives as needed. Micro-surfacing can be utilized for preventive maintenance and surface rehabilitation on both low and high ADT pavements. Its uses include texturing, sealing and rut filling. This work is to be accomplished according to [Publication 408, Specifications](#), Section 483.

### ULTRA-THIN BONDED WEARING COURSE

Ultra-thin bonded wearing course is a paver placed seal/wearing course of open-graded, plant mixed, bituminous concrete placed on a polymer modified asphalt emulsion tack/seal coat. This work is to be accomplished according to [Publication 408, Specifications](#), Section 489.

## THIN BONDED CONCRETE OVERLAY OF ASPHALT PAVEMENT

Thin Bonded Concrete Overlay of Asphalt Pavement (Thin BCOA) is a process where a thin layer of concrete (2.5-4 in.), usually high strength and fiber reinforced, is placed over a prepared surface of distressed asphalt. The Thin BCOA utilizes short joint spacing and bonds to the underlying asphalt surface. The underlying asphalt surface must be a minimum of 3 inches thick after preparation.

Thin BCOA provides a durable wearing surface for a variety of applications which include low volume roads, intersections and ramps where rutting, shoving, slippage and thermal cracking are occurring.

Thin BCOA can be placed and opened to traffic within 24 hours by using an accelerated concrete mix. This work is to be accomplished according to [Publication 408, Specifications](#), Section 523 and [Publication 242, Pavement Policy Manual](#), Table 10.10.

## MECHANIZED PATCHING

Mechanized patching shall be performed according to [Publication 113, Highway Foreman Manual](#), Performance Standards 711-7221-01, "Patching – Tow Paver" or 711-7122-02, "Patching – Mechanical – Mixer Paver" or 711-7122- 03, "Patching – Mechanical – Paver Finisher", 711-7122-04 "Patching – Edge – Mechanical, or 711-7122-05 "Mechanized Patching with a Miller & Widener."

Mechanized patching is intended to repair small areas, less than 500 feet, of severe weathering or raveling, block cracking and multiple shallow potholed areas. This work shall be done in accordance with Section 409, of [Publication 408, Specifications](#). Superpave material thicknesses shall comply with [Publication 242, Pavement Policy Manual](#), Table 9.5.

Mechanized patching projects completed with a finish paver shall be documented on the notification screen in SAP as well as the M-213 Program and be reviewed and approved by the Assistant District Executive for Maintenance.

Time restrictions for mechanized patching shall conform to [Publication 408, Specifications](#), Section 409.3(b).

Any rutting greater than ½" and not flushed, must be tack coated and a thoroughly compacted leveling course applied to fill the ruts and level the surrounding pavement.

Any full width mechanical patch located on a curve or within braking distance of an intersection as well as all full width patches longer than 50' must meet the current SRL requirements as listed in Table 5.4, [Publication 242, Pavement policy Manual](#).

Department Force or contract work in this activity is limited to applying FJ-1 or FJ-1C to a minimum compacted depth of 1"; or 9.5 mm Fine-Graded (FG) Superpave mixes applied to a minimum compacted depth of 1"; or 9.5 mm Superpave Mix applied to a minimum compacted depth of 1 1/2".

A paving notch is to be used at each end of a full width patch of 1" or greater depth.

Tack coat shall be applied in accordance with [Publication 408, Specifications](#), Section 460, on all Superpave material and FJ mechanized patching projects.

Temporary pavement markings may be required per [Publication 408, Specifications](#), Section 901.3.

## BASE REPAIR

Base repair shall be done in accordance with [Publication 408, Specifications](#) Section 316, and [Publication 113, Highway Foreman Manual](#), Performance Standards 711- 7126-01, "Base/Sub-Base Repair Flexible Base – Light Duty"; 711-7126-02, "Base/Sub-Base Repair Flexible Base – Heavy Duty"; 711-7126-03, "Base/Sub-Base Repair Rigid Base"; or 711- 7126-04 "Base/Sub-Base Repair, Mechanized (Widener)."

Base repair is intended to repair fatigue cracked, potholed or distorted pavement sections and restore the structural integrity of the pavement. Every effort should be made to make repairs with material similar in type and thickness to existing material to provide proper drainage and avoid trapping water due to inconsistent layers in the pavement. Each project must be evaluated to determine the cause of existing base failures and the type of repair necessary to correct them.

The area to be repaired needs to be marked and saw cut or milled. All distressed material within the marked area must be removed to sound material. The existing subgrade or subbase must be compacted before placing the base course material.

## LEVELING

Leveling is the application of bituminous material over extended lengths of roadway to correct surface distortions such as irregular cross section or wheel path rutting. Leveling courses are normally followed by additional surface applications of bituminous material; either a sealcoat (oil and chipping) or maintenance paving in the same or subsequent construction season. Thinner applications of leveling are sometimes referred to as a scratch. Reference [Publication 242, Pavement Policy Manual](#), Table 10.5 for Superpave thickness requirements. All applications of bituminous material placed to correct surface distortions such as irregular cross section or wheel path rutting in excess of 500 feet in continuous length shall be charged to Leveling (711-7131). Application of short sections of bituminous material less than 500 feet in length shall be charged to Mechanized Patching 711-7122. Leveling projects shall be planned and approved by the Assistant District Executive for Maintenance on the organization's M-213 program.

Materials such as 9.5mm Superpave, 9.5mm Fine Grade Superpave, FJ, and FB-1 and FB-2 Wearing courses are used as leveling courses to remove surface distortions such as minor wheel rutting and is intended to prepare a roadway for the application of a uniform wearing course or surface treatment.

Materials such as FB-1 and FB-2 Binder Course, and 19mm Superpave Binder Course are used as leveling courses to provide additional structural support, establish cross slope, and to remove surface distortions.

Prior to the placement of maintenance paving, particular attention should be given to removing wheel path ruts of 1/2" or greater with a scratch or leveling course. The depth of leveling will vary according to field conditions. Wheel rutting greater than 1/2" may affect the ability to achieve density of the leveling course, engineering judgement should be used to determine appropriate treatment.

The application of the leveling course is to be a separate and distinct operation and placed in a similar manner as a wearing or binder course, including proper tacking and compacting as per [Publication 408, Specifications](#), Section 460 and 409.3(h).

Prior to the placement of scratch or leveling, base repair must be completed to provide a stable base when necessary. Binder courses are not capable of bridging pot holes, or distress requiring base repair, and if left untreated will cause premature failure of the bituminous material.

Compaction density testing is required on all leveling and paving courses that are greater than or equal to 1" in depth or greater than or equal to 110 pounds per square yard per inch. Use of a non-nuclear or nuclear testing gauge must be on-site and used to measure density throughout the project. A minimum of 92% density must be achieved and verified by using the testing gauge during the course of the operation, and field adjustments made to achieve maximum possible density. If the target density is not achieved, establish a new optimum rolling pattern, documenting it on [Form TR-4276C](#). Documentation must be on site and include roller size and type, as well as rolling pattern and the optimum number of passes identified according to the type of roller. Testing gauge must be recalibrated annually as well as at the time of any repair if needed. Proof of recalibration must be maintained and available upon request.

Before terminating work each day, all centerlines, lane lines and edge lines covered or destroyed during paving activity shall be replaced, in accordance with [Publication 408, Specifications](#), Section 901.3, on roadways that satisfy either of the following:

- Roadway has an Average Daily Traffic (ADT) of 6,000 vehicles or greater.
- Two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

Replacement of pavement markings covered or destroyed by paving are optional on roadways that do not meet either of the conditions listed above. If the pavement markings will be replaced on these roadways at a later date, install No Pavement Markings (W21-16) signs at intervals not exceeding ½ mile in each direction of travel. The roadway must be repainted no more than 14 days after paving completion and the No Pavement Markings signs removed after standard pavement markings have been applied.

Standard pavement markings are shown in [Publication 111, Traffic Control](#) and the Manual on Uniform Traffic Control Devices (MUTCD).

When maintenance paving or leveling courses are placed, it is necessary to evaluate the drop off condition of the pavement edge. Pavement edges not in compliance with Publication 23, Chapter 5, require the deployment of signs and warning devices in accordance with [Publication 408, Specifications](#), Section 901, while there is a drop off condition. Shoulder back up must be placed within 14 days of the last day of paving on a project.

### JOINT REPAIR

Joint repair is the correction of tented joints and blowups on bituminous overlaid concrete pavement. The entire depth of pavement structure is removed and replaced with bituminous concrete. This is considered to be a temporary repair.

Temporary joint repair shall be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7126-03, "Base/Sub-Base Repair – Rigid Base".

For additional information refer to Section 309, [Publication 408, Specifications](#) and [Publication 113, Highway Foreman Manual](#), Performance Standard 711--7126-02, "Base/Sub-Base Repair Flexible Base – Heavy Duty".

### MILLING

Milling is the removal of a pavement surface through the use of a milling machine and is performed when the pavement surface is old or deteriorated, but the underlying structural layers are still sound. The depth of milling will vary depending on the type of distress or the intended layer depth to be replaced on the milled surface. "Mill and Fill" is a common term for when a pavement layer is milled off and new material is placed on the milled surface. Milling and replacing the existing surface is an important method of pavement preservation because it helps preserve the underlying pavement layers by keeping water out. Areas with limited vertical clearance (such as under a bridge), urban settings with curbs and fixed utility alignment requirements, and severely deteriorated bituminous pavement layers are all examples of roadways that may require milling prior to placing a new surface.

### WIDENING

This activity is the widening of roadways with deficient pavement width. The width criteria in Appendix A of this chapter, (Chapter 7 of Publication 23, Maintenance Manual) should be used to determine the minimum desirable width.

Work accomplished by Department Forces or Contract projects shall be approved in advance by the Assistant District Executive for Maintenance and scheduled on the M-213 program.

If both sides of the roadway are to be widened, it shall consist of a minimum of 2 feet on each side. Partial lane widening (< 10 ft.) shall match pavement type and depth.

Full lane additions ( 10 ft.) shall match existing pavement type and depth unless circumstances dictate heavier traffic loadings for the additional lane; then design for actual traffic shall be approved by the District Pavement Engineer/Manager. When changing pavement layer thicknesses, check that drainage is adequately provided throughout the pavement cross-section.

### Widening of Cement Concrete Pavements

If the existing pavement has a surface or base consisting of cement concrete pavement, widening or lane additions shall be in accordance with [Publication 242, Pavement Policy Manual](#) Chapter 4.8 and the following, unless waiver is granted by the Pavement Design and Analysis Unit of Central Office:

1. Bituminous material may be used, without waiver request, if the cement concrete pavement:
  - A. was constructed prior to 1945 or
  - B. has non-uniform depth, or

- C. has depth less than 9 in., or
  - D. carries no more than 40 trucks per day
2. Class AA cement concrete shall be used.
  3. Widening of plain cement concrete pavement shall be constructed with plain cement concrete. Reinforced concrete pavement may be widened with either reinforced or plain cement concrete pavement.
  4. Lane additions and widening shall be tied to the existing pavement with steel reinforcement tie bars.
  5. If the future traffic pattern supports the flow of traffic diagonally crossing the longitudinal joints, consider removal and replacement of slabs involved.
  6. Transverse joints spacings for the widening or lane addition are as follows:
    - A. Plain Concrete - 15 ft. joint spacing all depths
    - B. Reinforced Concrete - 30 ft. joint spacingTransverse joints on the widening or lane addition shall be aligned with those on the existing pavement, and intermittently as needed to most closely match these defined spacings.
  7. This work shall be charged to assembly 711-7136-02 (Pavement Widening Cement Concrete).

### Widening of Bituminous Pavements

If the existing pavement consists of full-depth bituminous material, widening or lane additions shall be in accordance with [Pub 242, Pavement Policy Manual](#), Chapter 5.11 and as follows.

1. Either Reclaimed Asphalt Pavement (RAP), or 25 mm Superpave Mix may be used for widening. Aggregate Bituminous Base Course (ABBC) may be used in lieu of RAP with approval of the District Executive.
2. If RAP material is used, the depth of the widened pavement shall match the existing pavement depth or be a minimum of 6 inches, whichever is less. A mix design is recommended. Only clean RAP may be used and the widened area shall be sealed during the same construction season. (See [Publication 27](#) (Bulletin 27), Chapter 2, Section 6 for the mix design process.)
3. The depth of the widened pavement when using 25 mm Superpave shall match the depth of the existing pavement using one or more lifts according to Table 9.5 of [Publication 242, Pavement Policy Manual](#).
4. The work shall be done in accordance with Sections 210, "SUBGRADE"; Section 341, "COLD RECYCLED BITUMINOUS BASE COURSE"; Section 409, "PLANT-MIXED BITUMINOUS CONCRETE COURSES"; and Section 320, "AGGREGATE BITUMINOUS BASE COURSE" of [Publication 408, Specifications](#) and applicable special provisions.
5. This work shall be charged to either assembly 711-7136 (Roadway-Pavement Widening with B.C.B.C.) or 711-7137 (Roadway Pavement Widening with Recycled Material).

### Bituminous Recycling

Bituminous recycling shall be performed according to [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7133-01, "Recycling – Bituminous, Mechanized Mobile Plant".

Bituminous recycling is the restoration of the cross section of a severely distressed pavement by the milling and recycling of the milled material into the pavement and/or shoulder reconstruction. It also provides a uniform surface and maintains profile for resurfacing and reduces the thickness of shoulder reconstruction. The amount of milling may vary depending on the type of distress identified.

Reclaimed Asphalt Pavement (RAP) is the product of asphalt pavement that may include surface treatments which are milled. Clean RAP is such material that is free of subbase, dirt, soil, or other contaminants. Milling

travel lanes for overlays should always yield clean RAP.

Contaminated RAP is milled asphalt pavement mixed with materials such as subbase or soil. Milled shoulder material, widening or base repairs may include contaminated RAP if the milling extends beyond the depth or width of the asphalt pavement. Do not co-mingle clean and contaminated RAP material.

The milled material also is received, issued, and tracked appropriately through the use of SAP Plant Maintenance. The recorded data is then used to assist in the planning of Department Force work, including RAP paving and seal coat using recycled chip stone extracted from the milled material.

Each District will maintain a plan to account for all milled asphalt pavement material retained by County Maintenance Organizations and provided to contractors as part of construction contracts. A template for each District to copy and maintain is provided at the following location:

P:\penndot shared\Bureau of Maintenance and Operations\Asset Management Division\District RAP Plans

Information is to be entered into the "Retain" and "Use" worksheets; the "Summary" worksheet will update automatically. Each March, the plan is to be updated to account for all projects with milling items ([Publication 408, Specifications](#), Sections 491 and 492) to be constructed in the upcoming construction season.

For guidance regarding the environmental regulations pertaining to the recycling of bituminous pavement products, refer to [Publication 611, Waste Management Guidance Manual](#), Section 9.0.

Only clean or uncontaminated milled asphalt material is to be used in RAP for paving roadways or shoulders. Additionally, unbound milled asphalt material should not be used as part of a pavement/shoulder structure. This work includes widening, shoulder upgrades, cold recycling and full depth reclamation. The use of clean millings for roadway shoulder back up and fill activities is acceptable (cannot be used as site fill). If used for shoulder back up, it must be sealed within the same construction season it was placed.

A mix design is recommended when RAP is used as part of a pavement/shoulder structure. This includes widening. (See [Publication 408, Specifications](#) Section 342, Cold Recycled Bituminous Base Course, Central Plant Mix and Section 341, Cold Recycled Bituminous Base Course, Cold-In-Place. Both of these specifications define a mix design process and equipment to measure the proper amount of emulsified asphalt and mixing. See [Publication 27](#) (Bulletin 27), Chapter 2, Section 6 for the mix design process.)

There is value in the asphalt material contained in milled asphalt material, and it is recommended that usage takes advantage of that value. It is preferred to not use this material as trench backfill or subbase material beneath pavement and/or base repair. Milled asphalt material does not provide proper drainage of aggregate subbase, increasing the possibility of poor drainage and premature failure.

If milled asphalt material is used for chip seal aggregate, it is only to be placed on roads with ADT <1000 (two-way) unless the material used is milled, retained, segregated, inventoried and managed in a manner that the Skid Resistance Level (SRL) is known, verifiable and acceptable for the ADT of the route on which it is placed. Note that if the milled asphalt material is comprised of both wearing and binder courses, the SRL cannot be assumed.

## **OPERATIONS AND MAINTENANCE PRACTICES FOR POROUS PAVING SYSTEMS**

Porous pavement consists of a pervious surface course underlain by a uniformly graded stone bed that provides temporary storage for peak rate control and promotes infiltration. The surface may contain porous asphalt or porous concrete on soil that is not compacted. Porous, permeable and pervious are all names for this kind of pavement. They are best used in areas where they will not be subject to high traffic volumes, heavy loads or high rates of speed. These locations include park-and-rides, not including the bus lane, parking lots, pull-offs, bicycle and walking paths, and sidewalks.

### **MAINTENANCE**

Periodic maintenance is required to keep these systems functioning as designed. The lack of maintenance can lead to the system becoming clogged with debris. If the system becomes clogged it may experience premature failure from freeze thaw action.

## 1. Creating a Maintenance Plan

The first step in creating a maintenance plan is to determine the infiltration rate of the system. This should be performed and documented as soon as possible after the installation and before the pavement goes into service. This can be performed using a single ring infiltrometer test. (ASTM C1701 is specific to the Concrete Industry but a similar procedure can be used for any type of pavement.) This should be performed in three locations for every 25,000 square feet and an average taken of the three procedures. A simple drawing of these locations should be made and kept on file for future reference. A change in the infiltration rate will determine the appropriate frequency of maintenance. It is recommended that the testing should be performed prior to application of any winter services/treatments when the temperature is above freezing, and again in the spring after all winter services/treatments have been applied.

## 2. Maintenance

Three levels of maintenance are described below. Note that more frequent maintenance typically allows for a lesser level of maintenance activity to be applied to keep the system open, thereby reducing maintenance costs.

- Routine: Include visual inspection of the porous paving to ensure that it is clean of debris and sediments and that it will dewater between storms. Routine maintenance would include blowing with a leaf blower or similar equipment, truck sweeping or dry vacuuming.
- Periodic Maintenance: In areas that see freezing temperatures, maintenance should be performed just before winter to ensure that the voids in the pavement are clean and free of materials that may inhibit draining and therefore could contribute to freeze-thaw damage. Periodic maintenance would include pressure washing and/or vacuuming with either a dry vacuum or a regenerative vacuum sweeper. Care should be taken not to damage the surface with high pressure washing equipment.
- Deep Cleaning/Unclogging: Over time, deep cleaning/unclogging may become necessary if routine periodic maintenance is not performed and the void structure becomes clogged with debris. Typically an average infiltration rate decrease of 25% from the initial baseline value triggers the need for deep cleaning/unclogging. Specialized equipment that incorporates water pressure and vacuuming are used for deep cleaning/unclogging.

## 3. Maintenance Log

A maintenance log for pervious pavements, as illustrated in [Publication 584, Drainage Manual](#), should be completed to document the following:

- Date of Service
- Name of individual/company performing the service
- Type of maintenance performed
- Amount (Lbs.) and types of sediment/debris/other material removed as a result of cleaning
- General observations and record of pavement condition
- Infiltration rate before and after the cleaning from the original locations documented prior to placing the pavement into service.

## 4. Winter Maintenance

The following recommendations should be followed:

- Anti-icing pre-treatments should not be used on porous pavements. If they are used on adjacent pavements, care should be taken to prevent the adjacent runoff from infiltrating the porous pavement.
- Deicing chemicals containing the following should not be used: Magnesium Chloride, Calcium Magnesium acetate, or potassium acetate, ammonium sulfate, ammonium nitrate.
- Sodium or Calcium Chloride anti-skid can be used after the first year in service. If deterioration is noted, discontinue use of this treatment.

- Anti-skid may be applied with the understanding that vacuum cleaning must be performed after the winter season.
- Snowplowing can be performed with trucks outfitted with plows with a polyurethane blade edge. Snow blowers are preferred.
- Snow removal should not be performed using front end loaders or skid loaders by either scooping or back dragging.

Porous pavements should not be used as a storage area to pile anti-skid or snow from plowing operations as this will clog the surface and will also likely contain high amounts of deicing chemicals.

## FULL DEPTH RECLAMATION

Full-depth reclamation(FDR) is a pavement rehabilitation technique in which the full flexible pavement section and a predetermined portion of the underlying materials are uniformly crushed, pulverized or blended, and then graded and compacted to provide a smooth, strong, stabilized base course. Further stabilization may be obtained through the use of available stabilizers such as asphalt, Portland Cement, fly ash and lime. The selection of FDR stabilizers is based on the soil type, percent passing No. 200 sieve, and plasticity index. FDR not only preserves the investment in in-situ materials, but also resolves the issues and minimizes the costs of material disposal normally associated with conventional pavement reconstruction practices. FDR provides an effective and sustainable way to recycle the existing pavement. FDR does not resolve or address subgrade drainage issues and drainage shall be addressed separately, prior to the FDR work.

The Department has experience with FDR dating back many years. However, a research project was initiated in 2010 to comprehensively investigate the subject, and develop detailed processes and procedures for use by the Department. The resulting details of the processes and procedures for conducting FDR projects are contained in [Publication 242, Pavement Policy Manual](#), and construction requirements are contained in [Publication 408, Specifications](#), Section 344, Full Depth Reclamation. Appendix J of [Publication 242, Pavement Policy Manual](#) is the document “Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide,” which discusses the various options for FDR, project selection guidelines, mix design methods, and construction procedures. Maintenance forces are required to follow the guidelines and criteria provided in these reference documents. The FDR process is illustrated in Appendix C at the end of this chapter. Specific references for carrying out the steps outlined in the process flowchart are:

Project Selection - Appendix J of [Publication 242, Pavement Policy Manual](#), Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide, Chapter 2, Evaluation and Assessment of the Roadway.

Mix Design – Appendix J of [Publication 242, Pavement Policy Manual](#), Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide, Chapter 3, Design. For mechanical stabilization design using asphalt and for Full Depth Reclamation, refer to [Publication 27](#) (Bulletin 27).

Pavement Design - [Publication 242, Pavement Policy Manual](#), Section 3.1.5, 5.12 and Appendix J Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide, Chapters 2.5, Determine Layer Thickness and Drainage Conditions, and 6, Surfacing.

Construction - Appendix J of [Publication 242, Pavement Policy Manual](#), Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide, Chapter 4, Construction, and [Publication 408, Specifications](#), Section 344, Full Depth Reclamation.

QC/QA – Appendix J of [Publication 242, Pavement Policy Manual](#), Standards and Specifications for Full Depth Pavement Reclamation: A Best Practices Guide, Chapter 5, Quality Assurance/Performance Measurement.

## RECONSTRUCTION

This activity is the complete reconstruction of a section of road to upgrade the structural capacity or to improve safety.

There are several cases where complete removal of the existing pavement section down to the subgrade may

be warranted. Complete removal and replacement is needed if the pavement is badly deteriorated, grade restrictions prevent raising the pavement surface with an overlay, or weak subgrade may be contributing to the poor pavement performance such that correction by undercutting and backfill is required. At the time of reconstruction, drainage must also be addressed. Complete removal and replacement provides the most uniform and stable pavement section while keeping grade adjustments to a minimum. However, it is usually a costly method of reconstruction.

### **TACK COAT**

A tack coat is a spray application of emulsified asphalt material applied to the road surface prior to placement of hot plant mix bituminous material. The purpose of a tack coat is to ensure adhesion between the existing surface and the new course being applied.

A tack coat is to be applied prior to placement of all leveling courses, wearing courses, mechanized patches or pothole repairs. Exceptions can be approved in writing by the Assistant District Executive for Maintenance in instances when a wearing course is placed immediately over newly laid, clean and dry leveling course. Tack coat is also required when micro-surfacing over an existing concrete roadway.

A tack coat is not required when placing the following: FB-1, FB-2, cold mix or when placing micro-surfacing over an existing bituminous surface.

The most common emulsified asphalt materials used for tack coat are TACK and NTT/CNTT, and shall be applied in accordance with [Publication 408, Specifications, Section 460](#).

During construction of the longitudinal joint, paint the vertical face of the previously placed lane with a very thin coating of emulsified asphalt tack coat material (TACK) or the same type of oil used in the bituminous pavement prior to placing the abutting lane.

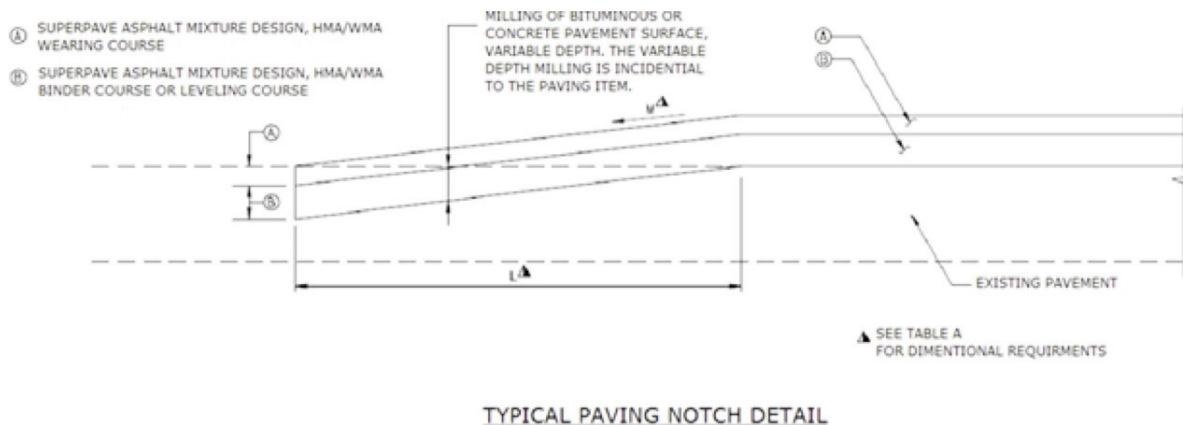
Synthetic Resin Tack Coat (SRTC) is approved solely for use as a pothole tack coat. SRTC contains approximately 50% mineral spirits which can have a flash point as low as 100F. Suitable safety precautions are mandatory at all times when handling this material. Open flames or sparks must not be permitted close to this material or the non-pressurized backpack sprayer that is used to apply this material.

SRTC also releases undesirable Volatile Organic Compound (VOC) emissions into the atmosphere which adversely affect air quality, and therefore the use of this material is to be restricted to pothole patching when other suitable tack coat materials are not available. Air quality is monitored by and is under the regulation of the Environmental Protection Agency (EPA).

### **PAVING NOTCH**

The purpose of a paving notch is to provide a smooth transition between the existing pavement and the new bituminous pavement course being placed and also to prevent raveling which is common with a feathered edge.

Paving notches shall be constructed at the beginning and end points of the paving and at intersecting roads when placing hot plant bituminous mix material at a depth of 1" or greater. This applies to Paving (711- 7131) and Mechanized Patching (711-7122) operations.



**NOTES**

1. USE HIGHER APPROPRIATE CRITERIA IF A CROSS STREET HAS A FUNCTIONAL CLASSIFICATION OF COLLECTORS AND LOCAL ROADS OR HIGHER.
2. USE 85th PERCENTILE SPEED, IF AVAILABLE. OTHERWISE, USE THE POSTED SPEED.
3. PLACE EDGE FLUSH WITH EXISTING PAVEMENT AND SEAL AS SPECIFIED IN PUBLICATION 408, SECTION 409.3(k)3.

**TABLE A**

FUNCTIONAL CLASSIFICATION	SLOPE M (MAXIMUM)	PAVING NOTCH L (MINIMUM)
INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS	0.17% (1" IN 50')	50'
ARTERIALS > 45 MPH SEE NOTE 2	0.28% (1" IN 30')	30'
ARTERIALS ≤ 45 MPH SEE NOTE 2	0.33% (1" IN 25')	25'
COLLECTORS AND LOCAL ROADS	0.33% (1" IN 25')	25'
CROSS STREETS SEE NOTE 1	8.33% (1" IN 12')	1'

Paving notches must be constructed using a grinding/milling machine to make a cut in a triangular shape in accordance with the standard drawing, "Typical Paving Notch Detail" for ADT less than 20,000. For ADT greater than 20,000 and on Interstates, use the current [Publication 72M, Roadway Construction \(RC\) Standards](#).

The depth of the notch should be a minimum of 1" or the depth of the wearing course being applied if greater than 1". A notch that is cut too deep should be repaired by placing a layer of bituminous mix material in the overcut notch and compacting to the desired triangular shape.

The minimum length of the notch is 25' for the main line and one foot for intersecting cross streets and at intersection of driveways as necessary.

A notch is not required on stabilized roads or when using FB material.

A tack coat shall be applied to the surface including vertical face of the notch prior to placement of the bituminous material. After compaction, evenly apply the sealant a minimum of 6 inches on both sides of the joint.

**7.4 RIGID PAVEMENT MAINTENANCE**

The goal of rigid pavement maintenance is to maintain a smooth riding pavement, without a bituminous overlay, for as long as possible. This is accomplished by:

1. Emphasis on joint sealing, permanent joint spall repair, concrete patching, and surface spall repair.
2. Slab jacking of settled slabs before more serious failures occur.

**ROUTINE MAINTENANCE**

Routine surface maintenance activities are those which are done primarily by Department Forces to provide preventive maintenance and otherwise maintain the integrity of the pavement until a surface improvement is required and programmed. They are activities that are included in the Long Term Plan and scheduled on the Work Order.

## STANDARDS OF CARE FOR POTHOLE PATCHING AND SURFACE REPAIR

Paved surfaces on our network must be maintained to meet our standards of care. Pothole Repairs are to be completed on a priority basis by the following dates:

Pothole Patching	Maintenance Activity	Activity Target Completion Date
Interstate Highways	Springtime Repair	End of April
Non-Interstate NHS Highways	Springtime Repairs	Memorial Day
Non-NHS Highways	Springtime Repairs	End of June

Pothole repairs shall be made throughout the year, whether they are observed by the Department or reported through the Customer Care Center or 1-800-FIX-ROAD. Therefore, it is important that appropriate resources are in place so that pothole repairs can be scheduled and completed in a timely manner, in conjunction with all other maintenance tasks. County Maintenance Organization plans shall contain a pothole schedule and repair work is to be completed correctly, with properly staffed and equipped crews, in accordance with [Publication 113, Highway Foreman Manual](#), Maintenance Performance Standards. When scheduling pothole repair work, roads with the highest Average Daily Traffic (ADT) should be prioritized first, followed by lower volume roads and other maintenance work such as shoulder cutting and grading, bridge maintenance, surface treatment and guiderail work.

### POTHOLE PATCHING

Pothole Patching shall be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7121-01 "Manual Patching - Standard".

This activity includes the preparation and patching of potholes and deteriorated concrete in concrete pavements. The potholes normally occur along cracks and longitudinal or transverse joints, and may extend the full depth of the slab.

Bituminous pothole patching of concrete pavements by Department Force is considered to be temporary patching. The procedure for making these temporary patches is different from permanent patching done on bituminous surfaces. Squaring and cutting of the hole is not required.

Potholes shall be thoroughly cleaned. All loose and broken concrete shall be removed and the hole blown clean and dried with compressed air.

The clean, dry surface shall be tacked with an approved tack coat material in accordance with Section 460.3(b), [Publication 408, Specifications](#). Tack coat is to be used with hot mix/warm mix patching materials. Synthetic resin tack material shall only be used on dry surfaces and applied with an approved applicator. After the tack coat has been applied and allowed to cure, the bituminous material is to be placed in lifts not exceeding 6" in compacted depth when using 25 mm Superpave Mix or 4.5" in compacted depth when using 19 mm or 2" when using 9.5 mm Superpave Mix (in compliance with [Publication 242, Pavement Policy Manual](#) Table 9.5). The material in each lift must be worked into the corners.

After leveling, each lift must be compacted with an approved mechanical tamper. Care must be taken when placing the last lift to ensure that, after compaction, the surface of the patch matches the surrounding pavement.

It is not necessary to edge seal bituminous patches in concrete pavement.

### SURFACE REPAIRS

Surface repairs are those made to restore the riding surface of the pavement. Primarily, they are repairs of surface spalls, popouts and scaling. Spalls and popouts are surface defects that occur in the slab away from a joint. Generally, they are circular in shape and extend down to the reinforcing steel. Spalls may be

temporarily repaired with the standard bituminous patching procedures previously described for pothole patching on rigid pavements. An alternate procedure is the spray patch method, which may be used on Type 3 concrete pavements. A spray patch is made by filling the hole with alternate layers of a liquid bituminous material, such as RS2, CRS2 and NO. 8 or NO. 9 aggregate. The spalled area must be thoroughly cleaned and dry (the hole may be damp when emulsions are used). Saw cutting is not required. A thin film of bituminous material shall be sprayed on the clean, dry surface. Sufficient AASHTO NO. 8 or NO. 9 aggregate is placed in the hole to completely cover the bituminous material. This procedure is continued until the level of material in the hole is slightly above the surrounding pavement. The completed patch shall be compacted with a roller. All foreign material shall be removed from the pavement surface around the patch prior to compaction to ensure full contact of the roller with the patching material.

Popouts are also surface defects that occur in the slab away from a joint. They occur where the expansion or deterioration of single pieces of coarse aggregate have caused a small pit in the surface. Popouts are normally too small to be individually repaired. If serious enough to adversely affect the riding quality of the pavement, they may be repaired with a mechanized patch or slurry seal. Scaling, another type of surface defect is the complete loss of the cement mortar matrix that covers the aggregate, leaving a rough textured riding surface. Scaling may involve an area several feet square or the entire slab. Depending upon the severity and scope, a scaled surface can be rehabilitated with a mechanized patch, slurry seal, grinding, or resurfacing. The taper at the end of a mechanized patch or overlay shall conform to [Publication 72M, Roadway Construction \(RC\) Standards](#).

### **BLOWUPS/CONCRETE SLAB FAILURE**

Blowups are characterized by a tenting effect at a transverse joint caused by expansion of the pavement on either side of the joint. This expansion causes the adjacent pavement slabs to rise off the subgrade and may create an obstruction to traffic. The expansion is caused by high summertime temperatures and usually occurs in pavements where the transverse joints have not been properly maintained and are filled with incompressible material. Blowup repair can be classified as an emergency repair, depending upon the severity of blowup, and may require traffic control.

When the blowup occurs, the pavement should be saw-cut transversely on either side of the blowup. Care should be taken not to bind the saw blade in the cut by back pressure of the concrete slab. All concrete is removed between the saw cuts. Additional saw cuts may be necessary to break the slab into manageably-sized pieces. The subbase should be leveled and compacted. Superpave HMA/WMA 25mm Binder or Base Course material shall be placed in lifts not to exceed 5.5" in compacted depth. This is considered to be a temporary repair.

Schedule a permanent repair for a blowup that is not obstructing traffic or to replace a temporary patch in accordance with [Publication 72M, Roadway Construction \(RC\) Standards](#).

### **CRACK AND JOINT REPAIR**

PCC pavement joint problems can be divided into several categories: seal failures, transverse joint spalling, and longitudinal joint spalling. Corrective measures include spot joint sealing, joint cleaning and sealing, joint rehabilitation, joint spall repair or joint replacement. Concrete pavements are divided into three types, based upon the expected service life of the pavement. Joint maintenance will vary according to the type of concrete pavement.

1. **Type 1** - These are pavements that have an expected service life of ten years or more. Joints in these pavements should be rehabilitated. Where not physically possible, sealing methods for Type 2 pavement shall be used.
2. **Type 2** - These are pavements with an expected service life of five to ten years. The best available cleaning and sealing technology should be used on these pavements.
3. **Type 3** - These are pavements with an expected service life of zero to five years and/or are candidates for a surface improvement project. Minimum cleaning and sealing procedures may be used on these pavements.

Type 3 - concrete pavements shall be identified by the Highway Maintenance Manager and approved by the District Executive. All other concrete pavements shall be considered Type 1 or Type 2.

### **CRACK AND JOINT SEALING**

Joint sealing and repair shall be done in accordance with [Publication 113, Highway Foreman Manual](#), Performance Standard 711-7147-01 "Joint Sealing Concrete Roads".

This activity includes the cleaning and sealing of random cracks and transverse and longitudinal joints in plain or reinforced PCC pavements.

Crack and joint sealing is required to prevent the intrusion of incompressible materials into cracks and/or joints and the infiltration of water into the underlying subbase and/or subgrade. Timely and proper sealing will maintain the integrity of the joints and pavement. It is anticipated that a properly cleaned and sealed joint will last at least five years. Joint and crack sealing shall only be performed when the air temperature is above 40 F or above 90 F, unless approved by the Assistant District Executive for Maintenance. No sealing shall be done within 24 hours after any precipitation or if there is moisture in the joint.

Spot sealing will normally require minimal cleaning equipment. Cleaning may be done with hooks and compressed air to remove any loose sealant for spot sealing Type 1 and Type 2 concrete pavements with Type IV (ASTM D-6690) on Type I pavements and Type I (ASTM D-6690) on Type II pavements. Prepackaged AC with rubber may be used on Type II pavements with District approval. Preferred sealant for Type 3 concrete pavements is AC and rubber or Type I (ASTM D-6690).

Always be sure to thoroughly clean and dry joints and cracks prior to sealing. It is imperative that the sealant is placed 1/4" below the pavement surface.

### **JOINT REHABILITATION**

Joint rehabilitation is the creation of an adequate sealant reservoir in a joint and sealing of existing transverse contraction, construction, or expansion joints. Joint rehabilitation may also be required on the longitudinal joint.

This work shall be done in accordance with the latest standard RC-26M, [Publication 72M, Roadway Construction \(RC\) Standards](#).

### **JOINT SPALL REPAIR**

Joint spall repair is the repair of spalls adjacent to longitudinal or transverse joints. The condition is characterized by the cracking, breaking or chipping of slab edges adjacent to a longitudinal or transverse joint. It usually does not extend through the thickness of the slab but meets the joint at an angle. This work is described in [Publication 408, Specifications](#), Section 525 – Concrete Pavement Partial-Depth Repair.

### **JOINT REPLACEMENT**

Joint replacement is the replacement of the entire transverse joint. It is intended to repair crushed joints or joints which have several spalls. Normally, an area of three feet on each side of the existing joint would be removed and replaced. [Publication 242, Pavement Policy Manual](#), Section 4.2.C describes when to use PCC for patching material. [Publication 72M, Roadway Construction \(RC\) Standards](#), shows how the work is to be completed.

### **SUBSEALING**

Subsealing ([Publication 408, Specifications](#), Section 679) is the stabilization of faulted slabs with grout or polyurethane foam pumped beneath the pavement. It is intended to be used where minor faulting has occurred.

### **SUBSEALING AND SLABJACKING**

Subsealing and slabjacking ([Publication 408, Specifications](#), Section 681) is the correction of minor settlement of the slabs and the filling of voids beneath the pavement. It will also be used to correct isolated faulting of slabs. Subsealing around the raised slab is performed to ensure all voids are filled.

**SUBSEALING, SLABJACKING, AND GRINDING**

Subsealing, slabjacking and grinding is the filling of voids beneath the pavement, the correction of minor settlements and the grinding of the surface to restore the profile on major rehabilitation contracts. Grinding ([Publication 408, Specifications](#), Section 514) is done after subsealing and slabjacking. It is generally done as a part of a concrete rehabilitation project.

**OVERLAY**

This is resurfacing of an existing pavement to restore the pavement to smooth riding condition. Overlays include both bituminous and concrete. Micro-surfacing ([Publication 408, Specifications](#), Section 483), Ultra-thin Bonded Wearing Course ([Publication 408, Specifications](#), Section 489) and High Friction Surface Treatment ([Publication 408, Specifications](#), Section 659) can be used for texturing purposes.

**FULL-DEPTH CONCRETE PATCHING**

Full-depth Department Force concrete patching shall be limited to isolated spot repairs which may potentially present a safety problem to the motoring public and when there is a need to act in a timely manner. Work shall be completed in accordance with [Publication 408, Specifications](#), Section 516.

Isolated spot repairs shall be defined as a maximum of 100 square yards per lane mile (approximately 35 cubic yards of concrete).

Requests for exceptions to this policy shall be submitted to the Director of the Bureau of Maintenance and Operations for approval.

**7.5 APPENDICES****APPENDIX A****CHART 1****MINIMUM WIDTH CRITERIA FOR MAINTENANCE PROJECTS ‡**

CURRENT TRAFFIC ADT	PAVEMENT		SHOULDERS * (EACH SIDE) MINIMUM
	DESIRABLE		
0 To 400**	20' - 0"	18' - 0"	2' - 0" Minimum
401 To 1,000	20' - 0"	18' - 0"	2' - 0" Minimum
1,001 To 2,000	22' - 0"	20' - 0"	2' - 0" Minimum
2,001 To 4,000 10% Heavy Vehicles***	22' - 0"	20' - 0"	3' - 0" Minimum
4,001 To 10,000 10% Heavy Vehicles***	22' - 0"	20' - 0"	3' - 0" Minimum
10,001 To 20,000	24' - 0"†	22' - 0"	4' - 0" Minimum
Over 20,000	24' - 0"†	24' - 0"†	5' - 0" Minimum

‡ THE MINIMUM WIDTH CRITERIA FOR BRIDGES SHALL CONFORM TO THE REQUIREMENTS IN Publication 13M, DESIGN MANUAL, PART 2, CHAPTER 1.

\* THE MINIMUM SHOULDER WIDTHS MAY BE WAIVED, AS REQUIRED, TO REMAIN WITHIN THE LIMITS OF EXISTING RIGHT-OF-WAY WIDTHS.

\*\* IN UNIQUE CIRCUMSTANCES, AN EXCEPTION MAY BE APPROVED BY THE DISTRICT EXECUTIVE.

\*\*\* OVER 10% HEAVY VEHICLES, PAVEMENT WIDTH IS 22' - 0" MINIMUM TO 24' - 0" DESIRABLE. EVERY EFFORT SHOULD BE MADE TO ACHIEVE 24' - 0" PAVEMENT WIDTHS WITHIN EXISTING RIGHT-OF-WAY. THE NUMBER OF HEAVY VEHICLES = CURRENT TRAFFIC ADT x % OF TRUCKS, BUSES AND RECREATIONAL VEHICLES.

† UNDER RESTRICTIVE OR SPECIAL CONDITIONS, SUCH AS RIGHT-OF WAY OR LATERAL CLEARANCE LIMITATIONS, REDUCTION OF PAVEMENT WIDTH FROM 24' - 0" TO 22' - 0" IS ACCEPTABLE.

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## APPENDIX B

### DEPARTMENT RESPONSIBILITY BEYOND CURBLINES

The Department's policy with regard to legal responsibility for maintenance beyond curb lines is as follows:

#### POLICY

**1. Highways in First-Class Cities**

Department of Transportation may not perform any maintenance beyond the face of curb (except that the P.U.C. may order such maintenance on bridges under its jurisdiction), unless, with respect to Act 615 highways only, it has entered into an agreement assuming such maintenance.

**2. County Highways Taken over by Act 615 of 1961**

Department of Transportation may not perform any maintenance (1) beyond portions available to vehicular traffic or (2) upon guiderail and drainage facilities, unless it has entered into an agreement assuming such maintenance.

**3. Highways in Boroughs, Incorporated Towns and Cities Other than First Class**

Department of Transportation will not perform any maintenance beyond curb lines except as required to maintain the structural integrity of the highway, such as slopes, walls, etc., unless, with respect to Act 615 highways only, Department has entered into an agreement assuming such maintenance.

Where some properties are curbed and others are not, the curb lines can be projected on the uncurbed properties.

If there are no existing curb lines, the Secretary can indicate on a plan of public record the width of the street or highway the Department will maintain.

**4. State Routes that had the Old Five-digit L.R. Numbers in Townships**

Department of Transportation may perform maintenance beyond curb lines. Where the Department has not assumed responsibility to perform such maintenance, townships may do so.

**5. State routes that had the Old One, Two, Three, or Four-Digit L.R. Numbers in Townships**

Department of Transportation will perform maintenance beyond curb lines.

Additional details related to drainage responsibilities within and beyond curblines can be found in this Publication (Publication 23) in Chapter 8, Drainage and Drainage Systems.

APPENDIX C

