

# **MAINTENANCE GUIDEBOOK III - PAVEMENT MAINTENANCE CHAPTER TWO - PAVEMENT MAINTENANCE PROCEDURES**

## **SECTION A INTRODUCTION**

Preventive maintenance extends the useful life of pavement. To accomplish this, the pavements should be inspected and maintained. The basic steps involve:

- Inspecting pavements;
- Reporting deficiencies;
- Scheduling maintenance activities/Issuing work orders;
- Performing preventive maintenance/Inspecting completed work;
- Monitoring results.

These steps should be performed in a continuous cycle to guarantee the success of a preventive pavement maintenance program.

### **1. INSPECTION**

In accordance with the Public Housing Management Assessment Program (PHMAP) requirements, all paved surfaces, including roadways, sidewalks, parking lots, dumpster pads, and play and game areas, should be inspected on an annual basis. For this purpose, a standard checklist should be developed (see sample, page 2-3). If available, a personal computer (PC) should be used. A checklist and a copy of the development plan identifying all paved areas should be taken along during the inspection. Detailed notes, sketches, and related inspection findings which complement and expand upon the checklist should be made directly on the development plan. Each annual inspection should utilize a new copy of the development plans so that the results can be compared with previous inspections. (In addition, a master copy of the development plan should note all repairs and the reinspection dates when repairs and preventive maintenance were performed). An assortment of off-the-shelf software is now available for PC applications related to pavement-maintenance programs.

### **2. REPORTING**

Deficiencies noted during the inspection should be developed into a report which logically groups the various pavement types, identifies the deficiencies, and prioritizes the necessary repairs. The urgency rating for prioritizing the repairs or preventive maintenance tasks may be rated as follows:

- 5 - No repairs are necessary. Schedule only annual preventive maintenance.
- 4 - Schedule for maintenance next year (minor deficiency).
- 3 - Schedule for maintenance this year.

- 2 - Schedule for immediate maintenance.
- 1 - Schedule emergency repairs (by maintenance staff or contractor).
- 0 - Cannot be repaired without major contract.

### **3. SCHEDULING**

Based on the preventive-maintenance program and the reported deficiencies of the inspection, a work schedule should be developed. The schedule should take into account the priority of maintenance and repair activities, and the estimated time and costs for each. Scheduling should also take into consideration seasonal factors such as special measures required for working in extreme temperatures.

### **4. PREVENTIVE MAINTENANCE**

Preventive maintenance requires a minimum amount of time, money, and resources if completed on time. It includes:

- Sealing joints and cracks;
- Applying a seal coat;
- Providing positive drainage;
- Maintaining edging or other structural supports which confine the pavement.

### **5. MONITORING**

This last step is an essential part of preventive maintenance. The HA evaluates the efficiency of the program and its implementation, updates the related records, and plans for any necessary corrective action and budgeting.

## **SECTION B GENERAL PAVEMENT MAINTENANCE AND REPAIR**

All pavements require maintenance. Good maintenance practice involves preventive maintenance, with an emphasis on taking timely action to repair any deterioration. The intent of preventive maintenance is to keep the pavement in the best possible condition in order to extend its lifetime and avoid expensive repairs. Specific preventive maintenance activities include:

- Sealing joints and cracks;
- Providing proper drainage;
- Applying seal coats.

The easiest way to assure that the pavement is maintained properly is to develop an annual program based

# PAVEMENT INSPECTION CHECKLIST

INSPECTOR NAME: \_\_\_\_\_

DATE OF INSPECTION: \_\_\_\_\_

PAVEMENT LOCATION: \_\_\_\_\_

PAVEMENT TYPE	CONDITION RATING	URGENCY RATING	COMMENTS
GENERAL APPEARANCE			
CLEANLINESS			
<b>BITUMINOUS PAVEMENT</b>			
Shrinkage and Localized Cracking			
Longitudinal and Transverse Cracking			
Ravelling/Abrasion/Pitting			
Rutting			
Shoving			
Edge Failure			
Potholes/Pavement Failure			
Ponding/Poor Drainage			
Requires Sealing			
<b>CONCRETE</b>			
Longitudinal/Transverse Cracking			
Spalling			
Scaling			
Crazing/Map Cracking			
Failed/Disintegrated Areas			

**CONDITION RATINGS:**

- 5 - *Excellent condition, no defects*
- 4 - *Very good condition, minor deficiencies*
- 3 - *Good condition, 10 -25% of pavement has minor deficiencies*
- 2 - *Fair condition, 25 - 50% of pavement has minor or major deficiencies*
- 1 - *Poor condition, over 50% of pavement is distressed*
- 0 - *Failure, pavement no longer functions.*

**URGENCY RATINGS:**

- 5 - *No scheduled repairs necessary, only annual preventive maintenance activities*
- 4 - *Schedule for maintenance next year, minor deficiency*
- 3 - *Schedule for maintenance this year*
- 2 - *Schedule for immediate maintenance*
- 1 - *Schedule emergency repairs (maintenance or contractor)*
- 0 - *Cannot be repaired without major contract.*

on inspections. Such a program should enable the HA to budget the work to be done either by the HA or by a contractor. A good program assures that pavements will be inspected at least on an annual basis, as required by the Public Housing Management Assessment Program (PHMAP) of the Department of Housing and Urban Development. However, semi-annual inspections are more desirable, especially in areas where there are seasons of extreme weather conditions. In the latter case, the inspection should be conducted before major seasonal changes. This will allow time to make repairs such as sealing cracks and correcting base failures. A second inspection should be made as soon as possible, after the seasonal change, in order to promptly repair the pavement damages resultant from extreme heat or cold. In addition to seasonal considerations, maintenance personnel should always be alert for the first indication of any pavement defect (for example, damage resulting from excessive truck wheel loads) so that timely repairs can be made.

## **1. SEASONAL CONSIDERATIONS**

The time of the year when pavement maintenance work takes place has considerable bearing on the procedures for making repairs, particularly patching. In summer, even a coarse-textured asphalt patch will gradually set under traffic and warm weather, while the same patch might fail within a day or so if placed in freezing winter conditions. It is easier to make and protect repairs of concrete pavement in warm weather than during freezing winter months. This does not mean that pavement failures should be ignored in the winter. When a continuing series of freezing and thawing cycles occur, be prepared to repair potholes. Potholes, which occur in both asphalt and concrete pavements in spite of good maintenance practices, should be repaired immediately, at least on a temporary basis. Several products are available to prevent progressive failures until weather conditions permit permanent repairs.

## **2. TYPICAL PAVEMENT STRUCTURE**

Before going into a detailed discussion of maintenance practices, the underlying strengths or weaknesses of pavement should be explained. Any pavement, whether built for vehicular, pedestrian, or recreational purposes, consists of subbase, base, and surface courses (see Figure 2-1). The subbase is undisturbed or compacted soils, the base normally consists of gravel or crushed stone, and the surface course, called the wearing course, is the concrete or bituminous asphalt pavement built on top of the base. Bituminous asphalt pavement is occasionally comprised of a wearing and binder course.

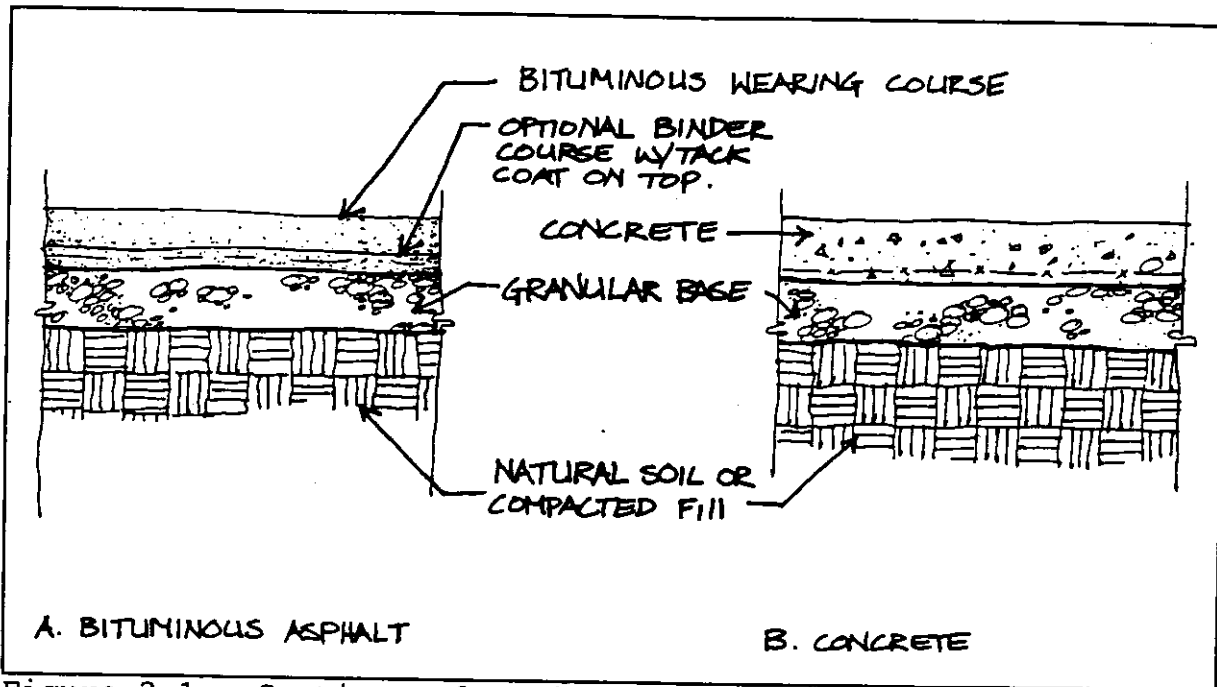


Figure 2-1: Sections of Typical Pavement Structure

### 3. CAUSES OF PAVEMENT FAILURE

The most common cause of pavement failure is the intrusion of water below the pavement, which may result from inadequate drainage. Other causes may include cracked or otherwise damaged pavements, insufficient base thickness, or an unstable subbase. Any break or crack in the pavement permits water to saturate the subbase, which is no longer able to support the loads. During periods of below-freezing temperatures, water and moisture become solid ice and, while expanding, cause pavement failure. Therefore, it is necessary that the subbase be kept dry and well drained in order to retain its stability.

As soon as pavement begins showing signs of deterioration, such as settlement and disintegration, an inspection should be made to determine the cause, and proper actions should be taken to correct the defects.

### 4. MAKING A PERMANENT PATCH

A patch should be made so that its strength, quality, and appearance will equal that of the remainder of the pavement. Specific patching materials are discussed in later chapters for bituminous and concrete pavements, as are details for their placement. The sequence of steps in making a patch is illustrated in Figure 2-2.

**a. Cleaning and Preparation**

The secret of a good repair job is thorough cleaning of the affected area and proper preparation of it to receive the repair materials. Following are recommendations for preparing various components of the pavement, including the subbase, base, and surface.

**b. Replacing the Subbase**

Prior to replacing the subbase, all soft, wet, unstable, loose, and undesirable materials should be removed. New, dry subbase material should be installed and thoroughly compacted. Where it is necessary to remove excess water from the subbase, appropriate drains should be installed.

**c. Replacing the Base Course**

After removing all unsuitable subbase and base course materials, including rock and gravel, the surrounding base material should be cleaned and prepared so that the new base can establish a good bond to the existing base. The new base course should match the existing base material (whether gravel, crushed stone, or concrete) and should be thoroughly compacted.

**d. Replacing the Surface Pavement**

When replacing the surface or wearing course for either bituminous or concrete pavements, the base should be swept clean and free of dust, dirt, loose rock, gravel, or other unsuitable material. The surrounding vertical surfaces should be properly prepared to establish a good bond with the new material. The new surface material may be concrete or a bituminous material, depending on the pavement type.

**e. Applying the Seal Coat**

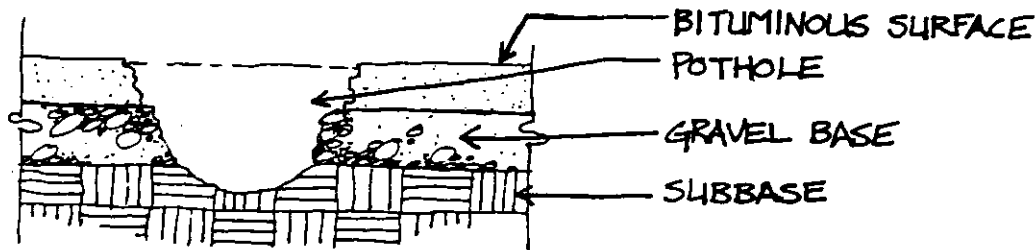
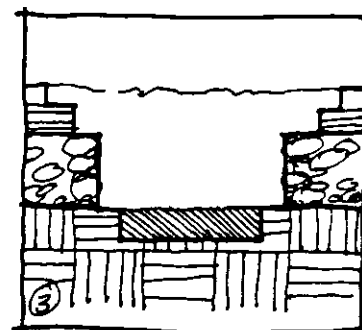
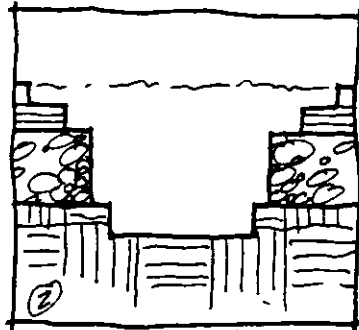
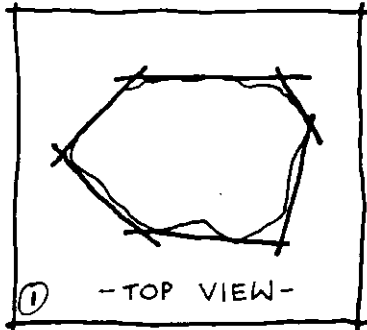
Prior to application of the seal coat or a leveling course, the pavement should be thoroughly cleaned. All dirt, dust, and loose material should be removed from the surface, cracks, and pits by sweeping with a broom and then flushing with clean water or compressed air. Oil and grease should be removed by scrubbing the affected areas with a nonfoaming detergent such as a solution of trisodium phosphate (mixed 1 cup trisodium phosphate to 1 gallon water). The surface should be flushed thoroughly with clean water to remove all of the cleaning solution.

During flushing, depressions and low areas will be filled with water. Mark the edge of each puddle with chalk on the pavement. These marks may be used for designating the limits of a leveling

MARK AND CUT EDGES OF POTHOLE IN STRAIGHT LINES ON TOP OF PAVEMENT.

REMOVE UNSUITABLE MATERIALS FROM POTHOLE AND TRIM & CLEAN EDGES OF EACH COURSE TO VERTICAL SURFACES.

REPLACE SUBBASE WITH DRY MATERIAL AND COMPACT THOROUGHLY.



REPLACE BASE COURSE TO MATCH EXISTING AND COMPACT THOROUGHLY.

PRIME TOP OF NEW BASE COURSE AND PAINT EDGES WITH EMULSION-TYPE SEALER.

PLACE PATCH BY COMPACTING IN LAYERS (1 1/2" MAX) TO MATCH EXISTING SURFACE & APPLY SEAL COAT TO COVER ALL JOINTS.

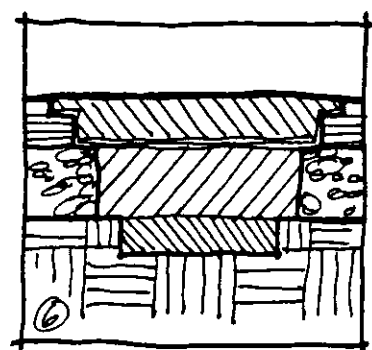
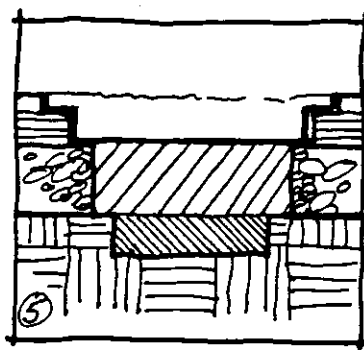
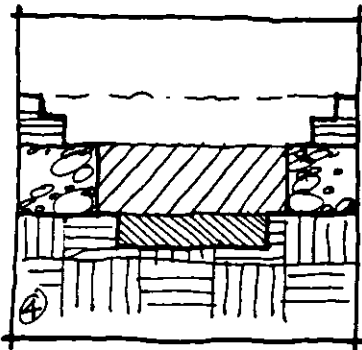


Figure 2-2: Steps in Making a Permanent Patch

course. In addition, by measuring the depth of water, the quantity of fill material required can be estimated. The water should then be swept from the puddle.

If a leveling course is to be installed, the area to be leveled should receive a "tack" coat.

especially if the leveling course is thin, because thin asphalt courses are very susceptible to delamination in the winter. The tack coat should be very thin (fogged).

## **5. LOW-TYPE PAVEMENTS AND DUST CONTROL**

In addition to the bituminous and concrete pavements covered in this guidebook, some HAs may have low-type pavements to maintain.

### **a. Low-Type Pavements**

These are pavements in which natural soils, selected soils, and mineral aggregates are used separately or in combination. They may be classified by the type of materials composing the surface area, such as natural soil, sand-clay, and coarse graded aggregate. Failures of these pavements are due to poor drainage, improper grading, inadequate compaction, and unsuitable materials. Repairs should be made promptly to correct any of the above conditions by removing unstable material, filling depressions and other surface irregularities with materials similar to surface materials, compacting into place, and smoothing and shaping the surfaces to drain.

### **b. Dust Control**

During dry weather, dust from low-type pavements can be a nuisance. It can be controlled by frequently spraying with water. The application of too much water, however, should be avoided, since it has a tendency to cause soft spots. Calcium chloride may also be applied. Calcium chloride is a chemical salt that attracts moisture from the air, and settles the dust. It may be used either in flake form or dissolved in water. When used in flake form, it should be spread evenly over the surface at the rate of approximately one pound per square yard. This may be done by hand or with a mechanical sower such as a seed sower. Applied at night, calcium chloride absorbs moisture from the air more quickly than by day.

When used in solution, a maximum of four pounds of calcium chloride dissolved in a gallon of water is spread by sprinkling at the rate of a pint to a quart per square yard. It is best to moisten dry surfaces during daytime operations. Since it is soluble in water, it may be washed away by rain, and needs to be replaced periodically. Calcium chloride should not be used on sticky clay, since it makes a slippery mess if the road surface contains insufficient coarse aggregate.



## **6. UTILITY CUTS**

Cuts made by utility companies in pavement owned by HAs are necessary to allow access to utility lines. However, these cuts should be done following a process set up by the HA. The HA should identify the location and specify the work to be done, the type of materials to be used, how the work is to be done, the hours in which the work may be done, and how traffic is to be managed.

The HA should ensure that the work is completed in accordance with the established process and sound construction practice. The cut in the pavement and its base should be approximately six inches wider than the utility trench on each side. Selected material should be used for backfill, which should be compacted in 6" layers and brought up to the top of the subbase. Utility cuts are notorious for settling even when the construction has met all specifications. Any settlement of the subgrade will leave a void under the patch. Heavy loads crossing over the patch will cause it to crack and eventually fail. Because settlement is such a problem, some jurisdictions allow a utility cut in a concrete road to be patched with bituminous material. When the patch settles, it is brought to grade level by adding more bituminous material.

**END OF CHAPTER TWO**