Chapter 8
Rehabilitation

RECYCLING ASPHALT PAVEMENTS

As natural resources become more scarce and more costly to obtain, their rehabilitation and re-use, or recycling, becomes more important. Asphalt cement and aggregates used in roadway construction constitute a sizable public investment. They are two very important natural resources whose value as construction materials are recoverable. This ability to recycle has enormous implications not only for the conservation of valuable resources but also for energy savings and total economic benefits.

Removal by Cold Milling

Recycling asphalt concrete pavements can be accomplished through: removal and transport to another location for crushing and reprocessing with transport to the new site for laydown and rolling; or through cold milling the surface; and/or conventional removal, with crushing, reprocessing, laydown, and rolling accomplished on the site.

Salvaged Material (RAP) Stockpile

Reprocessing the salvaged materials, plus the addition of virgin asphalt and new aggregates, can be accomplished through three different processes. In a hot mix process, a special drum for mixing is used to comply with environmental pollution requirements and the mixture produced is a fully recycled product containing 15-50% RAP. A cold, in-place recycling process normally involves processing a 2”- 4” depth followed by an Asphalt Concrete overlay. A third process, termed surface recycling involves heater scarification of the top 1” of pavement followed by an asphalt concrete overlay.

Hot Mix Recycling Advantages

1. Significant structural improvements can be obtained with little or no change in thickness.
2. Additional right-of-way is not needed.
3. Frost susceptibility may be reduced.
4. Surface and base distortion problems may be corrected.
5. Base preparation and shoulder work are reduced.

Cold Mix Recycling Advantages

1. Can correct many types of pavement distress that involve both surface and base courses.
2. Reduces the need for new materials and overall cost.
3. Hauling costs may be decreased if in-place method is used.
4. Increases structural strength without adding to pavement thickness.
5. Drainage problems are avoided.
6. Adding asphalt waterproofs the base and renders it less susceptible to frost action and moisture change.

Surface Recycling Advantages

1. Provides a very low-cost maintenance strategy.
2. Restores flexibility of aged and brittle asphalt.
3. Cracks are interrupted and filled.
4. Surface distortion, removed and leveled, drainage and crowns are re-established.
5. Improves skid resistance.
6. Eliminates the need for surface repairs.

BREAKING AND SEATING

A Portland Cement Concrete (PCC) pavement that has good drainage and is still relatively sound can be salvaged through breaking and seating and a hot mix Asphalt Concrete overlay. This option for rehabilitation is designed to reduce the opportunity for reflective cracking by decreasing the slab size of the PCC. Proper breaking and seating will virtually eliminate reflective cracking. If reflective cracks should appear, they usually will be small, tight cracks that can be maintained easily.

With this method of rehabilitation, the PCC is cracked at 24- to 30-inch intervals with heavy drop hammer equipment to create a more uniform pattern of cracking. Next, the cracked PCC pavement is seated with a rubber-tired roller of at least 35 tons. This seating action by the roller pushes down any pieces of PCC that might be over a void in the subbase. After the breaking and seating steps are completed, a 3-to 5-inch asphalt overlay is placed directly on the prepared old pavement.

This method offers the following benefits:

1. Prevents/delays reflective cracking.
2. Extends pavement service life.
3. Reduces maintenance costs.
4. Improves riding smoothness.

The procedural steps of the breaking and seating process are:

1. Crack the PCC slabs.
2. Seat cracked pieces.
3. Remove and patch soft areas.
4. Sweep clean.
5. Apply tack coat.
6. Place asphalt leveling course/overlay.

This method of recycling has been used for more than 30 years in many states.

RUBBLIZING

The rubblizing of Portland Cement Concrete pavements before an Asphalt Concrete overlay means the complete destruction of the concrete slab and of all concrete slab action. With this technique, the concrete-to-steel bond is broken on jointed-reinforced concrete pavements and on continously-reinforced concrete pavements. The rubblizing process effectively reduces the existing slab to an in-place crushed aggregate base.

1. Prevents reflective cracking.
2. Provides a sound base for the overlay.
3. Extends service of the pavement.
4. Provides a maintainable surface.

The procedural steps in the rubblizing process are:

1. Install necessary drainage.
2. Remove any existing overlay.
3. Sawcut the full thickness of the pavement adjacent to remaining sections.
4. Pulverize the PCC pavement.
5. Cut off the exposed steel reinforcement.
6. Compact the pulverized PCC pavement.
7. Apply a prime coat.
8. Place the Asphalt Concrete leveling course and overlay.

PAVING FABRICS

In recent years, paving fabrics, or geomembranes, have been used to reduce reflective cracking from the underlying pavement joints or cracks. A membrane is established through the application of liquid asphalt cement, fabric, and an Asphalt Concrete overlay. Fabric has been shown to be effective in developing a waterproof layer to minimize surface water intrusion .

An example of a possible use would be as a spot application on asphalt pavement sections that show signs of alligator cracking related to a weakened subgrade condition. Fabric would be placed just before the asphalt concrete overlay. Strip application of fabrics will be more effective if the crack or joint is a non-working joint, such as a longitudinal joint in a PCC pavement.

Experimental studies of fabric applications in Iowa have not been conclusive. Early reflective cracking may be delayed through the use of fabric in many cases, especially over a nonworking joint. Also, where water in the pavement structure is a potential problem, fabric can aid in the development of a waterproof membrane.

For additional assistance on specific applications of paving fabrics, contact the APAI.

SAWCUT AND SEALING JOINTS

On PCC rehabilitation projects, sawing and sealing the Asphalt Concrete overlay over the underlying PCC joints may extend the overlay's service life. Unless special procedures, such as crack and seat, are used to prepare the existing PCC pavement, the joints may eventually reflect through the asphalt overlay. These cracks can occur within a short time, depending on factors such as the thickness of the overlay, traffic, and environmental conditions. Reflective cracking is caused by the underlying joints moving because of temperature and moisture changes, warping of the slab, and loading conditions that result in tensile, shear, and flexural forces greater than the strength of the pavement. This results in a crack in the overlay approximately above the underlying joint.

Primary candidates for sawing and sealing of overlays over joints in the underlying PCC pavements are those overlays that have not lost structural integrity at the joints. Examples are overlays that are intended to increase structural capacity, correct skid resistance, prevent further scaling, or reduce noise.

To be effective, the sawcut in the overlay should be directly over the underlying joint. A maximum tolerance of 1 inch is required.

Reference marks, which will not be obliterated during the overlay operation, must be established at the underlying joint. The underlying joint must also be thoroughly cleaned and sealed with an approved sealer before overlaying.

Benefits

Sawcut and sealing of the asphalt overlay is an effective technique to reduce the detrimental effect of uncontrolled reflective cracking over the underlying PCC joints. The sawcut and seal technique establishes a weakened plane joint in the overlay directly above the joint, and it can then be effectively sealed and maintained.

The technique of sawcut and sealing joints offers the following benefits:

1. Controls reflective cracking.
2. Provides maintainable joints.
3. Extends service life.
4. Controls maintenance costs.
5. Adjoining surface will be stronger than at the natural crack.
6. Better appearance.
7. Smoother riding pavement.

The procedural steps in the process are:

1. Locate and reference existing joints in the underlying slab.
2. Thoroughly clean and seal joints.
3. Place overlay.
4. Sawcut directly over the referenced joint.
5. Clean and dry the sawcut.
6. Seal the sawcut.

After placement of a backer rope or tape, the width-to-depth ratio on saw and seal joints should be 1:1. The initial cut should be narrower than the final width and almost twice the depth. This is with the use of hot-type sealers.