Maintenance of Concrete Pavement



Overview

Concept of preventive maintenance
 Treatments

Concrete Pavement



Subgrade

Jointed Plane Concrete Pavement



Example Variable Spacing and Skewed Joints



Dowel Bars





Typically Low Budget

High Needs Preventive Maintenance Could be the Answer

Preventive Maintenance



Objective of Preventive Maintenance

Keep the pavement condition above a level that would require corrective maintenance or other strategies

When should a pavement preventive maintenance treatment be applied?



How much oil should a car burn before changing oil?

Maintenance Types

Preventive

Corrective

Emergency

Time or Traffic

Candidate for PM?





Candidate for PM?



Pumping





Pumping









Faulting



Functions of Maintenance Treatments

Seal joints and cracks

Preserve the pavement system

Retard future deterioration

Effective Preventive Maintenance





Time (Years)

Maintenance Treatments

Joint and crack sealing
 Retrofitting of dowels
 Subsealing (undersealing)

1. JOINT & CRACK SEALING

A routine maintenance activity
 To prevent intrusion of
 water
 incompressible materials





Warrants for Sealing >% failed sealants Pavement type, pavement & sealant condition & available fund Rating numbers based on sealant & pavement condition, traffic level & climate

Effect of Not Sealing Water infiltration may cause: ▶Pumping ► Faulting Joint spalling/deterioration ➢ Voids under slab Corrosion of dowel and tie bars Freeze-thaw slab deterioration

Five Steps to Resealing

a. Removing the old sealant
b. Shaping the reservoir
c. Cleaning the reservoir
d. Installing the backer rod
e. Installing the sealant

a. Old Sealant Removal

Manual
Sawing
Plowing
Cutting





Sawing

Plowing





Cutting

b. Shaping Reservoir

After removing old sealant
Widen as necessary (routing)
Dislodge all old material



Blade for Slight Widening



Old Sealant Sawing out the old Sealant






d. Installing Backer Rod







Sealant Materials Thermoplastic materials Hot-applied **Cold-applied** Thermosetting materials Chemically cured Solvent release Preformed compression sealants

1. Place filler



2. Place tape separator



3. Place sealant



Preformed Compression Sealant



Lane/Shoulder Joint

1 in. or greater reservoir against asphalt

Clean/Sandblast

Seal

Resealing Cracks

More difficult to:
Shape
Clean
Seal

Do not expect uniform reservoir
 Same cleaning steps as joints
 May use tape instead of backer rod

Shape



Clean / Seal

Sealing Performance

Reduces pumping and creation of voids

Preserves pavement condition

Extends pavement life

Sealing Limitations

Limited to low severity cracks
 Not recommended for cracks extending across full lane
 Routing may cause spalling

2. DOWEL BAR RERPFITTING

Increasingly popular method

- Installation of dowels to transfer load
- Faulted transverse joints and cracks
- Reduces further deterioration
 - Pumping and faulting
 - Spalling
 - Corner breaks



Good Load Transfer

Main Operations

Cutting slots
 Cleaning and preparing slots
 Placing the dowel bars
 Backfilling the slots

Line Up Slots Parallel to Centerline









Dowel Bar Retrofit Layout















Backfilling





3. SUBSEALING (UNDERSEALING)

Filling voids under the slab
 Stabilize slabs
 Grind to restore ride quality

Void Formation Under Slab at Joint



Void Detection

Visual inspection
 Proofrolling with heavy equipment
 Deflection nondestructive testing
 Radar or infrared testing
 Epoxy and drilling method

Visual Inspection

Look For:

Faulted joints Stains from pumping Shoulder blow holes Corner breaks Large shoulder drop-offs Depression areas

Static Deflection Testing


Dynamic Deflection Testing

Dynatest

Grout Materials

Cement grout mixtures
 Pozzolanic - cement grout (most common)
 Limestone - cement grout



Drilling Injection Holes





Automated Drill Rig





Pumping Grout

Starting Injection



Example Grout Injection Pattern



Push any underlying water out toward shoulders

Stop Injection When

 The slab begins to rise
 Grout no longer pumps below the maximum allowable pressure
 You see grout flowing up through adjacent holes

Checking Slab Lift



Final Steps

Insert wooden plugs only if required Perform post testing 24-48 hours after stabilizing the slab redo any slabs with high deflections consider replacing slab full-depth after third injection

Subsealing Performance

Increases structural integrity Extends pavement life ➢ Provides smooth ride Reduces faulting progression Reduces slab deflection Reduces reflection cracking

Alternative to Preventive Maintenance

Grinding
Major repair
Rehabilitation
Reconstruction



Grinding



Major Repair







8/10

Reconstruction



State-of-the-Practice



State of the Practice

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