Session 4: Slab Stabilization and Slab Jacking
Learning Outcomes

1. List benefits of slab stabilization and slab jacking
2. Describe recommended materials and mixtures
3. Describe recommended construction steps for both procedures.
4. Identify typical construction problems and remedies for slab stabilization.
Slab Stabilization vs. Slab Jacking

- Slab Stabilization:
  - Pressure insertion of a flowable material to restore support beneath PCC slabs
  - Fills existing voids but does not lift slab

- Slab Jacking:
  - The lifting or raising of a PCC slab by pressure inserting a grout beneath the slab
  - Levels depressed slabs and restores rideability (but not for correcting faulted joints)
Benefits

- Slab stabilization
  - Restores slab support
  - Reduces pavement deflections
  - Reduces progression of key distresses (pumping, faulting, corner breaks)
- Slab jacking
  - Re-establishes pavement profile
  - Reduces roughness
Slab Stabilization
Slab Stabilization

• Variable performance
• Not as widely used as in past years
• Big issue: identifying areas of loss of support (voids)
What Causes Voids?

- Water Infiltration
- Weakened Pavement Layers
- Traffic Loadings

**Initial Pumping**

- DIRECTION OF TRAFFIC
- STAINING OF SHOULDER AT THE TRANSVERSE JOINTS

**Development of Voids and Faulting**

- VOID
- FAULTING

**Slab Breakup**

- CORNER BREAKS

Fig. 4.1 on p. 4.3
Selection of Projects for Slab Stabilization

- Joints and working cracks exhibiting loss of support
- Little visible pavement damage (i.e., faulting or cracking)
- Recommended evaluation procedures:
  - Distress surveys
  - Deflection testing or other void detection procedures
Good or bad candidate?
Good or bad candidate?
Good or bad candidate?
Identifying Loss of Support

- Visual distress survey
- Deflection testing
  - Maximum deflections
  - Void detection procedures
- Other methods
Maximum Slab Corner Deflections

- Use an indicator of void
- Typical triggers range from 0.010 to 0.035 inches
- Variable load transfer can affect results
FWD Load Sweep for Void Detection

Fig. 4.8 on p. 4.13
Defining a Hole Pattern

Typical JPCP Hole Pattern

- Outer Shoulder
  - Transverse Joint
  - Recommended for Voids on Approach & Leave Sides
  - 30 to 46 cm (12 to 18 in)
  - 46 to 63 cm (18 to 24 in)
  - 63 to 90 cm (24 to 36 in)

63 cm (24 in)

TRAFFIC

Fig. 4.3 on p. 4.6
Slab Stabilization Materials

- Material types
  - Cement grout mixtures (typ. 25% cement)
    - Pozzolanic-cement
    - Limestone-cement
  - Polyurethane (e.g., Uretek)
    - Dense, two-part polymer
    - Rapid strength gain
    - Expansive, drives water out
Material Selection Factors

- Cost
- Time before opening to traffic
- Effect on subsurface drainage
- Availability of qualified contractors
- Projected performance of material
Construction Procedures

1. Drilling injection holes
2. Material preparation
3. Material injection
Construction
Drilling Injection Holes

- Pneumatic Drill
- Automated Drill Rig
- Cored Hole
Construction

Material Preparation

Grout Mixer

Materials
Construction

Operation
Quality Control

Pump Stop Triggers

- Maximum pressure of 0.69 MPa (100 psi)
- Slab lift $\leq$ 3 mm (0.125 in)
- Grout flowing from holes, cracks, or joints
- One minute has elapsed
Quality Control

Monitoring Slab Lift
Determining Effectiveness

- Comparison of before/after deflections
- Comparison of post-stabilization deflections to a maximum allowable deflection

Fig. 4.8 on p. 4.13
Slab Stabilization

Key Factors for Success

• Structurally sound pavement
• Accurate void detection
• Effective injection hole pattern
• Durable materials
• Careful monitoring during construction
Troubleshooting

- Problem:
  
  *No visible grout or no slab movement on the uplift gauge after one minute*

- Potential causes? Solutions?
Troubleshooting

• Problem:
  
  Uplift exceeds the specified maximum slab lift

• Potential causes? Solutions?
Troubleshooting

• Problem:
  Grout extrudes into a working transverse joint or crack

• Potential causes? Solutions?
Troubleshooting

• Problem:
  
  *Post-testing after grouting still indicates a loss of support*

• Potential causes? Solutions?
Slab Jacking
Slab Jacking

• Address localized areas of settlement
  ■ Fill areas
  ■ Culverts
  ■ Bridge approaches
• Materials:
  ■ Cement grouts widely used at one time
  ■ More recent use of polyurethane materials
Construction Procedures

1. Select hole locations
2. Complete preliminary work (drill holes)
3. Determine pump sequence
4. Only raise the slab a maximum of 6 mm (0.25 in) while pumping grout into any given hole
5. Continue with pumping sequence until the slab reaches the desired grade
Typical Hole Pattern and Pumping Sequence

Fig. 4.7 on p. 4.12
Stringline Method

Beginning of sag

String line

Nail to secure line

Maximum depth of sag

Wooden separator blocks

10 ft

Fig. 4.6 on p. 4.11
Stringline Method
Grouting Hole and Plug
Louisiana Slab Jacking Project
Completed Project
Slab Jacking

Key Factors for Success

• Structurally sound pavement with localized depression or settlement
• Effective injection hole pattern
• Durable materials
• Careful monitoring of slab lift
Review: Learning Outcomes

1. List benefits of slab stabilization and slab jacking
2. Describe recommended materials and mixtures
3. Describe recommended construction steps for both procedures.
4. Identify typical construction problems and remedies for slab stabilization.