

# Defects and Repair Techniques



# Topics



## A. Defects due to

1. Design
2. Construction
3. Distress

## B. Repair Techniques

1. Patching
2. Partial and Full Depth Repair
3. Cross Stitching
4. Diamond Grinding and Grooving
5. Slab Stabilization
6. Bonded and unbonded overlays

# Defects -Design



- ❑ Wrong selection of materials (concrete grade, slump etc)
- ❑ Insufficient/improper Drainage
- ❑ Wrong Detailing (eg. keyed joints) (Photo)
- ❑ Wrong selection of joint materials (eg. sealants) (Photo)
- ❑ Inefficient joints (joints too far)

# Keyed Joints (failure on 1 side only)



# Sealant Failure



# Defects – Construction (Concrete part)



Poor Concrete/Workmanship

Inconsistent concrete quality (Photo)

Bleeding (Photo)

Low density

Poor Casting techniques- Uneven Road finish

Honeycomb

Too early/late tining

Map Cracks, delamination

Cracks due to late saw cutting or locked dowelled joints

Rain Damaged (Photo)

# Inconsistent Concrete Quality



# Bleeding





# Rain Damage Surface



# Defects-Cracks



1. Shrinkage Cracks
2. Late sawcut cracks
3. Inefficient joint Cracks
4. Mapping Cracks
5. ASR Cracks
6. D-Cracks

# 1. Cracks-Shrinkage



### 3. Cracks- Inefficient Joint Cracks



## 4. Cracks – Mapping Cracks





# 5. Cracks - ASR

## Alkali-Silica Reaction

- Map-cracking pattern with cracks oriented parallel to slab-free edges.
- ▣ A chemical reaction between alkalis in the concrete and certain siliceous aggregates
- ▣ Forms an alkali-silica gel that absorbs water, expands and cracks concrete



## 6. Cracks – D cracking

- D-shaped, hairline cracks near joints and cracks
  - ▣ Poor quality aggregate
  - ▣ Water in pavement
  - ▣ Freezing temperatures



# Distress



1. Longitudinal Joints (Spalling at Keyed Joints)
2. Longitudinal Joints (Widening at Shoulder)
3. Transverse Joints (Spalling)
4. Transverse Joints (Pumping of Fines/Faulting)
5. Punch-outs
6. Joint Sealant Deterioration & pullout



# 1. Longitudinal joint Spalling(Keyed)



## 2. Longitudinal Joint (Shoulder Widening)



### 3. Transverse Joint Spalling



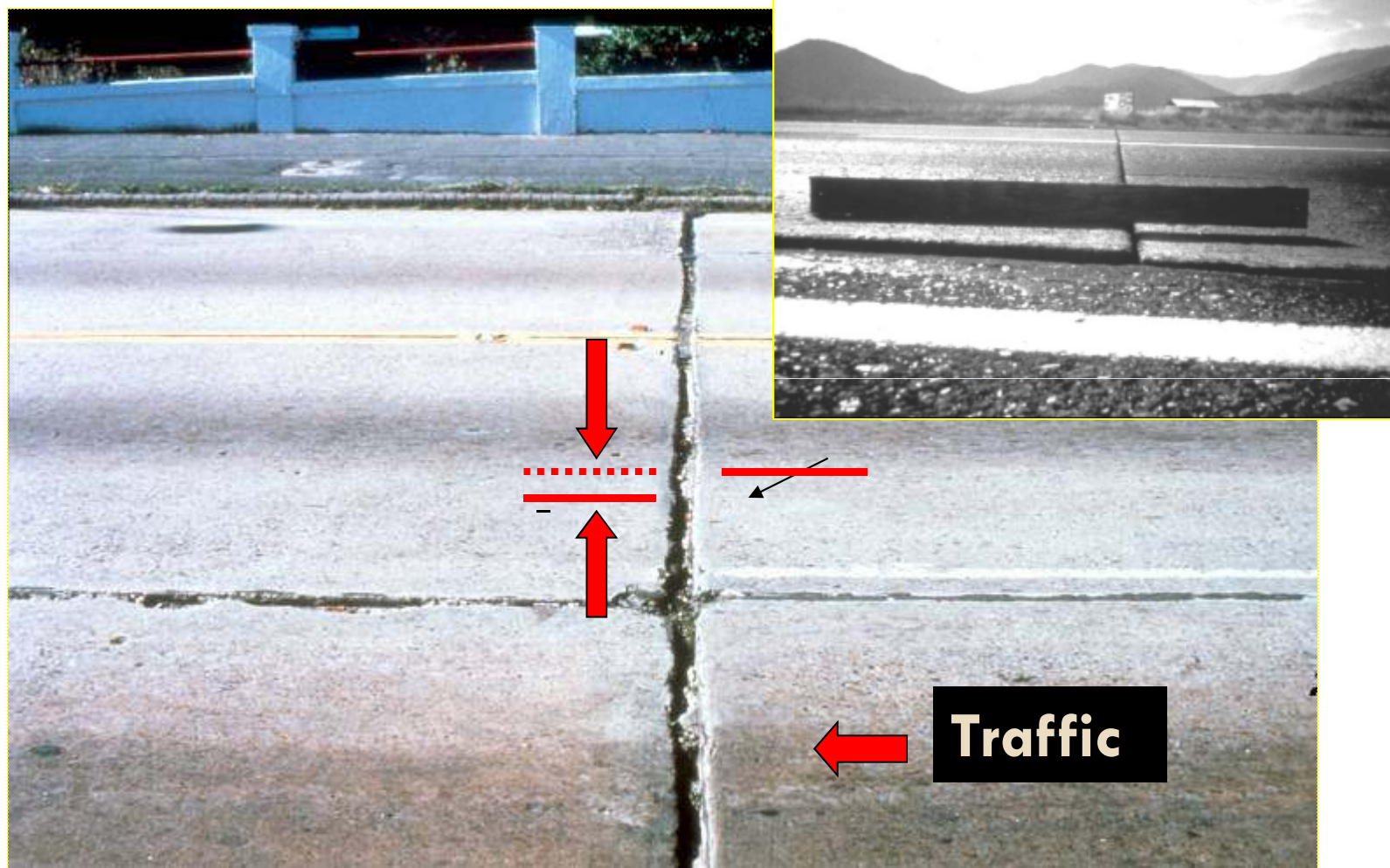
## 4. Pumping of Fines

- The forceful displacement of soil and water from beneath the pavement through joint and cracks.
  - ▣ Subgrade soil that will go into suspension.
  - ▣ Free water between slab and subgrade.
  - ▣ Frequent heavy wheel loads.





#### 4. End result is pumping then joint faulting



# 5. Pavement Distress Types

## Faulting

- The difference in elevation between slabs.
- ▣ Poor Load Transfer
- ▣ Loss of Support
  - Pumping of fines



## 6. Punch-Out

### Punchouts

- ❑ Low steel content
- ❑ High edge deflections
- ❑ Poor crack spacing
- ❑ Loss of support



# Repair Techniques



1. Patching
2. Partial and Full Depth Repair
3. Stitching
4. Diamond Grinding and Grooving
5. Slab Stabilization
6. Bonded and unbonded overlays



## 1. Patching



## 2. Full Depth Repair





### 3. Stitching-Cross





## 4. Diamond Grooving

About 150 diamond blades mounted on 1.25m drum



## 4. Diamond Grooving



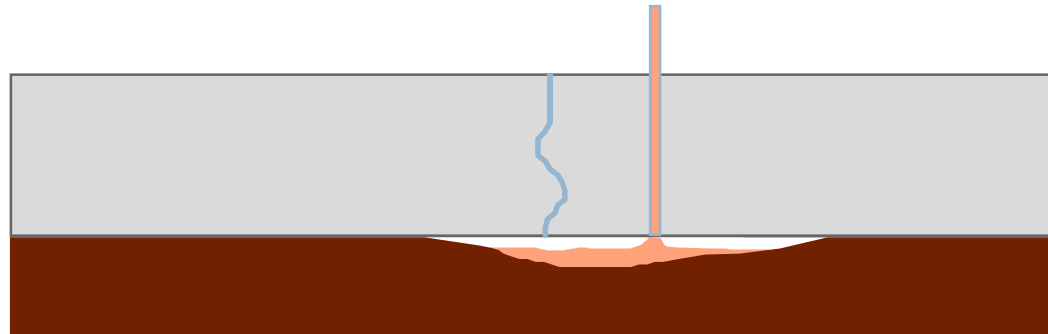
## 4. Diamond Grooving

Fine longitudinal texture  
(‘fine corduroy’)



## 5. Slab Stabilization

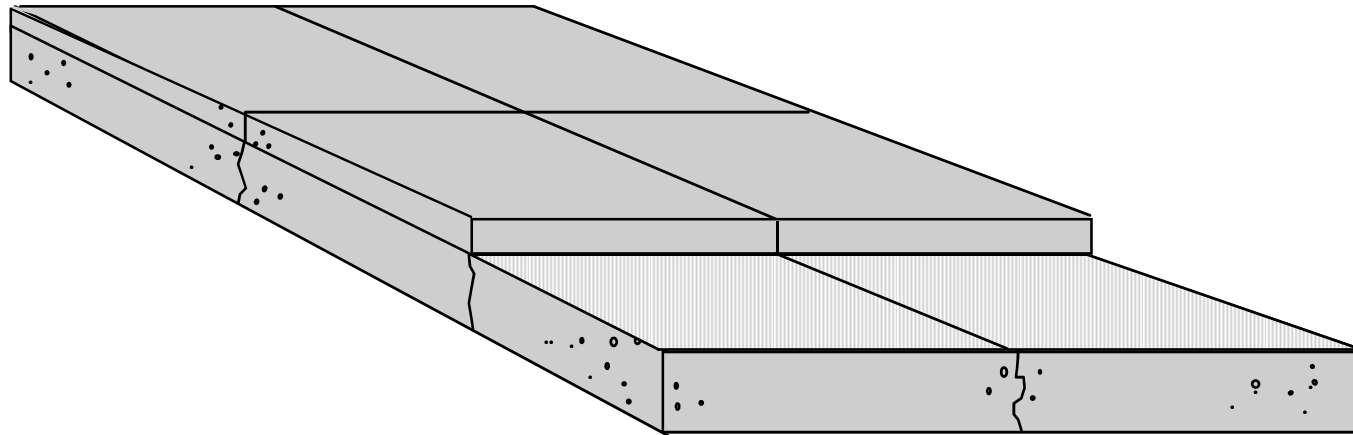
- Fills voids (3 mm or less) underneath the pavement.
- Reestablishes uniform support.
- Reduces stresses and deflections.





## 6a. Bonded Overlays

- Consists of a thin concrete layer (100 mm or less) on top of an existing concrete surface.
- Specific steps are taken to bond the new concrete overlay to the existing concrete.



## 6b. Unbonded Overlay

- Consists of thick concrete layer (125 mm or greater) on top of an existing concrete.
- Uses a “separation interlayer” to separate new overlay and existing concrete.

