

Module 2-1

Pavement Types

Objectives

- Understand role of each pavement layer
- Identify factors that affect performance
- Identify pavement classifications / types
- Describe characteristics
- Describe typical performance and distress mechanisms

Definitions

Distress (manifestation)

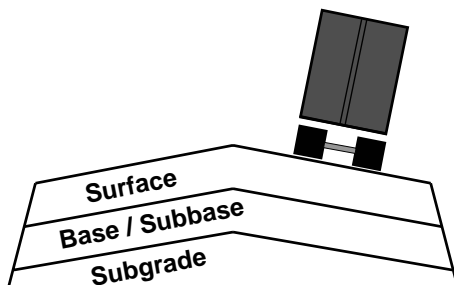
Mechanism

Introduction

Categories (classifications)

- Flexible
- Rigid
- Composite

Role of Pavement / Soil Layers



Factors Affecting Pavement Performance

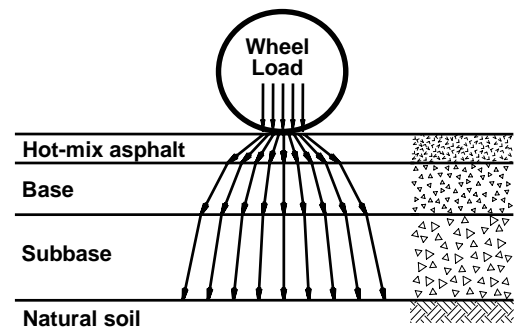
- Traffic
- Subgrade soil support
- Materials of construction
- Structural characteristics
- Construction and maintenance variation
- Moisture
- Maintenance / rehabilitation programs

Flexible Pavements

Components

- Surface-HMA (or BST)
- Base/Subbase

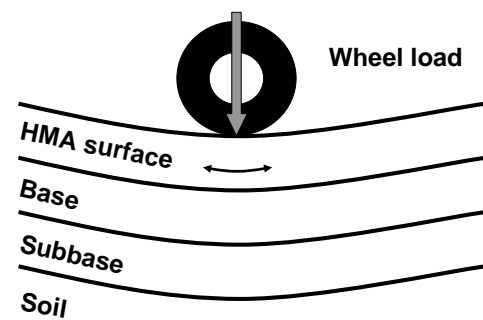
Distribution of Wheel Load



Basic Distress Mechanisms

- Load-related
- Temperature-related
- Moisture-related
- Age-related

Load-Related: Fatigue



Propogation of Fatigue Cracking



Early Stage of Fatigue Cracking



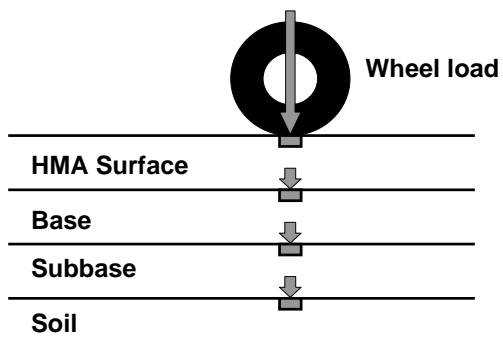
Intermediate Stage of Fatigue Cracking



Advanced Stage of Fatigue Cracking



Load-Related: Permanent Deformation



Minor Rutting



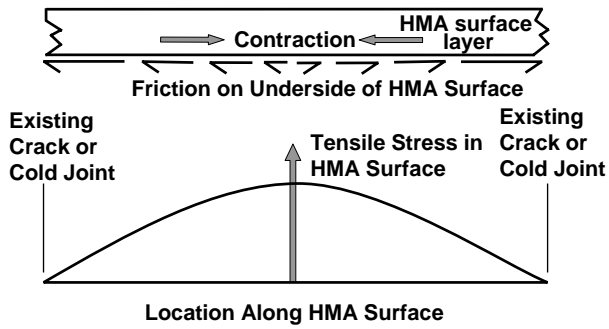
Severe Rutting



Rutting Confined to HMA Layer



Temperature-Related: Thermal Cracking



Thermal Cracking



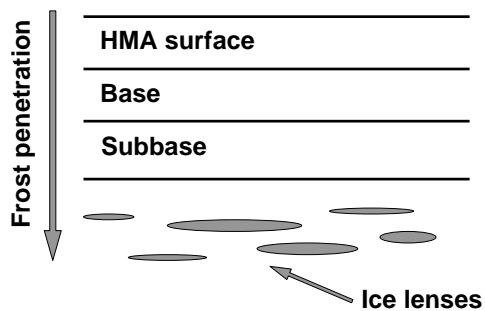
Thermal Cracks



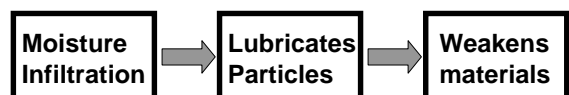
Wide Thermal Crack



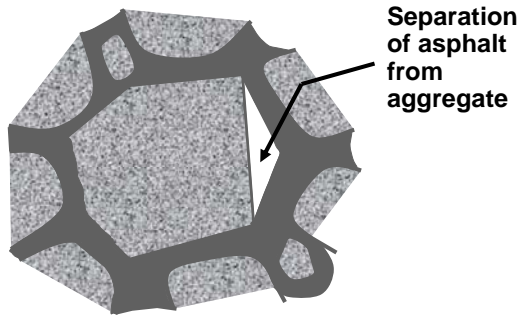
Temperature-Related: Frost Heave



Moisture-Related: Strength Loss



Moisture-Related: Stripping



Stripping



Stripping Below Thermal Crack



Oxidized HMA Surface Layer

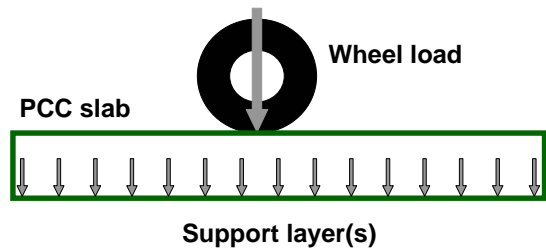


Rigid Pavements

Components

- Surface - PCC
- Base / Subbase
- Reinforcement
- Joints (configuration)
- Load transfer devices

Distribution of Wheel Load



Basic Distress Mechanisms

Load-related

- Fatigue
- Faulting

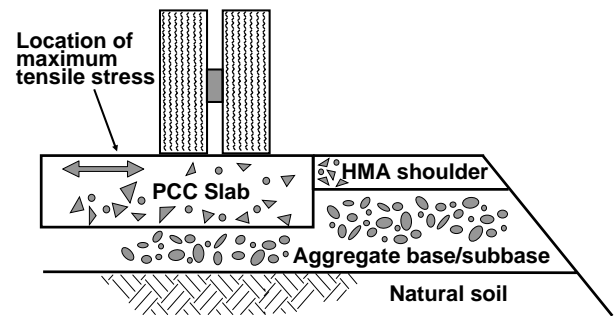
Temperature-related

- Low-temp. mid-slab cracking
- High-temp. joint / crack distress

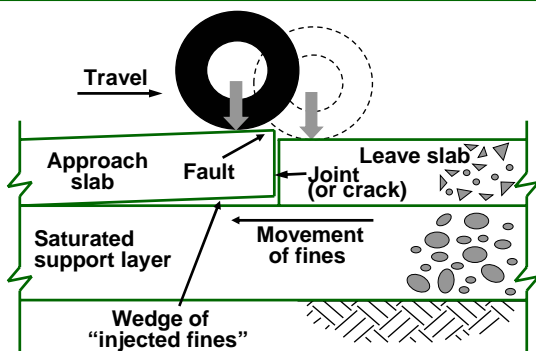
Moisture-related

- Pumping
- D - Cracking

Load-Related: Fatigue



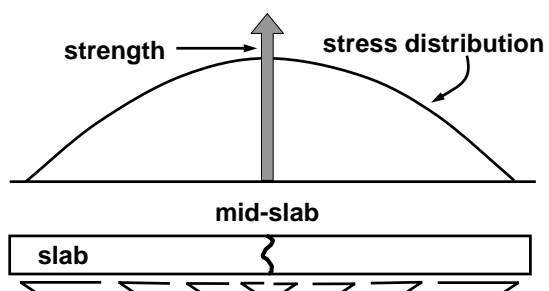
Load-Related: Faulting



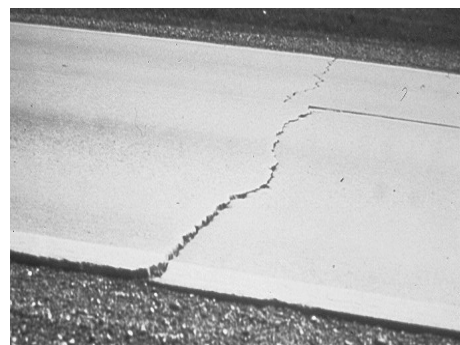
Load-Related: Faulting



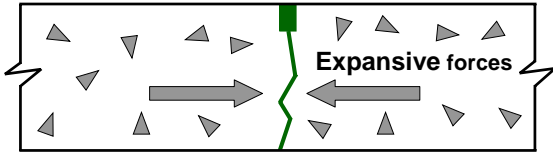
Temperature-Related: Mid-Slab Cracking



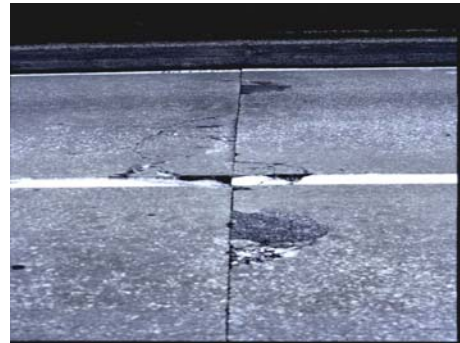
Temperature-Related: Mid-Slab Cracking



Temperature-Related: High-Temperature Joint / Crack Distress



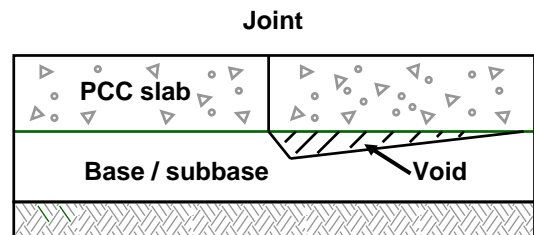
Temperature-Related: Spalling



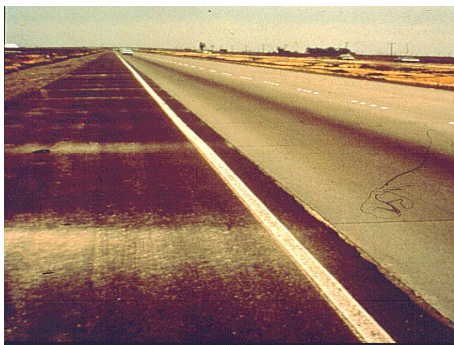
Temperature-Related: Blowup



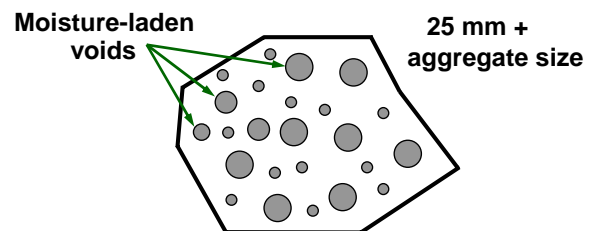
Moisture-Related: Pumping



Temperature-Related: Pumping



Moisture-Related: D-Cracking



Moisture-Related: D-Cracking



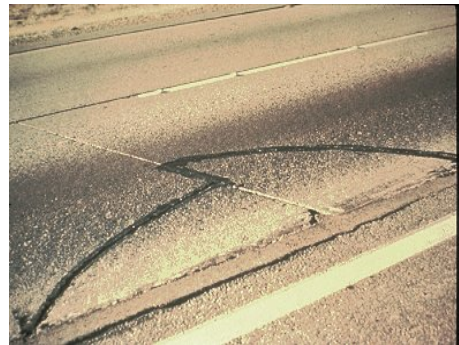
Rigid Pavement Types

- JPCP
- JRCP
- CRCP
- Pre-stressed concrete pavement

Jointed Plain Concrete Pavement

- No steel mesh
- Joint spacing: 4 to 7 m
- Slab thickness: 200 to 400 mm
- Contraction joints: with and without dowels
- Granular or stabilized base

Jointed Plain Concrete Pavement



Jointed Reinforced Concrete Pavement

- Steel mesh: 0.1 to 0.2% of cross-sectional area
- Joint spacing: 7.5 to 30 m
- Slab thickness: 150 to 400 mm
- Contraction joints with dowels
- Granular or stabilized base

Jointed Reinforced Concrete Pavement



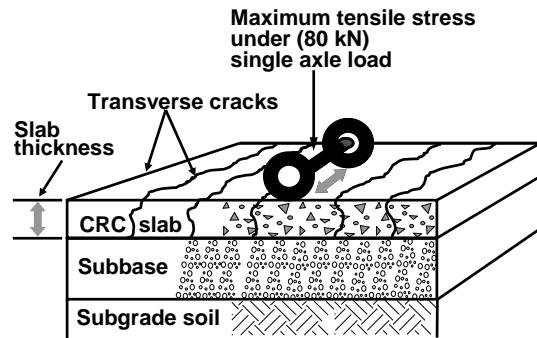
Continuously Reinforced Concrete Pavement

Reinforcement: 0.5 to 0.8% of cross-sectional area

Slab thickness: 200 to 400 mm

Granular or stabilized base

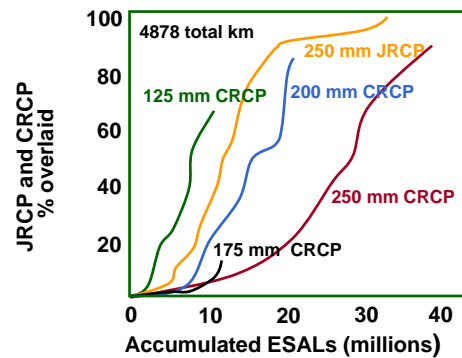
CRCP Cutaway



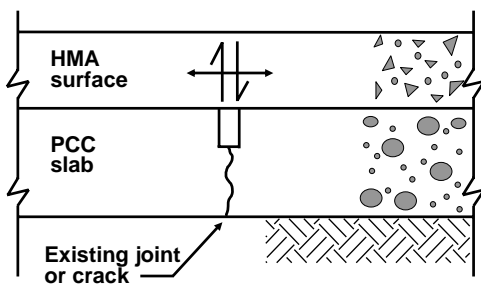
CRCP Punchout



Survival Curves



Asphalt / Concrete Composite Pavements



Asphalt / Concrete Composite



Summary

Role of each pavement layer

Factors that affect performance

Three pavement classifications

- Five types
- Characteristics
- Typical performance
- Basic mechanisms