

Module 2-5

Drainage Survey and Evaluation

Objectives

- List distresses caused by moisture
- Define drainage factors
- Describe principle behind drainage time
- List properties that influence drainability
- Impact of moisture on pavement distress

Definitions

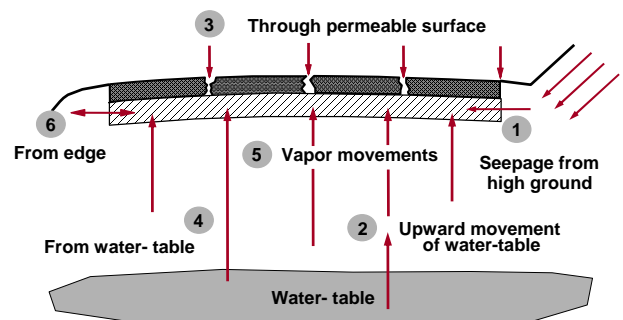
Moisture

- Infiltration
- Lateral seepage through natural soils
- Capillary action from underlying water table

Drainage

- Removal of moisture from pavement
- Prevent entry of moisture into pavement

Sources of Water



Moisture Related Distress Survey

Ditches clear of standing water ?

Ditches and pavement edge clear of grass/weeds ?

After a rain, is water flowing from joints or cracks ?

Are typical signs of pumping evident ?

Visual Evaluation

If sub-drainage is present, can the outlets be found and are they clear of debris ?

Are inlets clear and functioning ?

Are the joints or cracks sealed ?

Is the sealant in good condition ?

External and Internal Drainage Factors

External drainage factors - climate

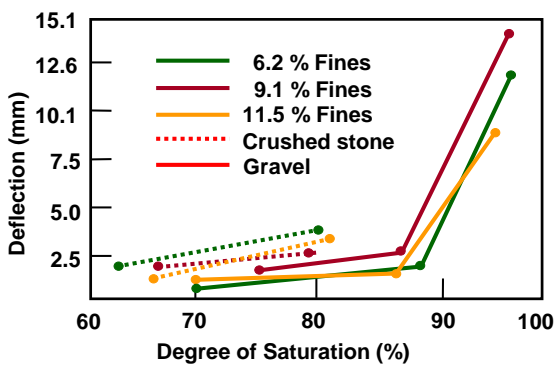
- Local climatic information
 - Precipitation used to estimate frequency that any granular layer at or near saturation
 - Temperature used to estimate effects of freezing on base and subgrade soil layers

Internal Drainage Factors

Roadway geometry and material properties

- Drainability
- Permeability
- Physical geometry of roadway
- Soil type
- Topography
- Water table
- Existing drainage facilities

Deflection Vs. Saturation of Base



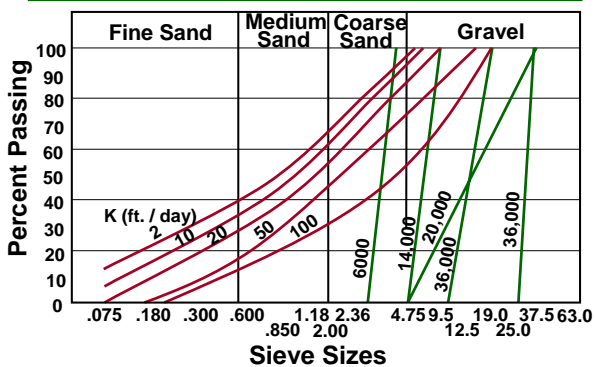
Internal Drainage Factors - Drainage Time

May be calculated for any given material and roadway section.

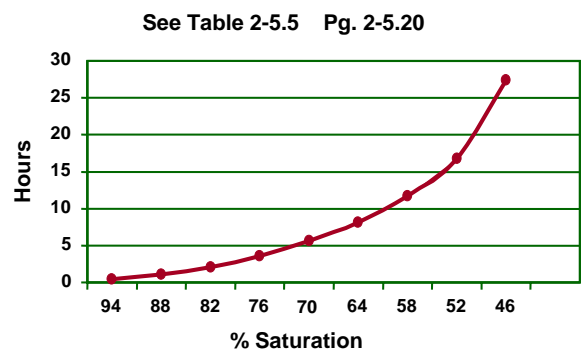
Inputs include:

- Permeability
- Layer thickness and width
- Drainage time
- Porosity
- Longitudinal and transverse grade

Internal Drainage Factors - Permeability



Example of Drainage Time Calculation



Internal Drainage Factors

Critical drainage time - Based on 85% saturation time related to the

- Performance of jointed PCCP
- Less than 5 hr. to 85% considered acceptable
- 5 hr. to 10 hr. marginal condition
- Greater than 10 hr. considered unacceptable

Internal Drainage Factors

Subgrade soil - The drainability of the subgrade soil is a function of:

- Soil grain size
- Depth of the water table
- Soil plasticity and topography

Combining Base and Subgrade Drainage

		PERFORMANCE		
		A	M	U
Subgrade Soil Durability	Good	EXC	G	F to P
	Fair	G	F	P to VP
	Poor	F to P	P to VP	VP

EXC - Excellent
 G - Good
 F - Fair
 P - Poor
 VP - Very Poor

A - Acceptable
 M - Marginal
 U - Unacceptable

Summary

The following information is required for drainage analysis

- External or climatic factors
 - Potential for moisture in pavement structure
 - Potential for temperature interaction with moisture
- Internal or material properties
 - Ability of granular layer to pass water to drains
 - Ability of subgrade to assist drainage