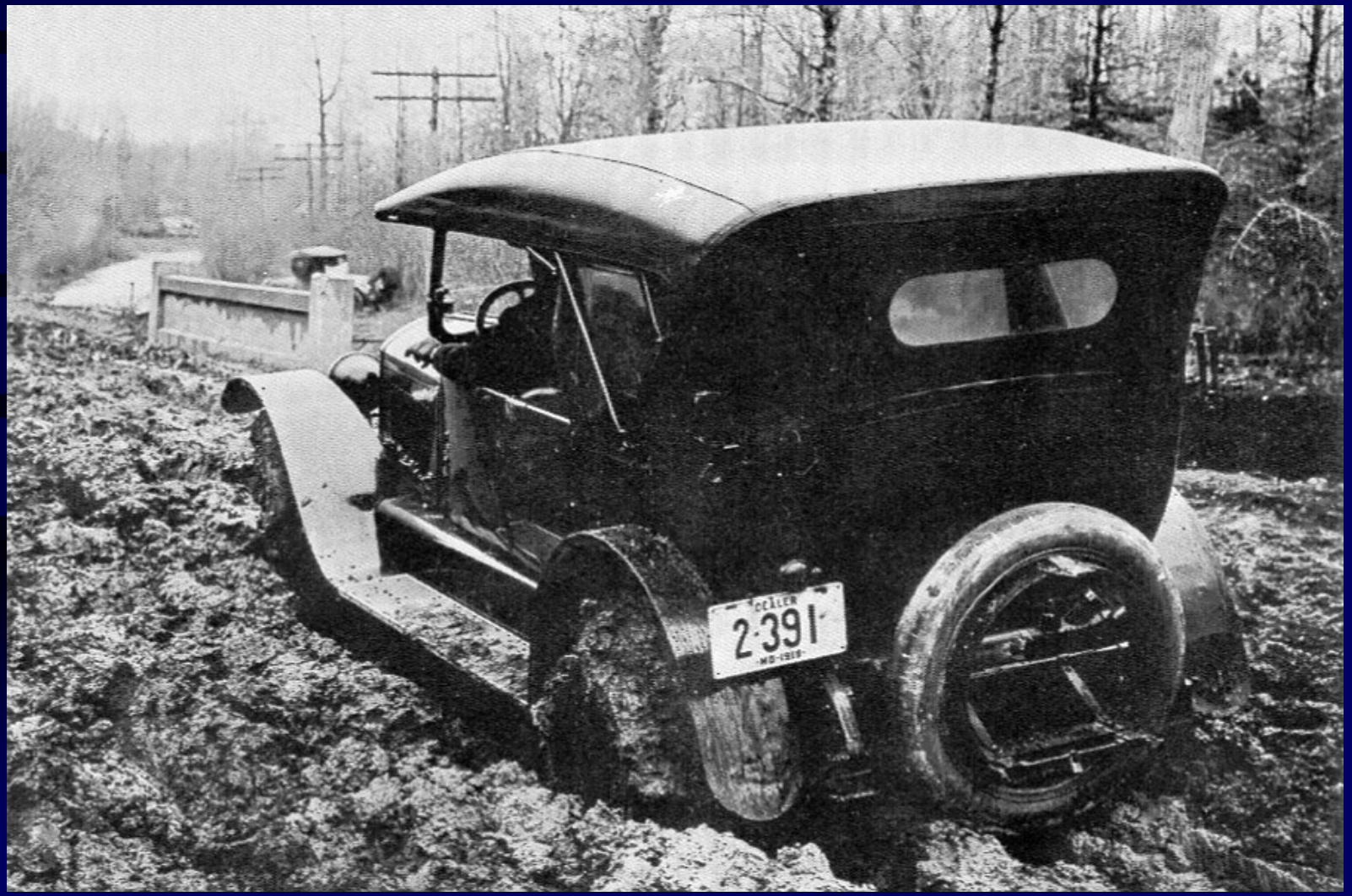
Drainage

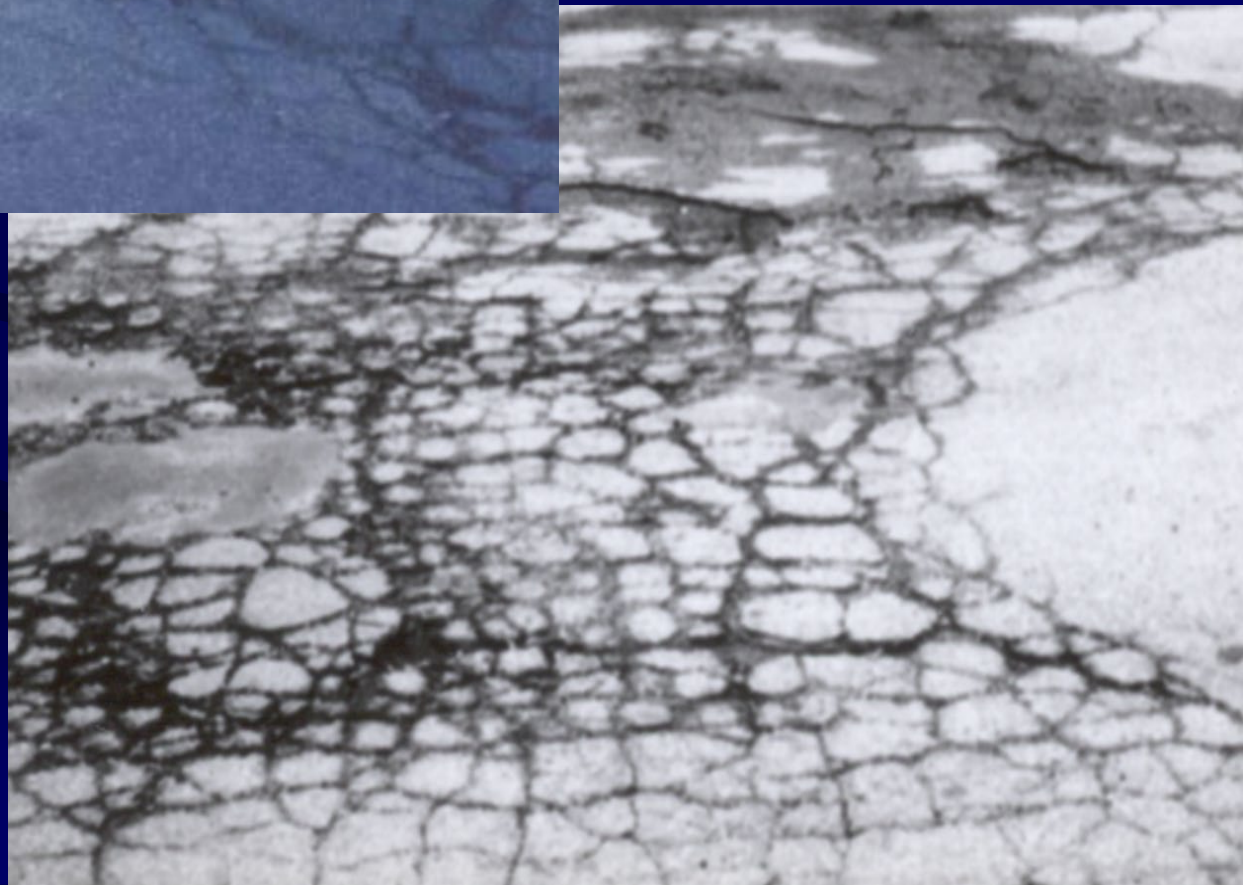


The three most important things in building and maintaining roads are:

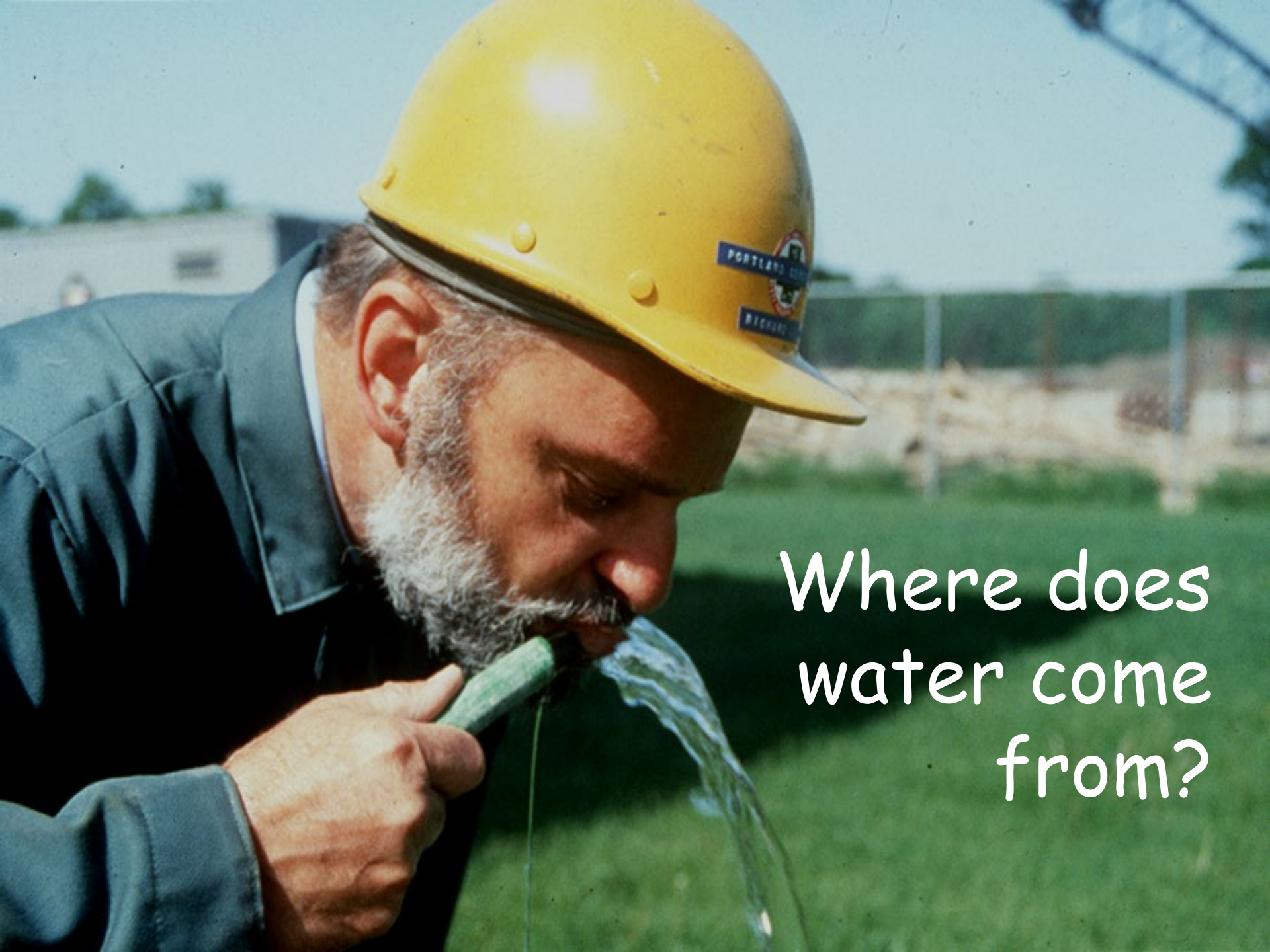
- Drainage,
- Drainage, and
- Drainage !!!

Poor Drainage Distresses

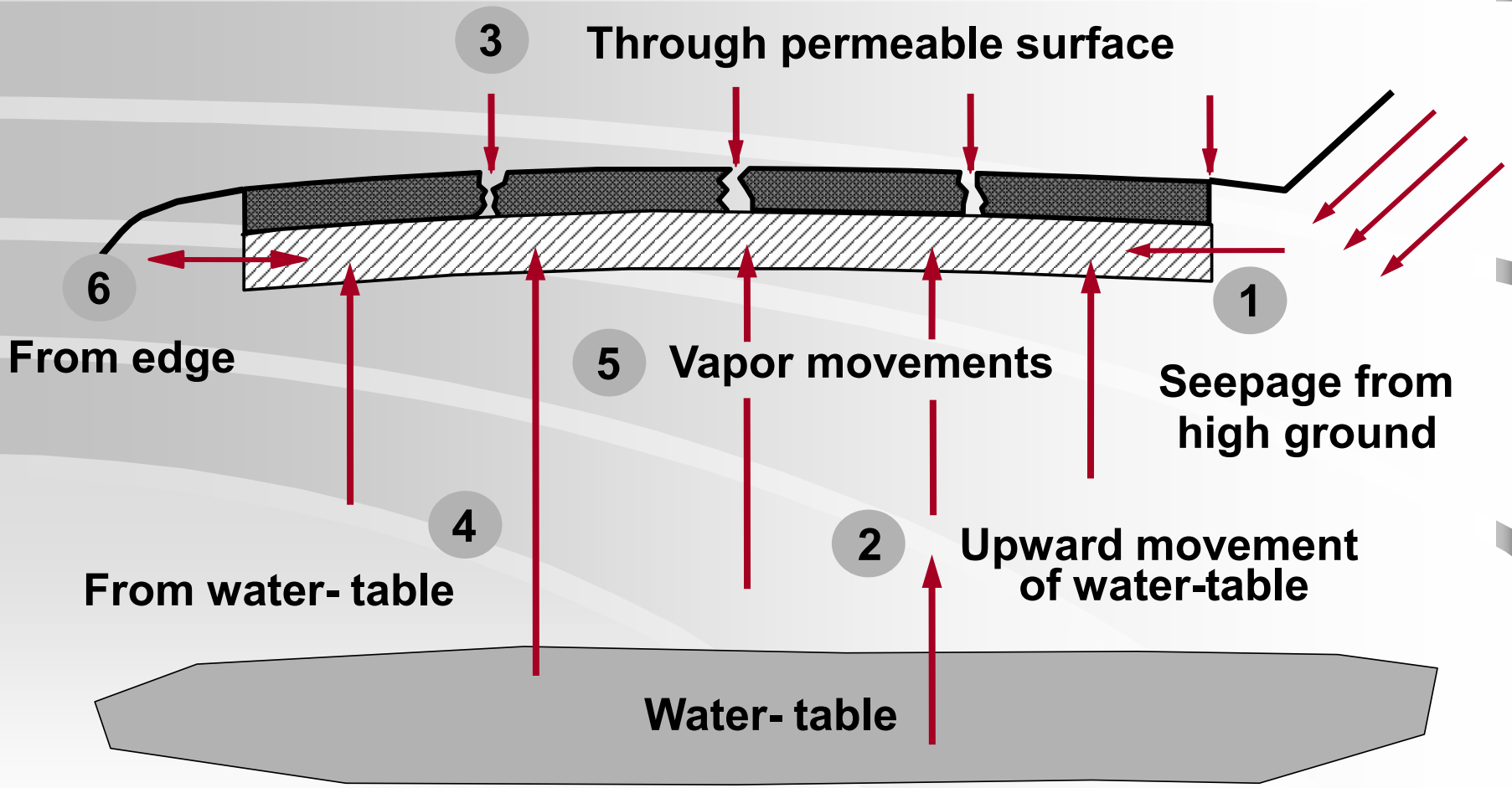
Poor Drainage Distresses



Poor Drainage Distresses


Where does water come from?

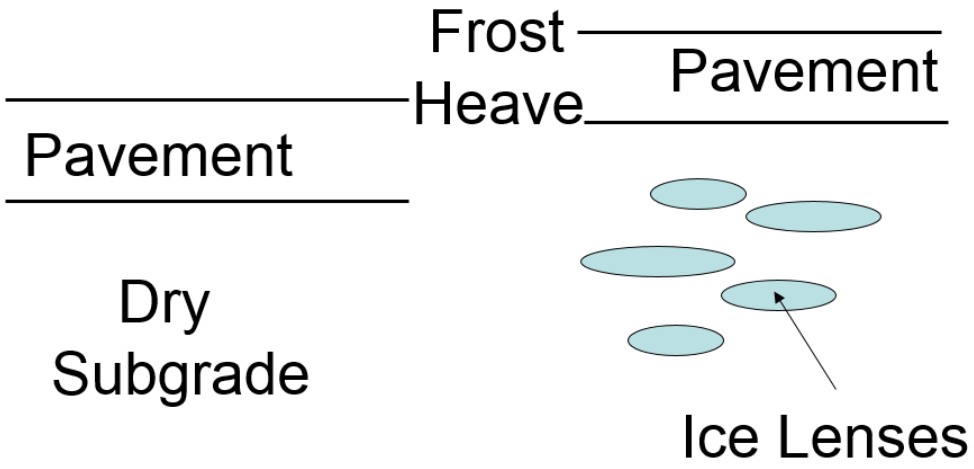
Sources of Water



What will moisture do?

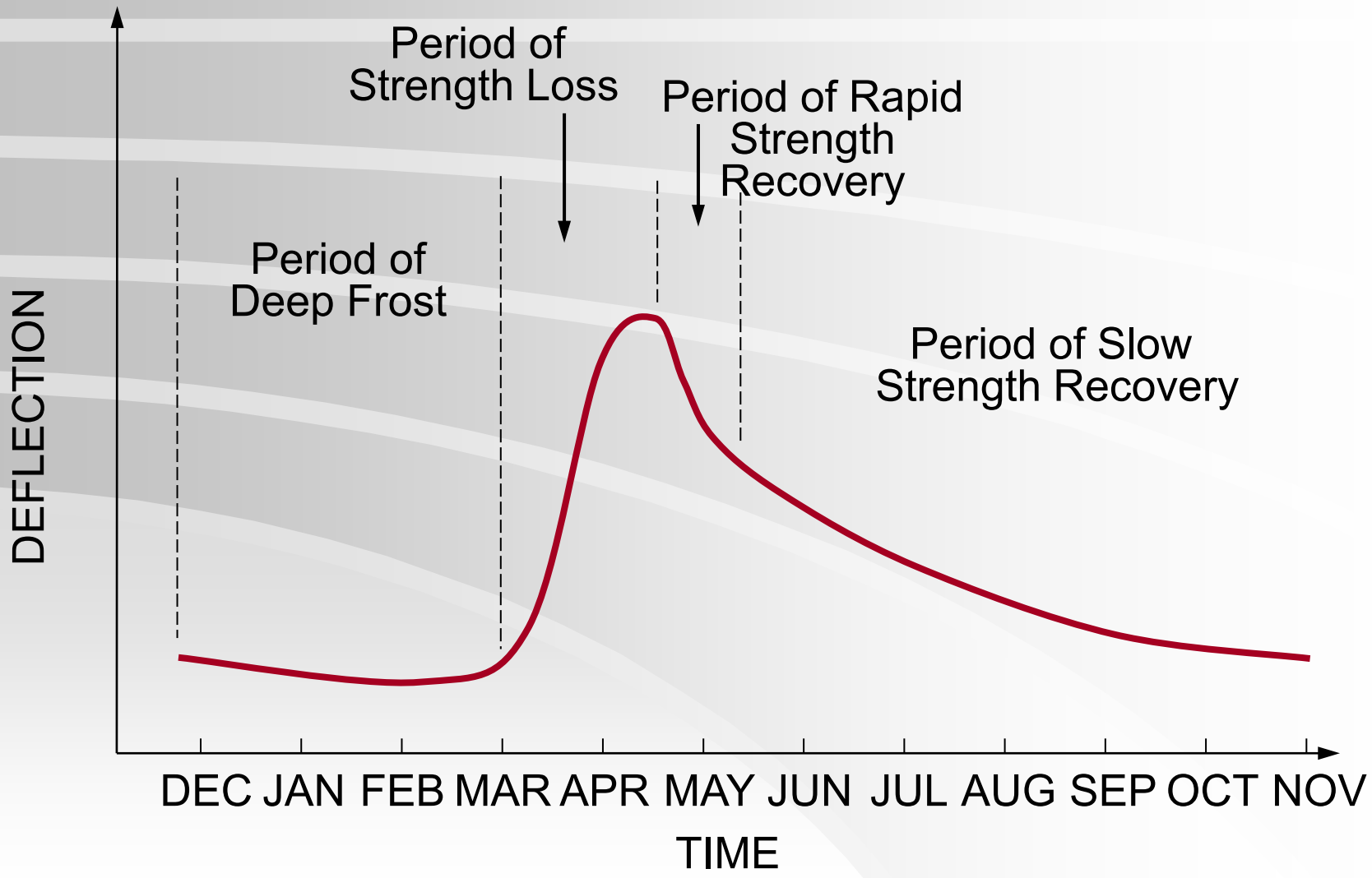
- Reduces soil strength
- Develops pot holes
- Swells soil
- Strips asphalt
- Frost heave
- Pumping

Frost Effect



Frost Heave

Typical Deflection / Time Plot



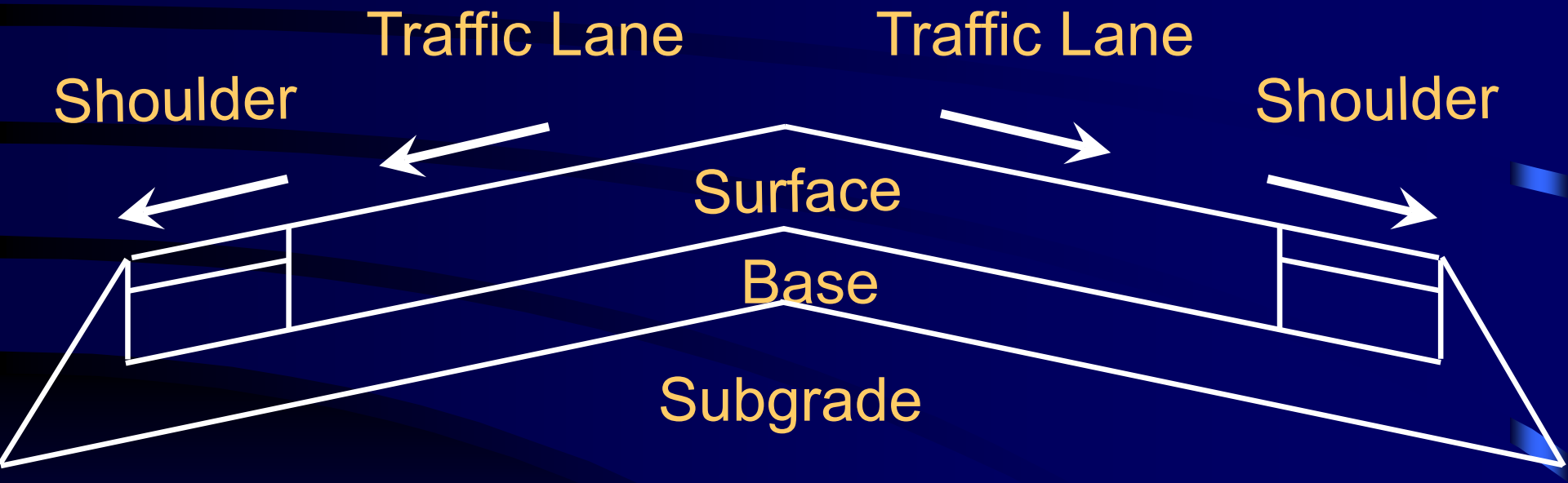
Approaches for Controlling Water in Pavement

1. Prevent moisture from entering the pavement (surface drainage)
   - Seal cracks & joints
   - Surface drainage (crown)
2. Quick removal of moisture (subsurface drainage)
3. Building a stronger pavement
4. Combinations

1. Prevent Entry of Moisture

- Sealing
  - ✓Cracks
  - ✓Surface treatment
- Surface drainage
  - ✓Crown

Surface Drainage



With curb
and gutter

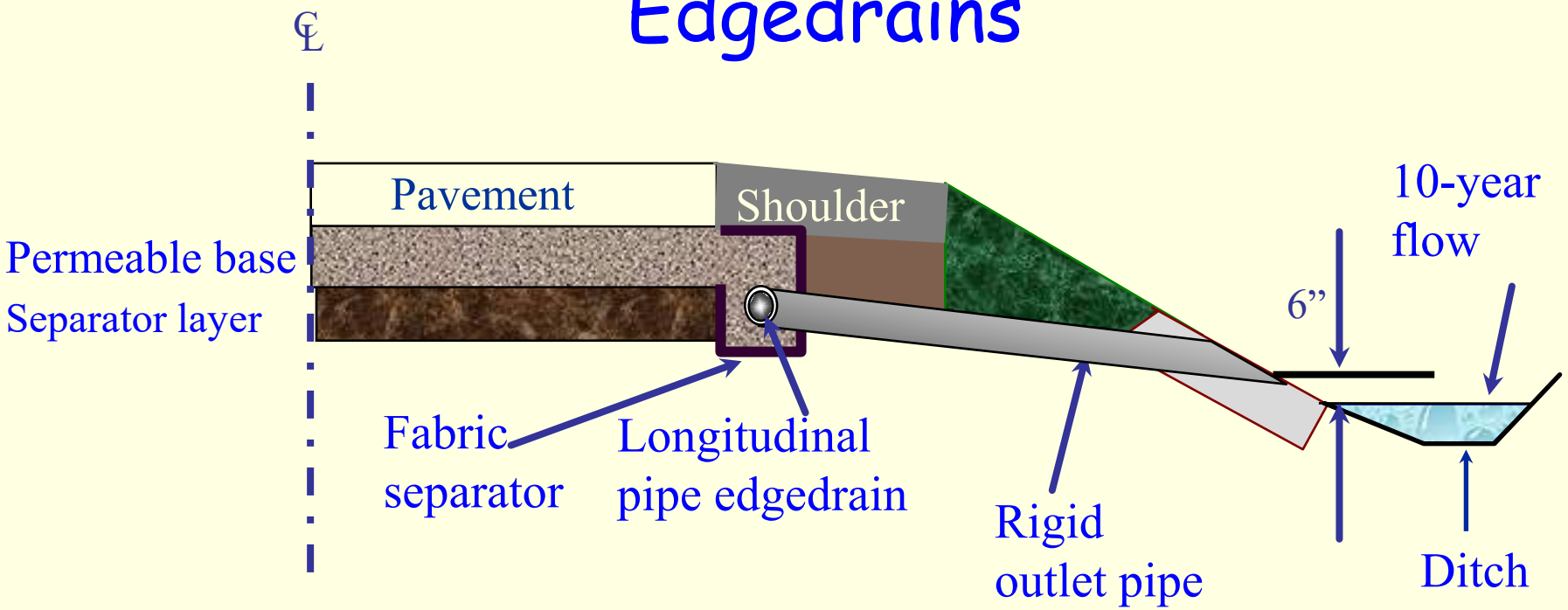
w/o curb
and gutter

2. Moisture Removal

- Subsurface Drainage Systems
- Inlets
- Sediment Control
- Drainage Structures

Subsurface Drainage Systems

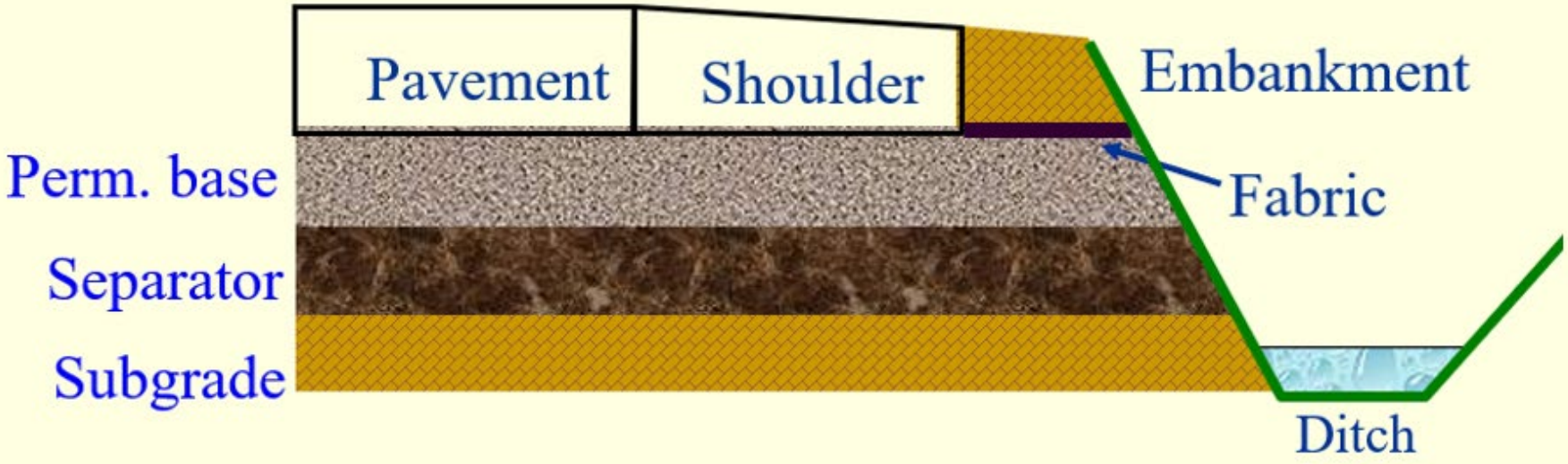
Permeable Base System with Edgedrains



Longitudinal Pipe Edgedrains

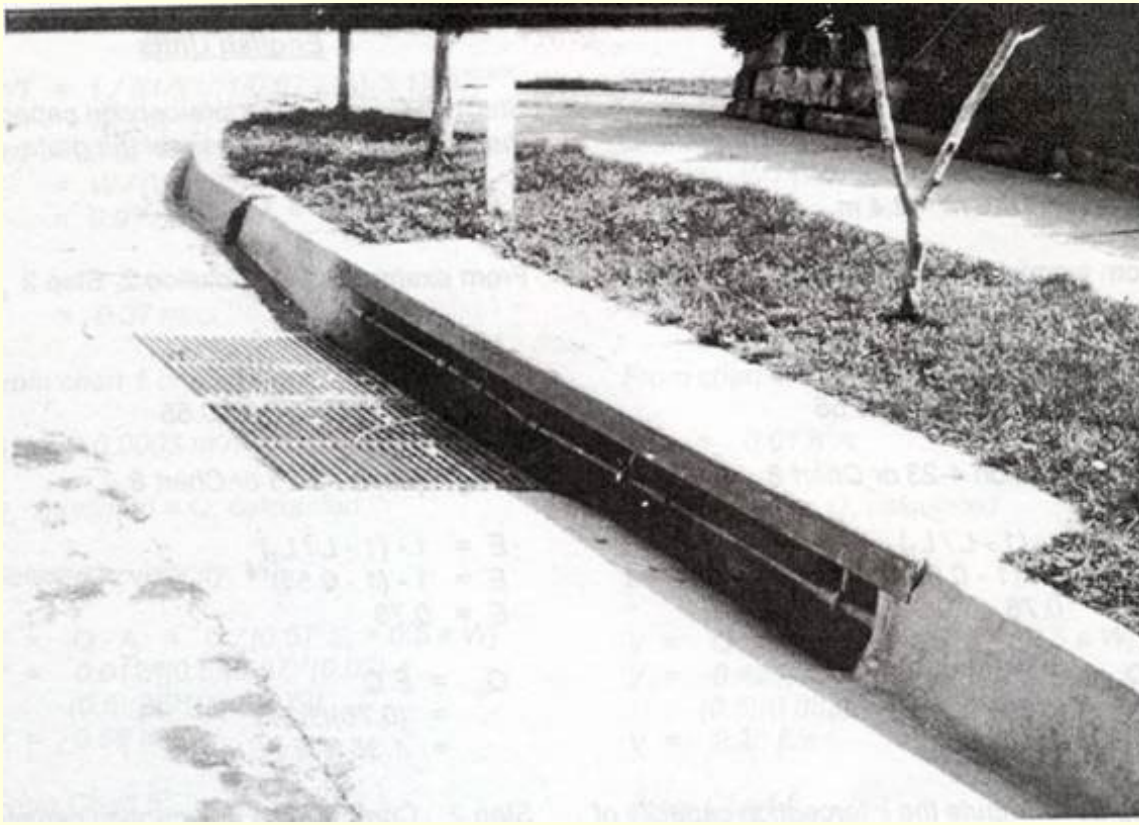
- Circular metallic or plastic pipes with perforations
- Run along the pavement length
- Intercept water from exiting pavement
- Drains to a ditch by the pavement

Permeable Base System



Collection Systems

- Roadside and median ditches
- Gutters
- Drainage inlets



Stormwater Discharge Control

- Detention / retention facilities
- Water quality Control

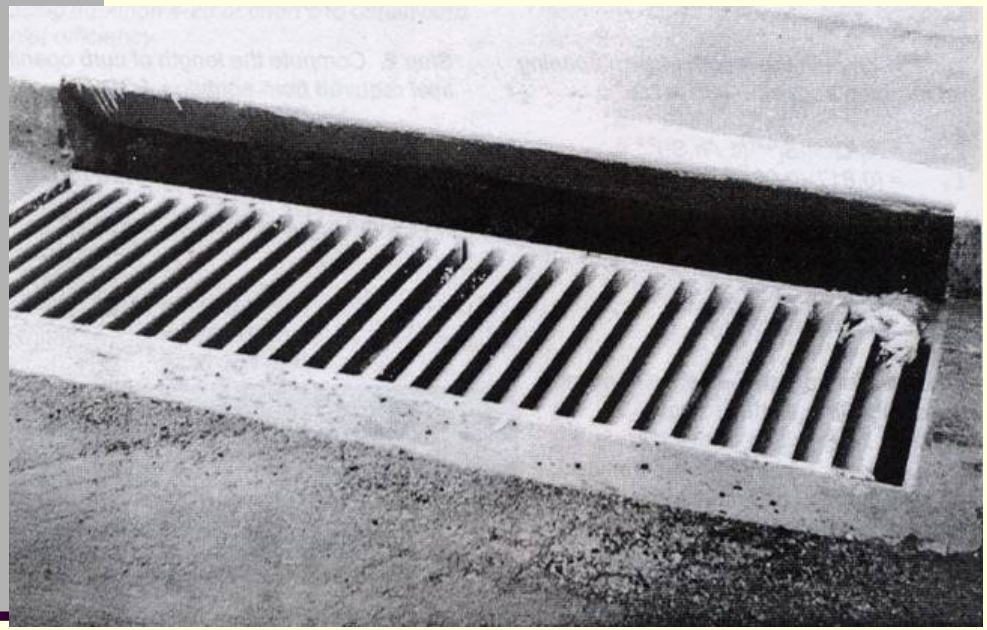
Stores or detains stormwater temporarily

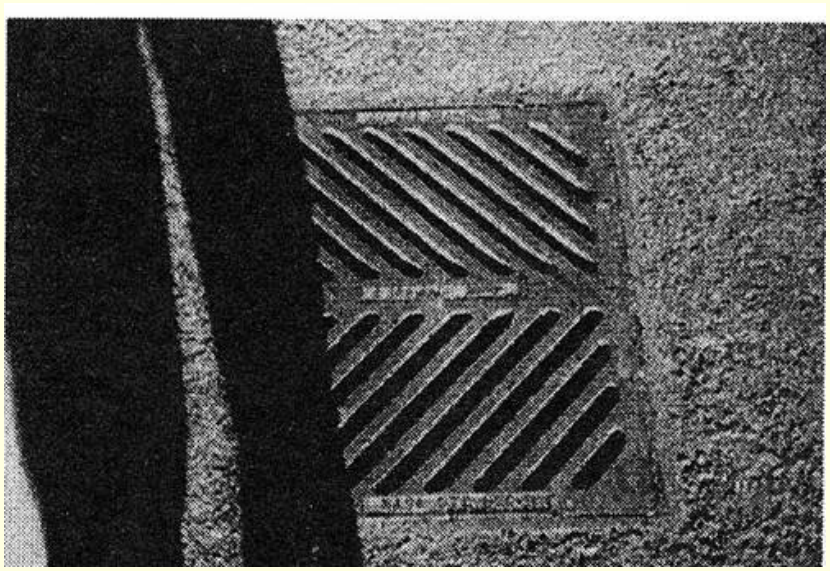
Holds or retains stormwater more permanently

Flood Water Relief

Combination Inlets

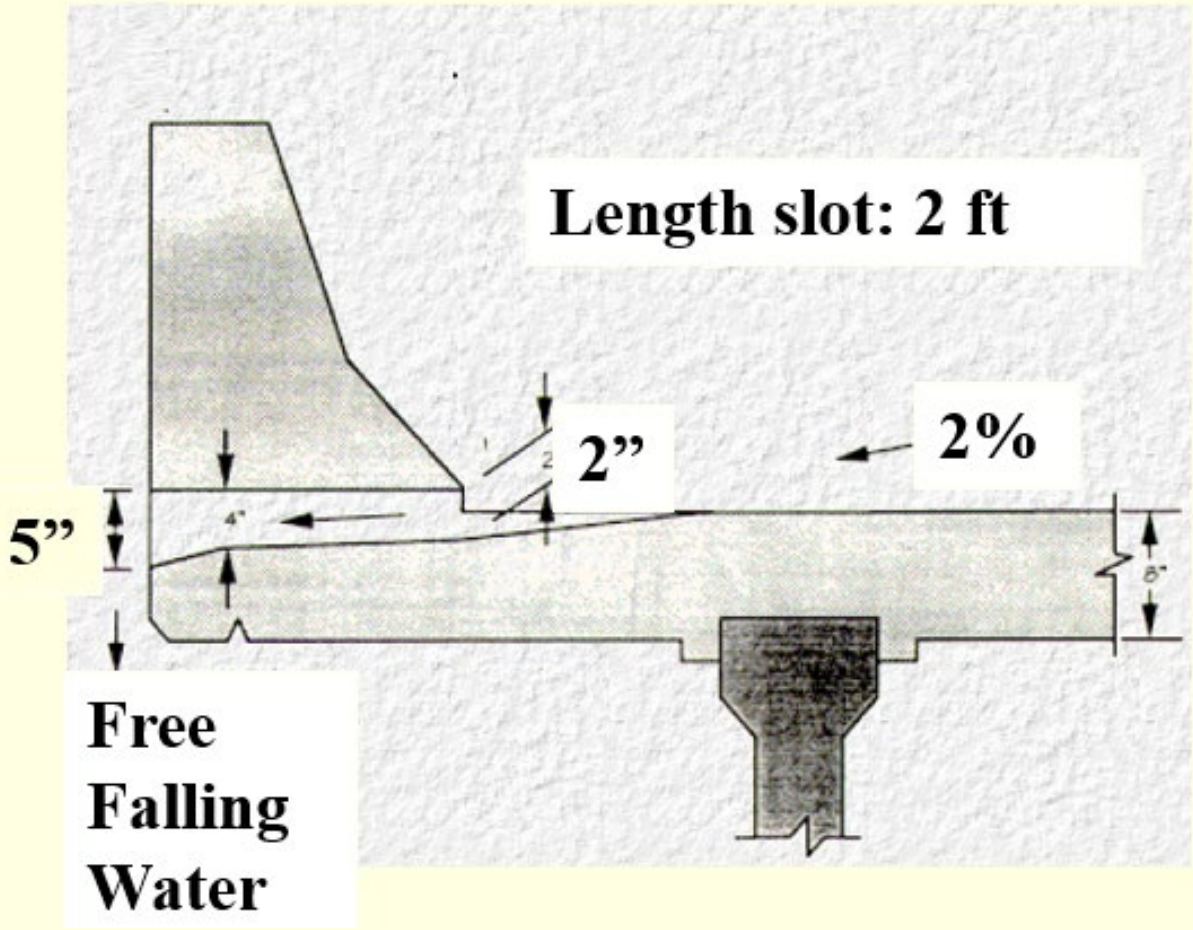
"Herring-Bone" angled bars Grate





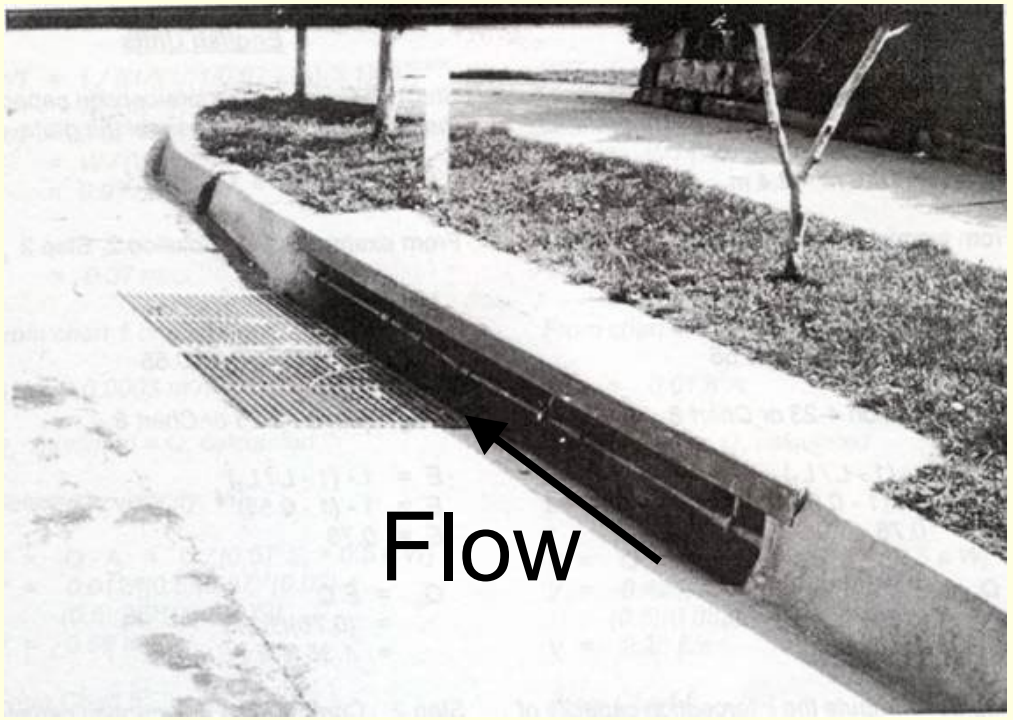
Combination curb-opening and 45° tilt-bar grate inlet

Bridge Deck Drainage Inlets



Combination Inlets

Grate & Slotted drain combination

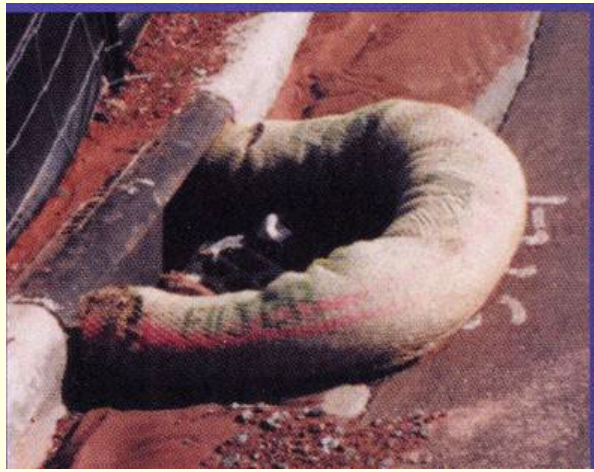


Sweeper combination

Culverts & Bridges

- Critical to carry the natural flow of water under the road
- Small pipes and box culverts can easily become plugged from eroded soil and debris

Sediment Control During Construction

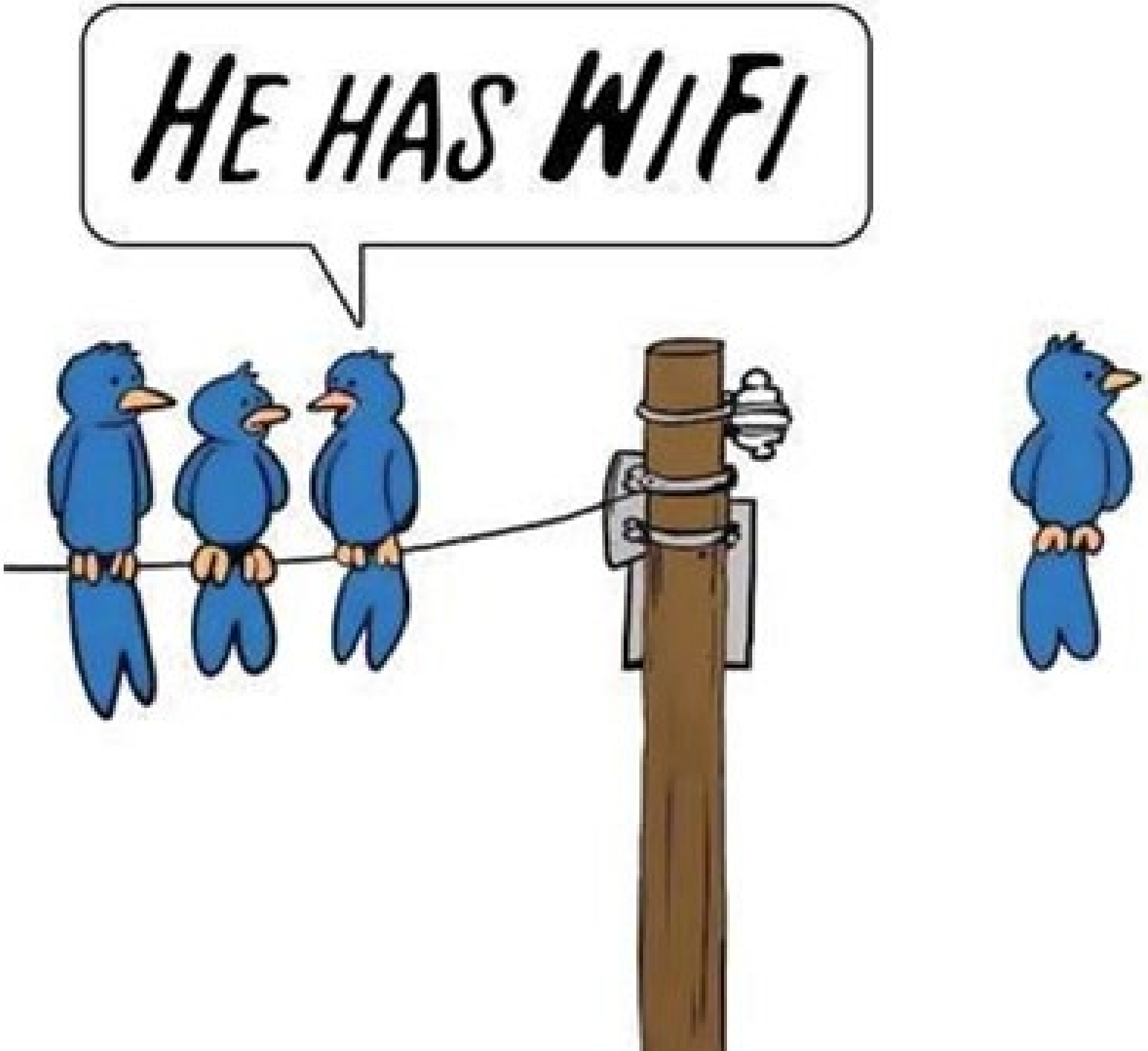


Moisture Related Distress Survey

- 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 ?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