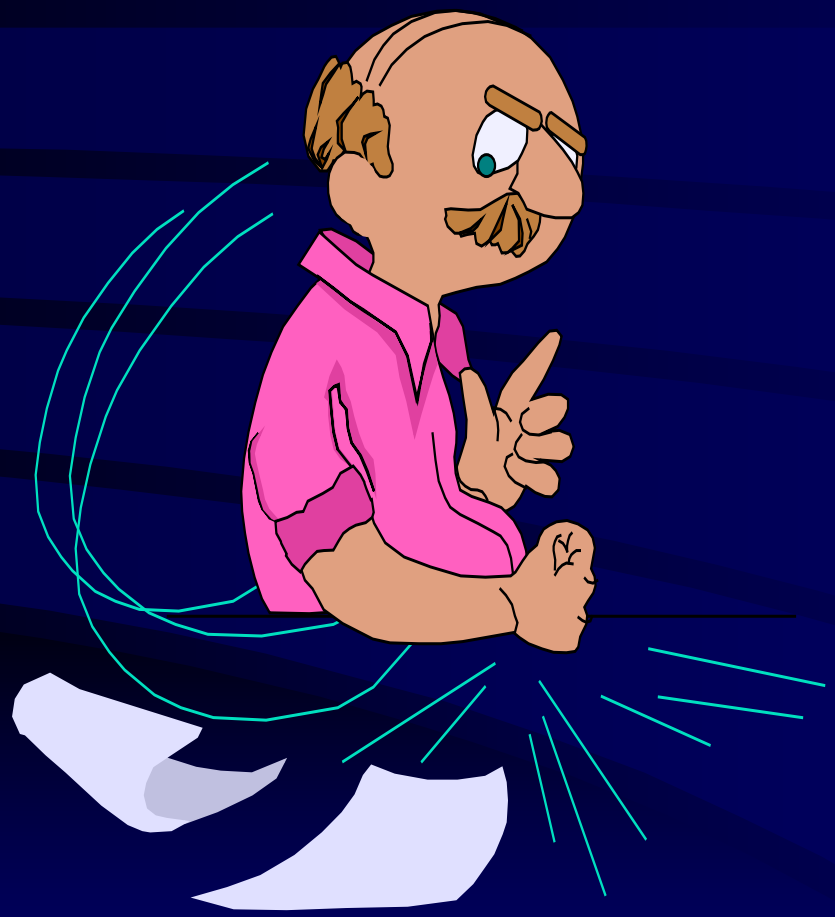


# CHIP SEALS

# Chip Seal

- An application of asphalt emulsion covered by a layer of one-sized chips (3/8 in.)
- Also known as surface treatment, seal coat, or armor coating

# Uses of Chip Seal

- Wearing course
- Waterproofing the surface
- Sealing small cracks
- Improving surface friction

# Conditions for Success

- Structurally sound
- Patched and cured
- Clean surface with no loose fragments
- Dry surface
- Pavement temperature > 70°F

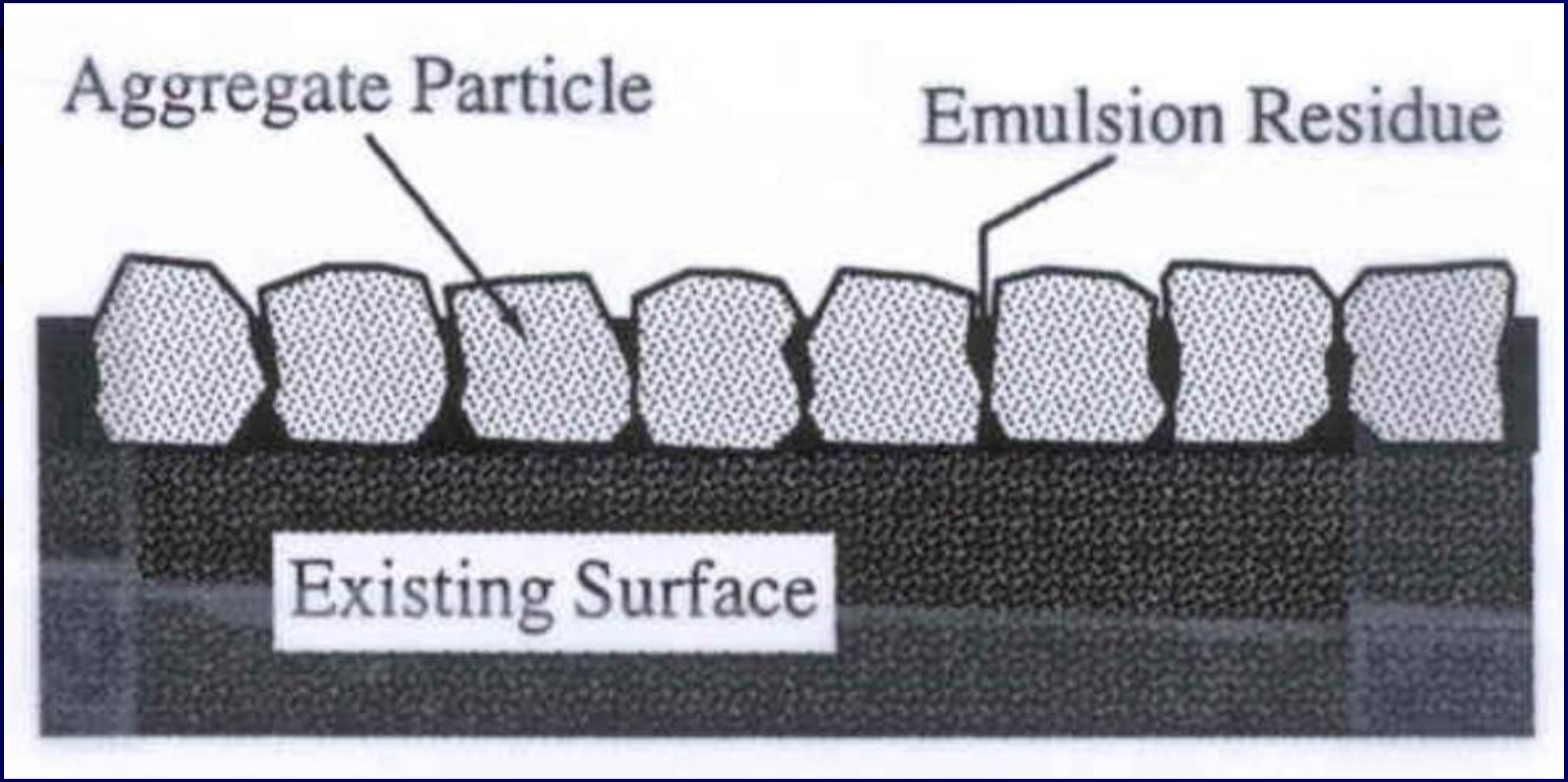
# Laboratory Tests

Design Test


Sweep Test

Vialit Test

# Optimum Configuration



# Optimum Rock Distribution

# Embedment Check

# Preparation & Weather

- Survey pavement condition
- Patch, seal, and cure
- Air temperature > 50°F
- Pavement temperature > 70°F
- Dry surface
- No threat of rain

# Patching and Crack Sealing

# Construction Procedure

- Clean with power broom
- Spray binder
- Spread aggregate immediately
- Roll immediately
- Allow binder to cure
- Sweep excess aggregate


Brooming

Binder Spraying

Rock Application

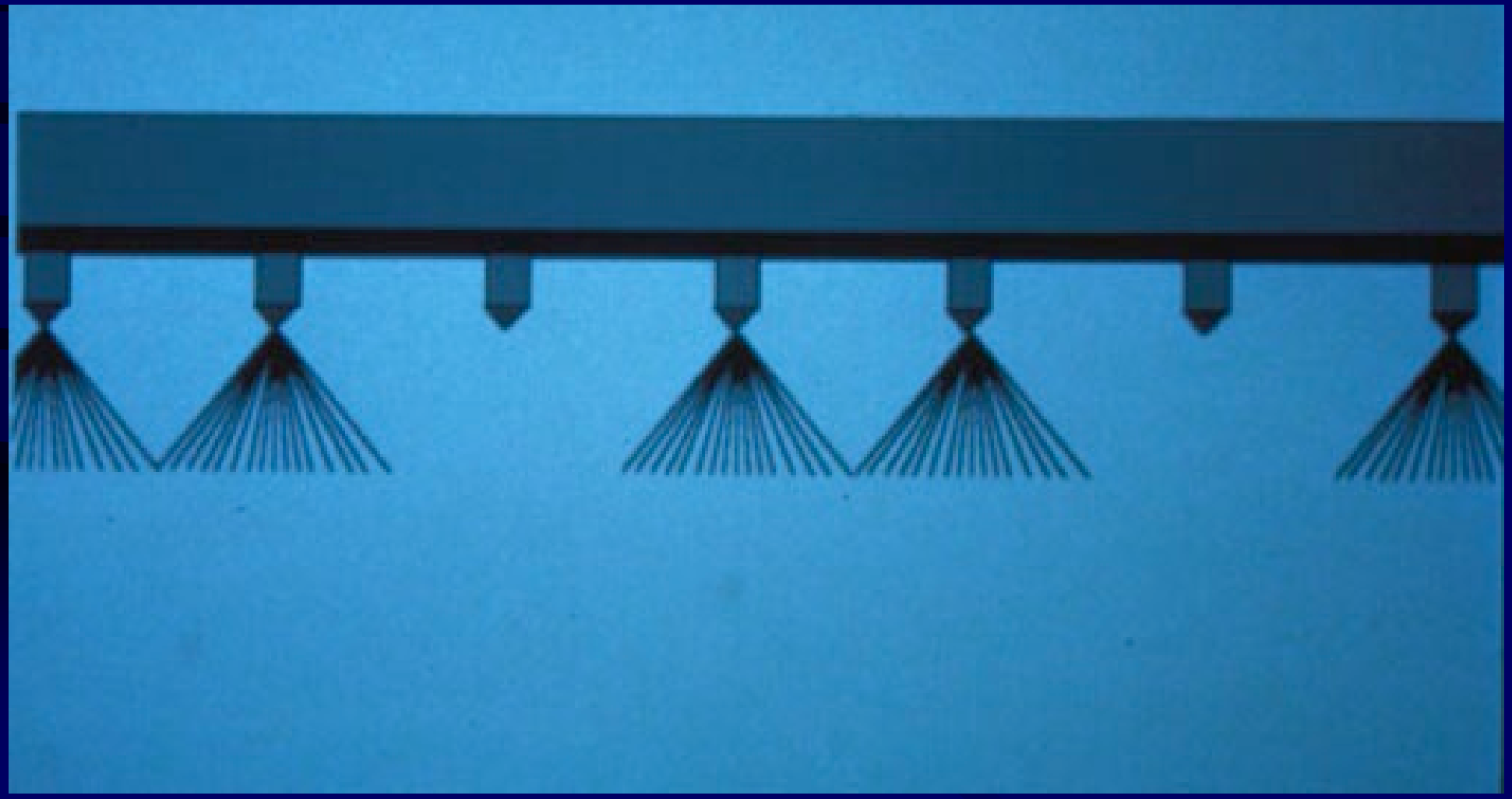
# Rolling

# Light Brooming

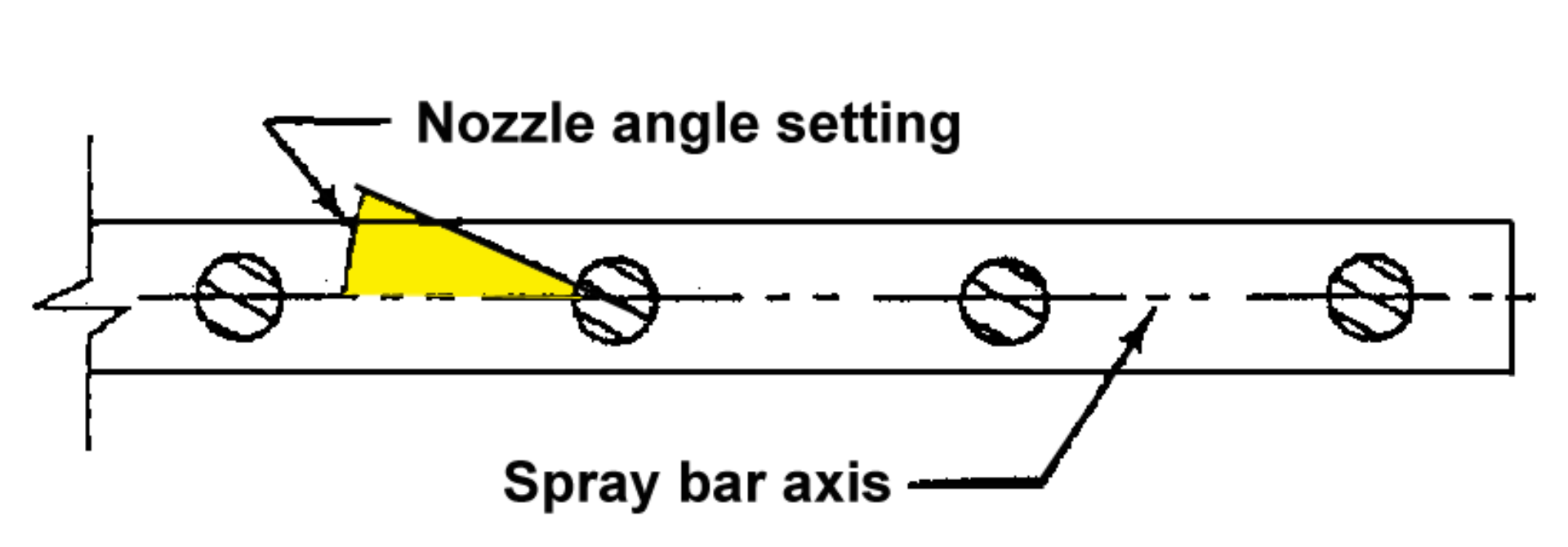
# Traffic Control

- Open road to traffic after rolling and removing excess chips
- Limit speed to 15 - 25 mph for 2 hours
- Use pilot car

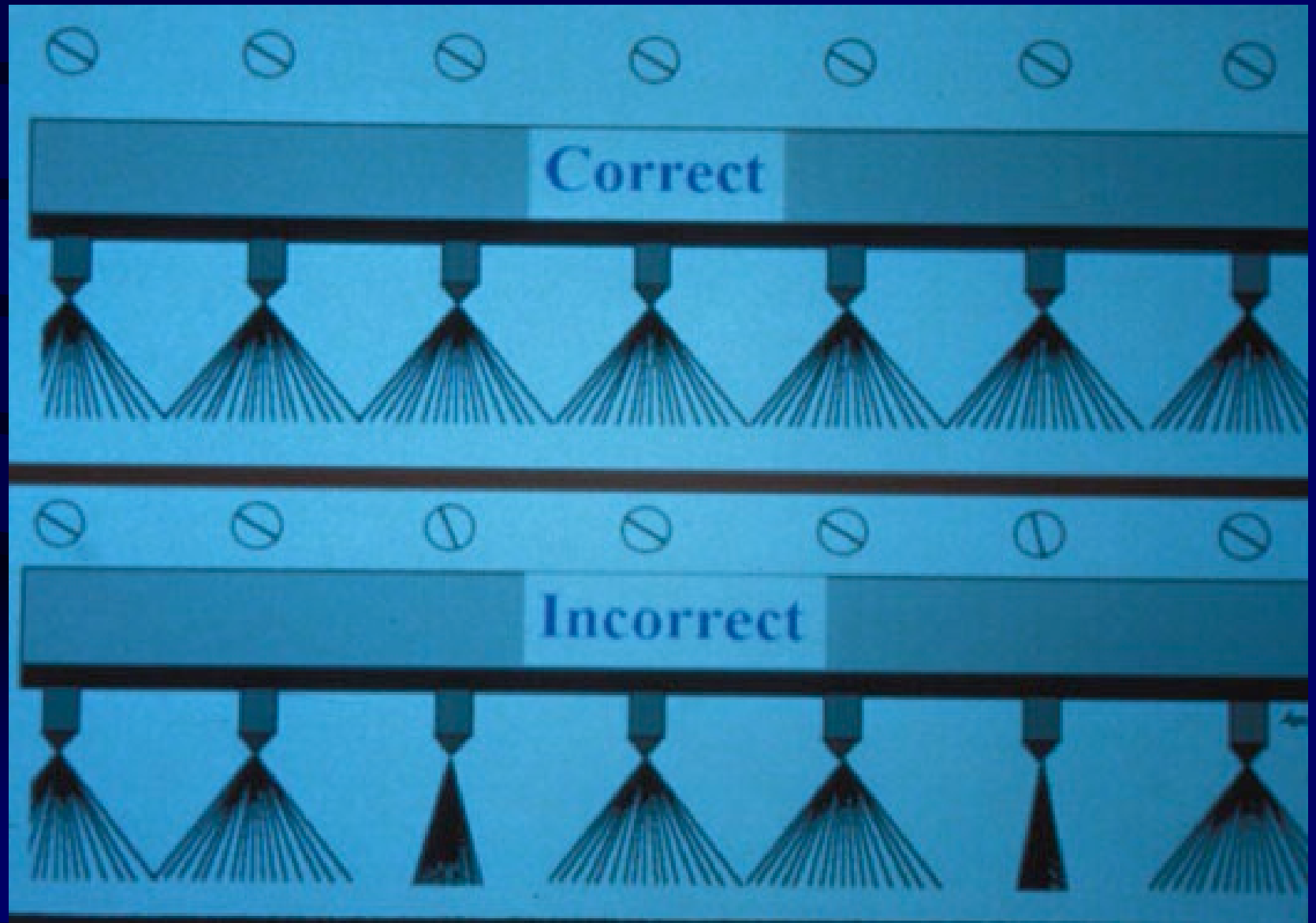
# Blocked Nozzles



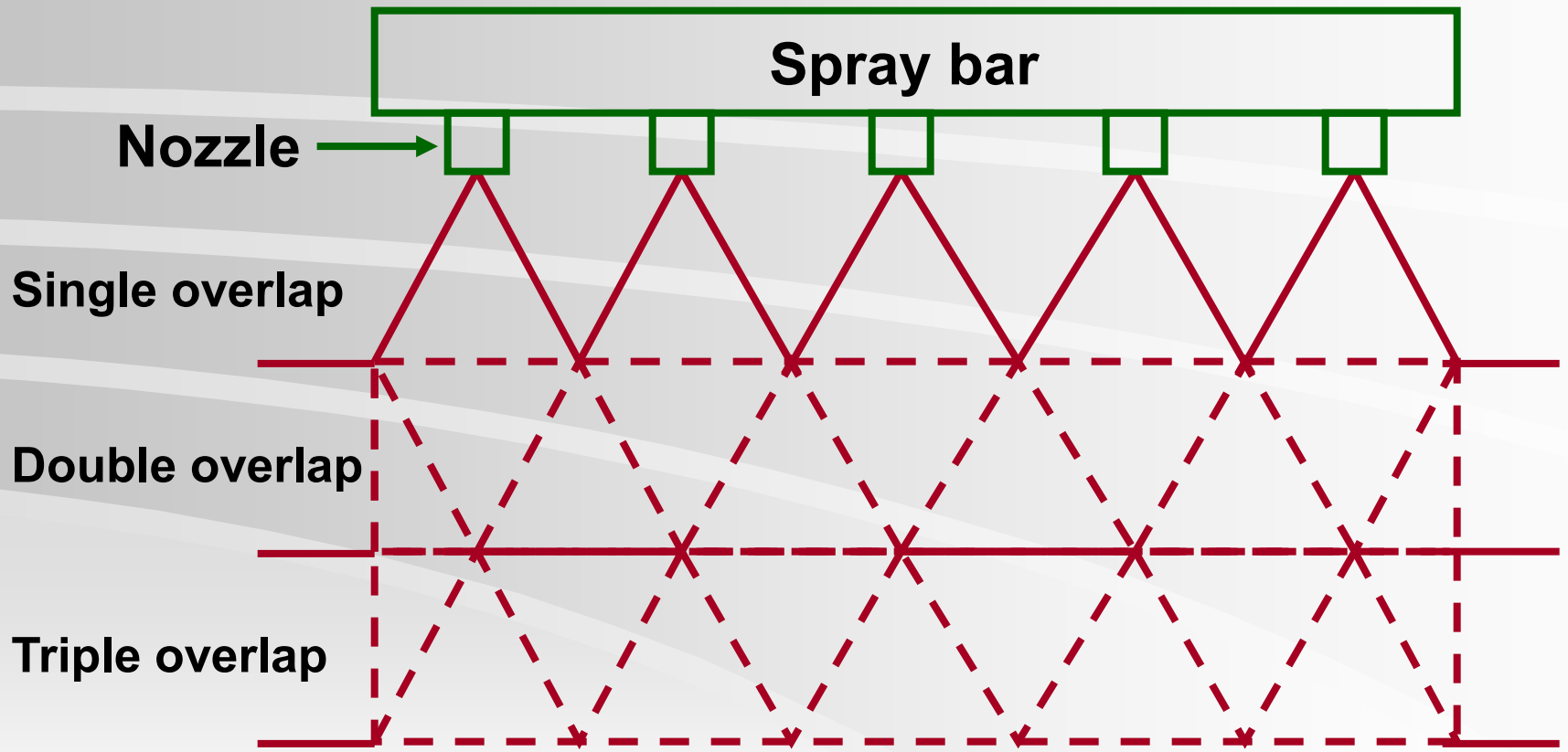
# Nozzle Angle



# Nozzle Angle



# Spray Bar Height




**Double overlap recommended**

# Calibration of Chip Spreader

# Transverse Joints

# Chip Seal Performance

- 4 to 7 years
- Pavement condition before application is critical

# Variations on Chip Seal

- Alternate binders
- Double and triple chip seals
- Precoated chips
- Light-weight chips
- Sand seal
- Scrub seal
- Sandwich seal
- Cape Seal

# Alternative Binders

- Polymer modified emulsion
- Crumb-rubber modified emulsion
- Asphalt cement

# Double Chip Seal

- Two alternate applications of emulsion and aggregate
- Each successive layer = 1/2 of preceding layer

First Layer
3/4 in. Chips

Second Layer
3/8 in. Chips

# Precoated Chips

- Eliminate dust
- Improve bond
- Coated chips should separate and flow readily thru spreader
- Binder is asphalt cement

# Light-Weight Chip Seal

- Use light-weight chips instead of regular chips
- Used to reduce the risk of breaking windshields

# Sand Seal

- Asphalt binder followed by sand cover
- Binder is rapid or medium setting emulsion
- Mostly for low volume roads

# Scrub Seal

Application of sand or small-sized aggregate on broomed layer of polymer-modified bitumen

# Scrub Seal

# Sandwich Seal

One application of binder between two layers of chips

Small Chips (3 – 5 mm)

Emulsion

Large chips (5 – 10 mm)

# Cape Seal

- Chip seal topped with either slurry seal or micro-surfacing
- Named after Cape Province of South Africa

# Micro-Surfacing on Chip Seal


A Wife is a wife, no matter who you are !!

SLURRY SEALS

# Slurry Seal

A slurry mixture of:

- Quick set emulsion
- Well-graded sand
- Mineral filler (in most cases)
- Water
- Additives to help setting (optional)
- Single Coat = ¼ in. thick

# Uses of Slurry Seal

- Seals minor cracks and voids
- Retards surface raveling
- Improves surface friction
- Delineates pavement areas

# Conditions for Success

- Structurally stable
- No cracks or movements under traffic
- No rutting or shoving

# Slurry Seal Types

| TYPE | GENERAL USAGE |
| --- | --- |
| I | Crack sealing (Low traffic) |
| II | Corrects raveling (Moderate to heavy traffic) |
| III | Fills minor irregularities & restores friction |

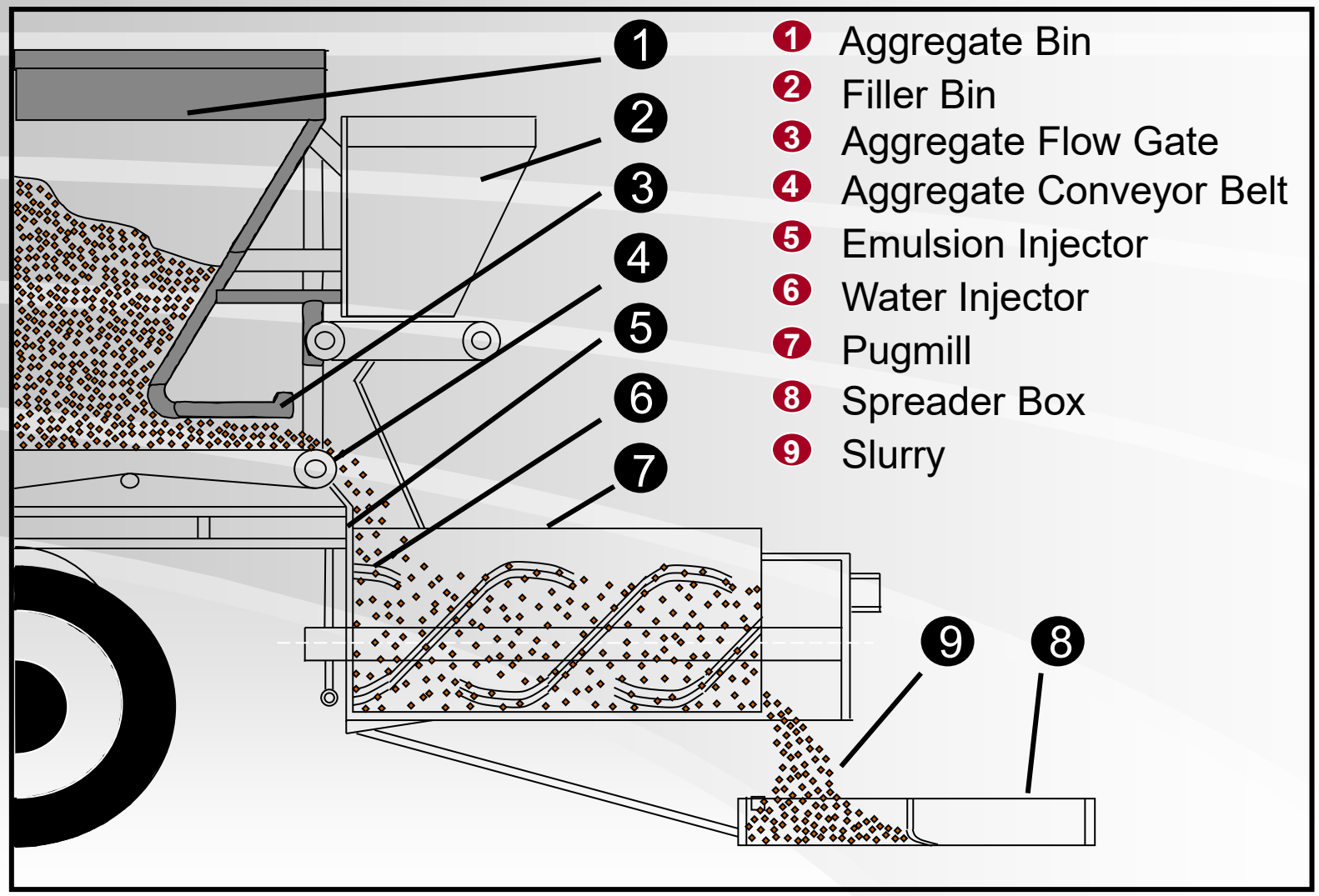
# Construction Considerations

- Seal cracks, patch, & cure
- Broom
- Tack coat if dry or raveled
- Continuous operation
- Pre-wet if hot weather

# Brooming

Slurry Machine

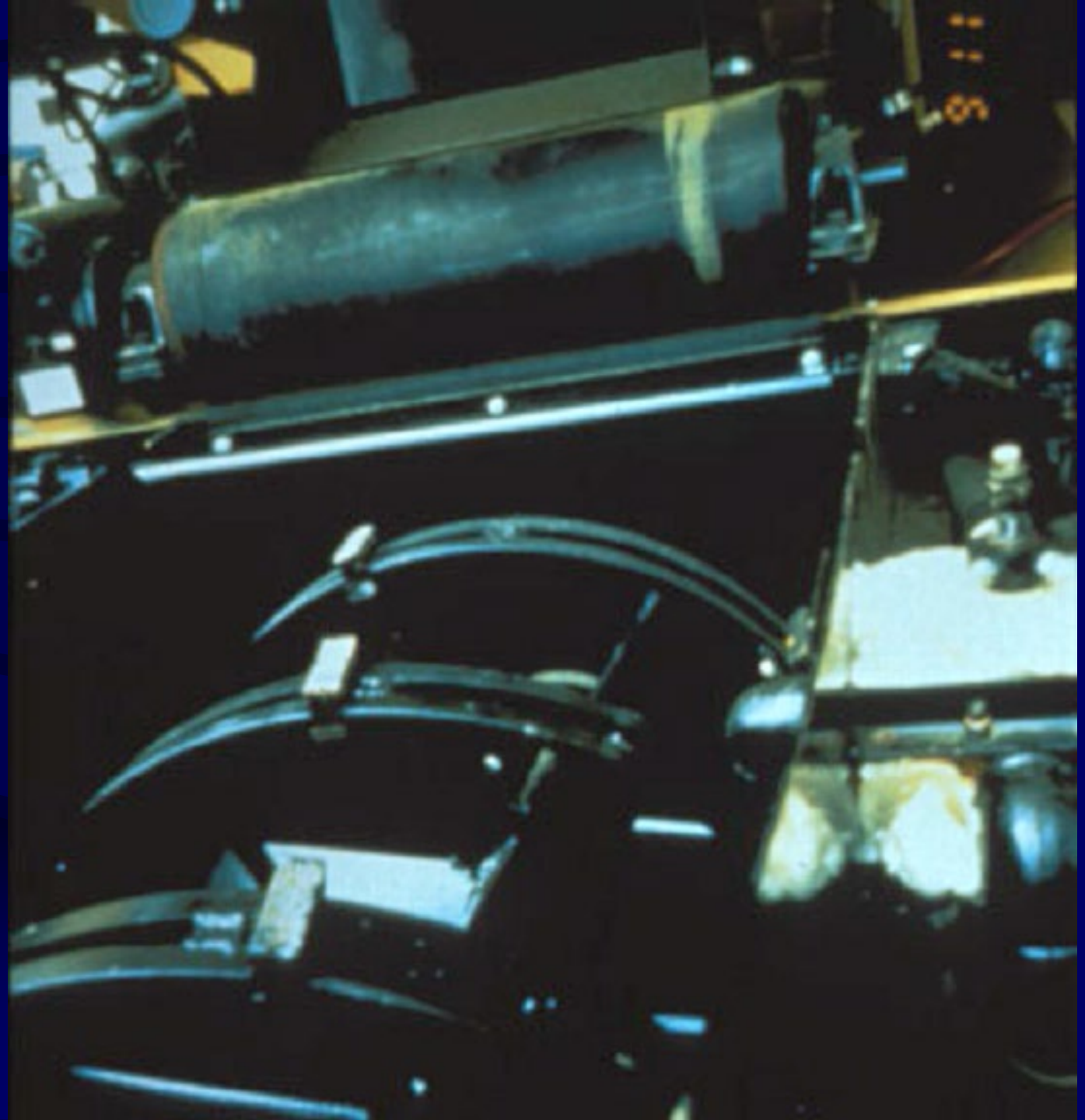
# Slurry Machine



# Loading Sand

# Adding Emulsion

# Slurry Mixer



# Spreader Box

# Slurry Application

# Manual Spreading

# Construction Considerations

- Roll only at locations subjected to abrasion
- Light pneumatic tire roller
- Start rolling when clear water can be pressed out with a piece of paper

# Slurry Seal Performance

3 - 5 years depending on

- Traffic
- Environment
- Existing pavement
- Quality of materials & design
- Construction Quality

# MICRO-SURFACING

# Micro-Surfacing

A thin surface paving system (3/8 – 1/2 in.) composed of

- Quick-set Polymer-modified emulsion
- Manufactured crushed stone
- Mineral filler
- Water
- Additives (as needed)

# Micro-Surfacing

- Can be viewed as polymer-modified slurry seal
- Except
  - Cures faster
  - Placed in a thicker layer

# Uses of Micro-Surfacing

- Raveled & flushed surfaces
- Oxidized surfaces
- Crack/void filing
- Minor leveling
- Interlayer

# Conditions for Success

- No large cracks or movements under traffic
- No excessive irregularities or shoving
- Moderate / high volume roads

# Pavement Preparation

- Repair/seal joints & cracks
- Cure sealant
- Tack coat if:
  - extremely dry, raveled
  - concrete
- Pre-wet during hot weather

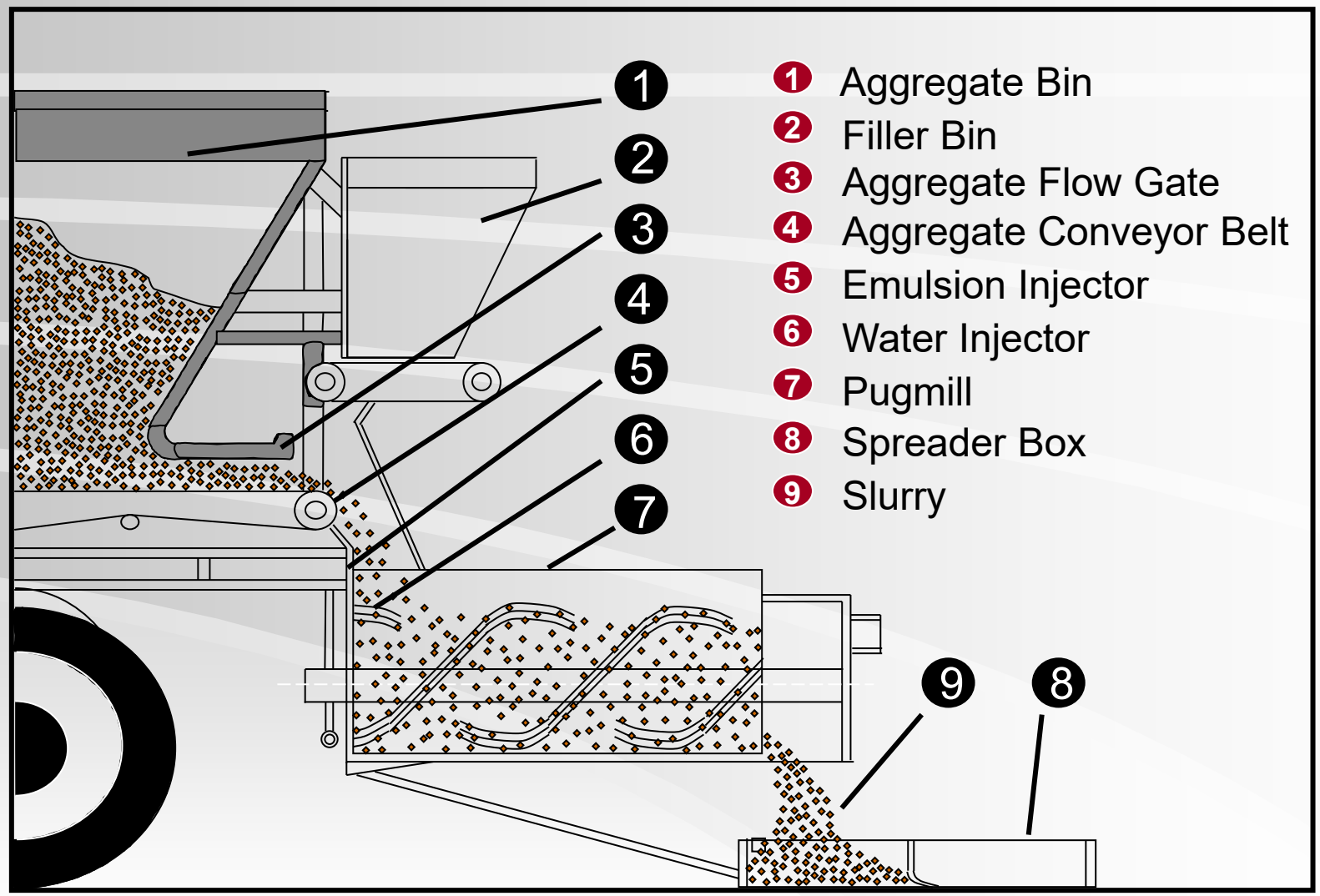
# Construction Equipment

1. Self-propelled machine (Continuous operation)
2. Truck-mounted unit (Batch operation)

# 1. Self-propelled Machine

Self-propelled, front-feed, continuous mixing machine

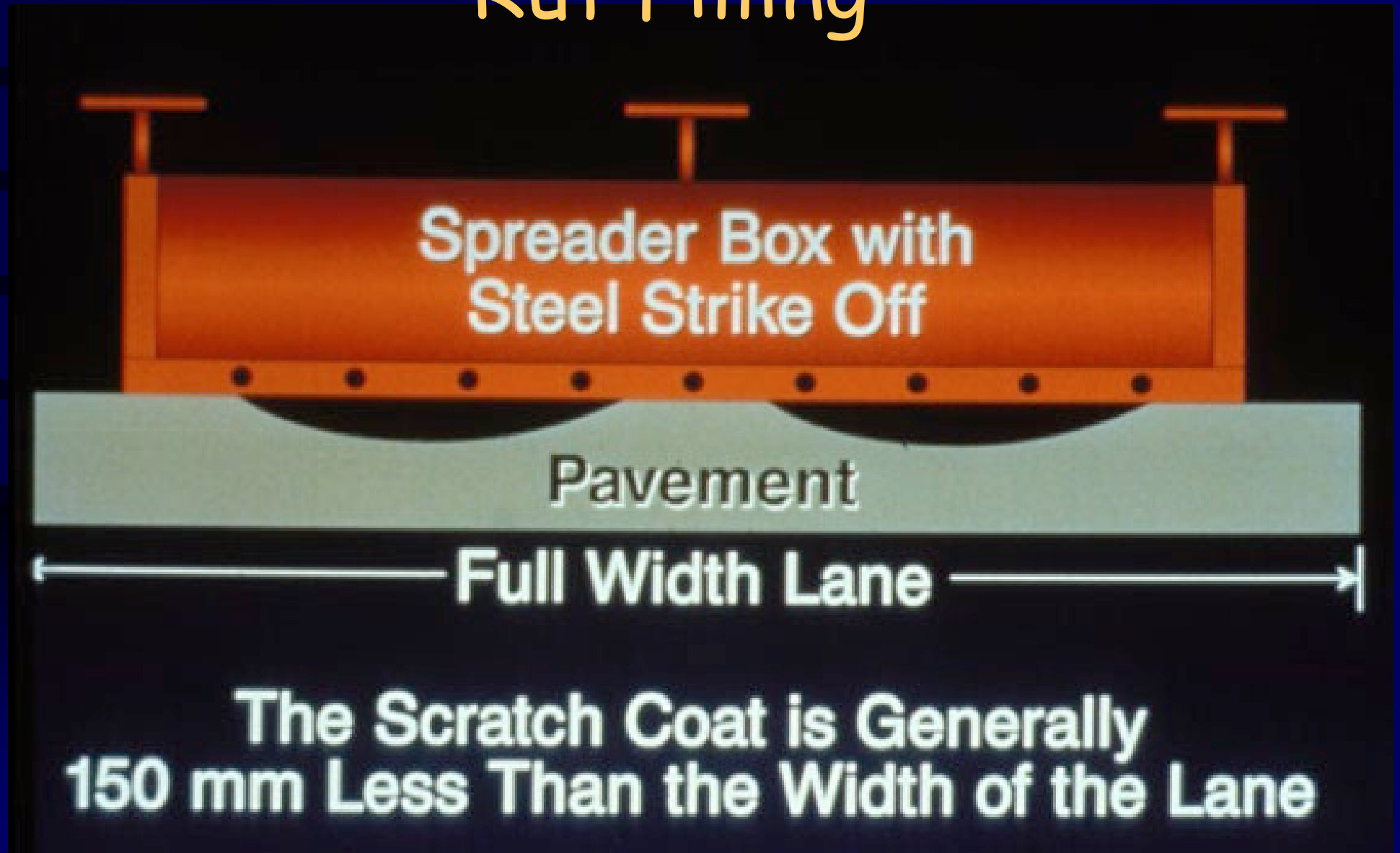
# 2. Truck-Mounted Unit

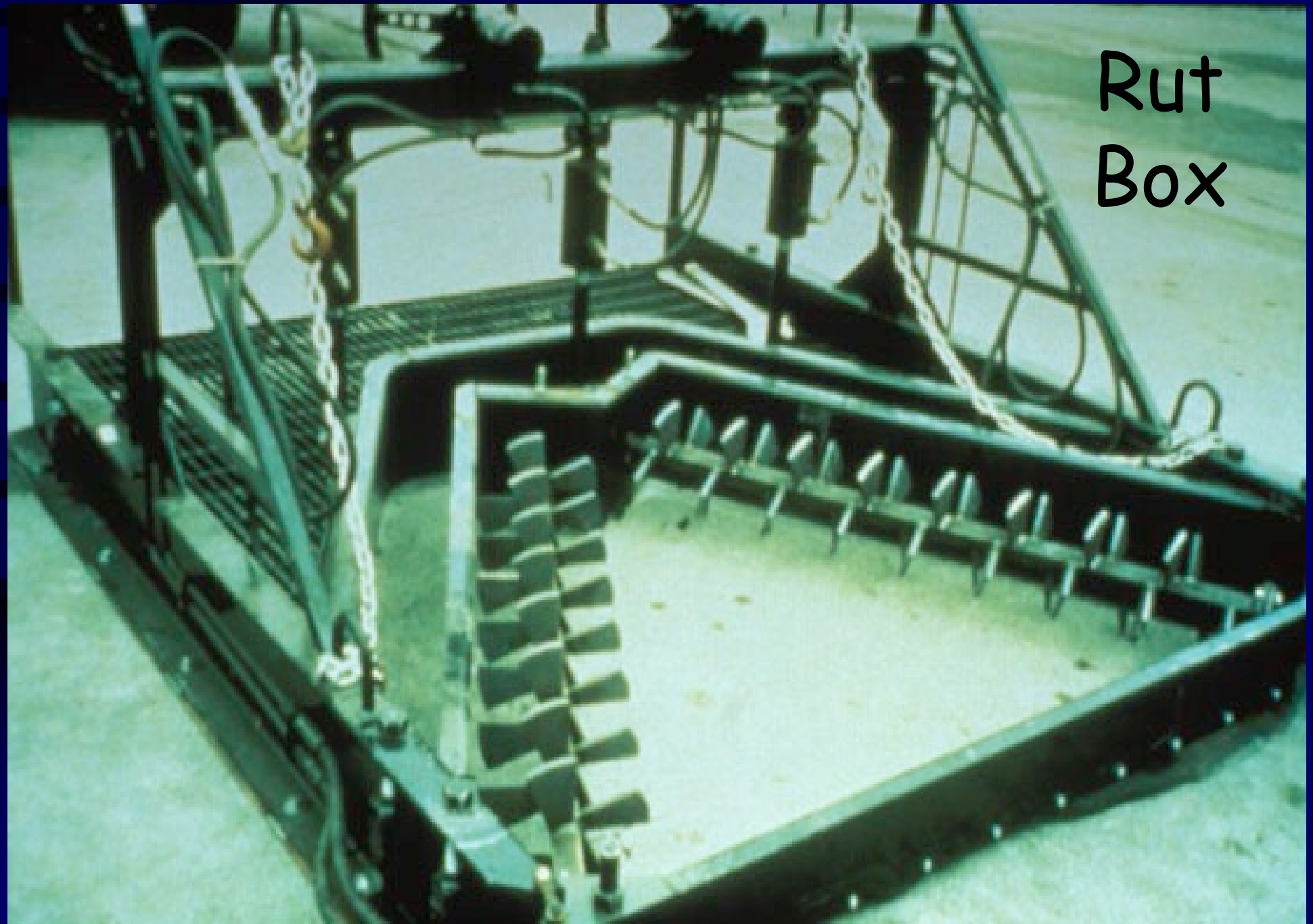

1
2
3
4
5
6
7
9
8
1 Aggregate Bin
2 Filler Bin
3 Aggregate Flow Gate
4 Aggregate Conveyor Belt
5 Emulsion Injector
6 Water Injector
7 Pugmill
8 Spreader Box
9 Slurry

# Mixer


Spreader
Box

# Special Spreader Box for Rut Filling




Rut
Box

# Traffic Control

Open road to traffic one hour after rolling

# 5-Year-Old Project

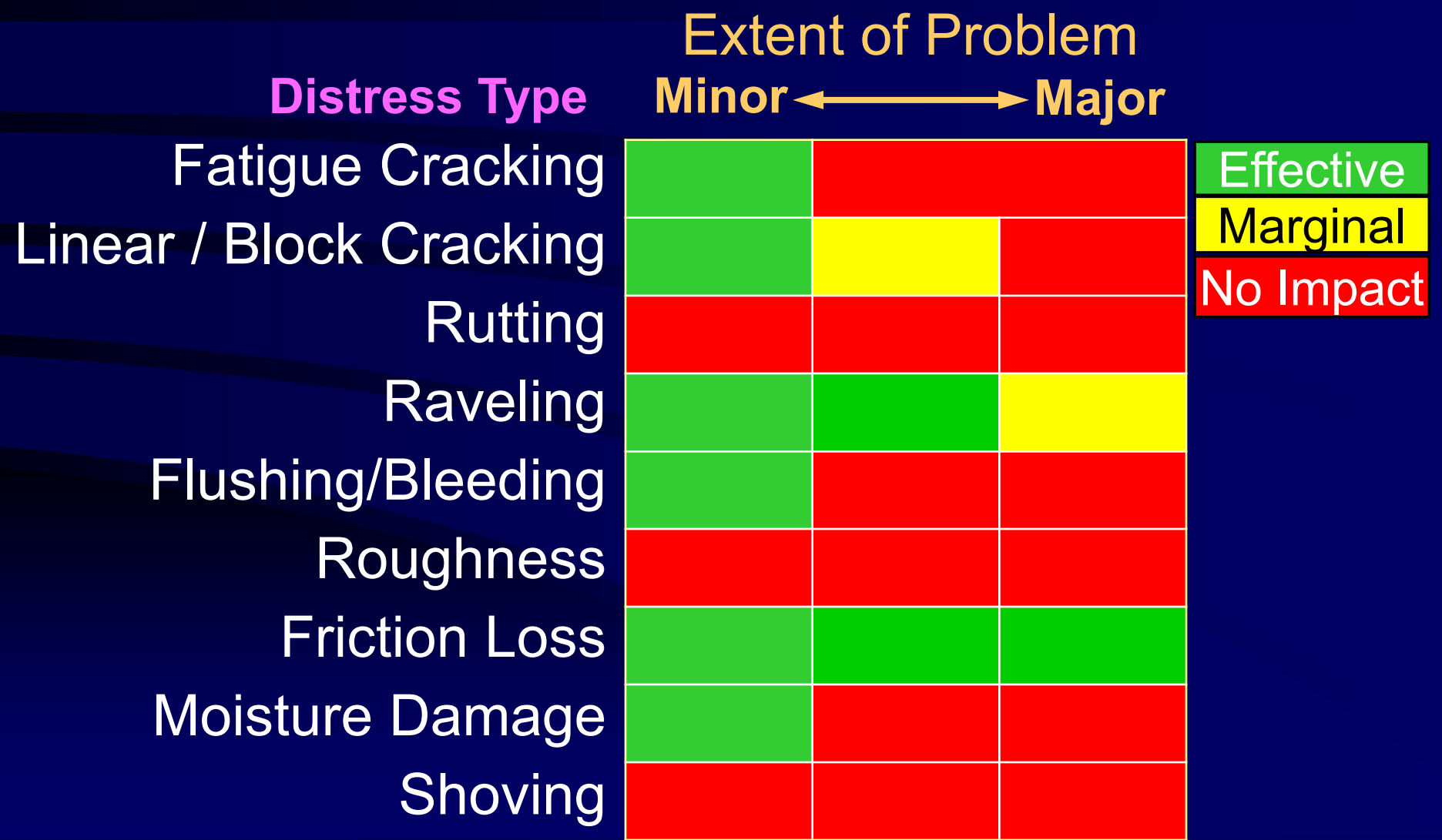
# Micro-Surfacing Cost

- Unit cost > hot-mix asphalt
- Cost is offset by
  - Thin layers
  - No appurtenance adjustment
  - Easier traffic control

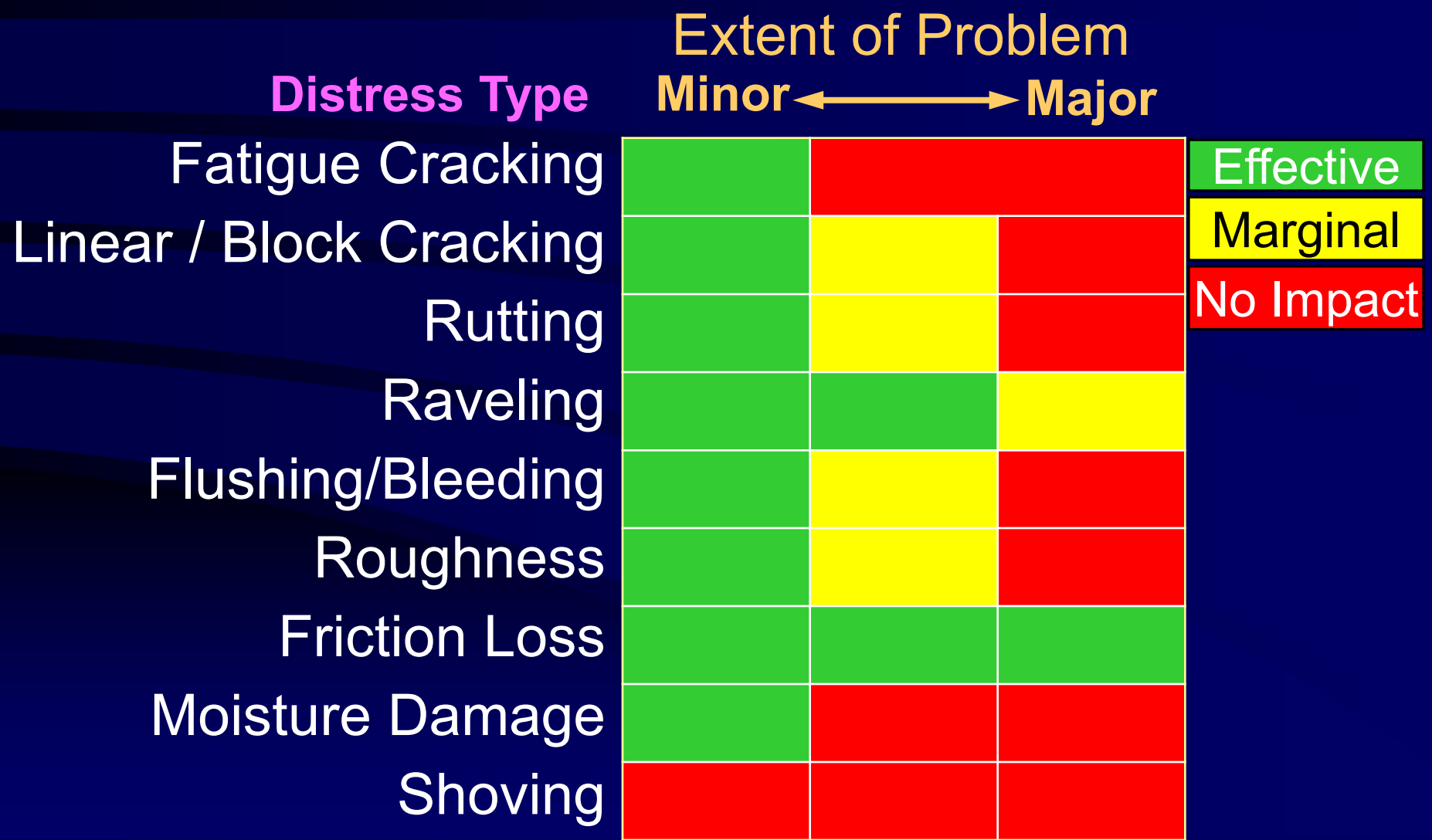
# Effectiveness of Maintenance Treatments

- Depends on pavement condition
- The better the condition before the treatment, the more effective the treatment is
- Varies with the type of treatment

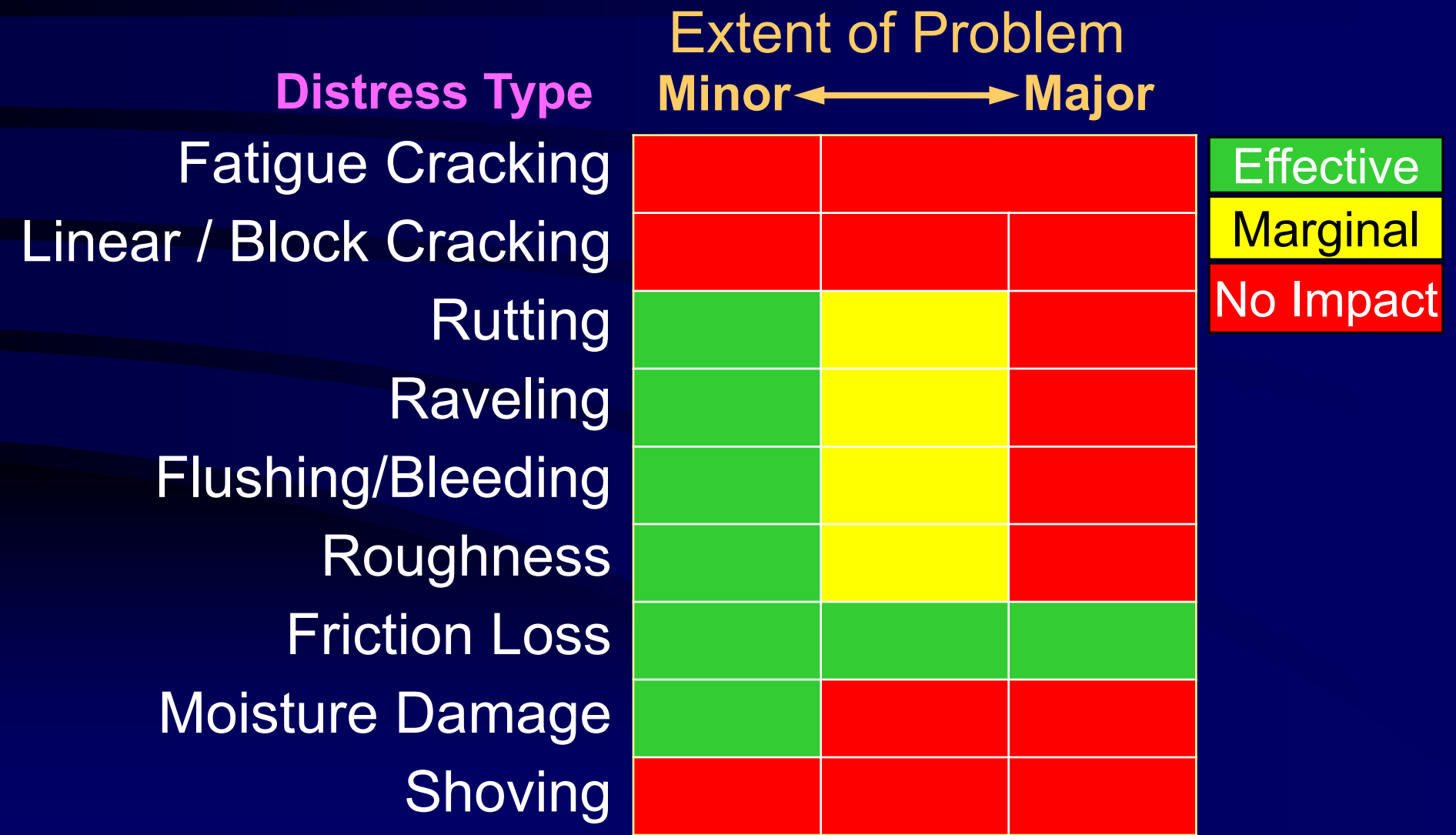
# Chip Seal


Extent of Problem
Distress Type
Minor
Major
Fatigue Cracking
Linear / Block Cracking
Rutting
Raveling
Flushing/Bleeding
Roughness
Friction Loss
Moisture Damage
Shoving
Effective
Marginal
No Impact

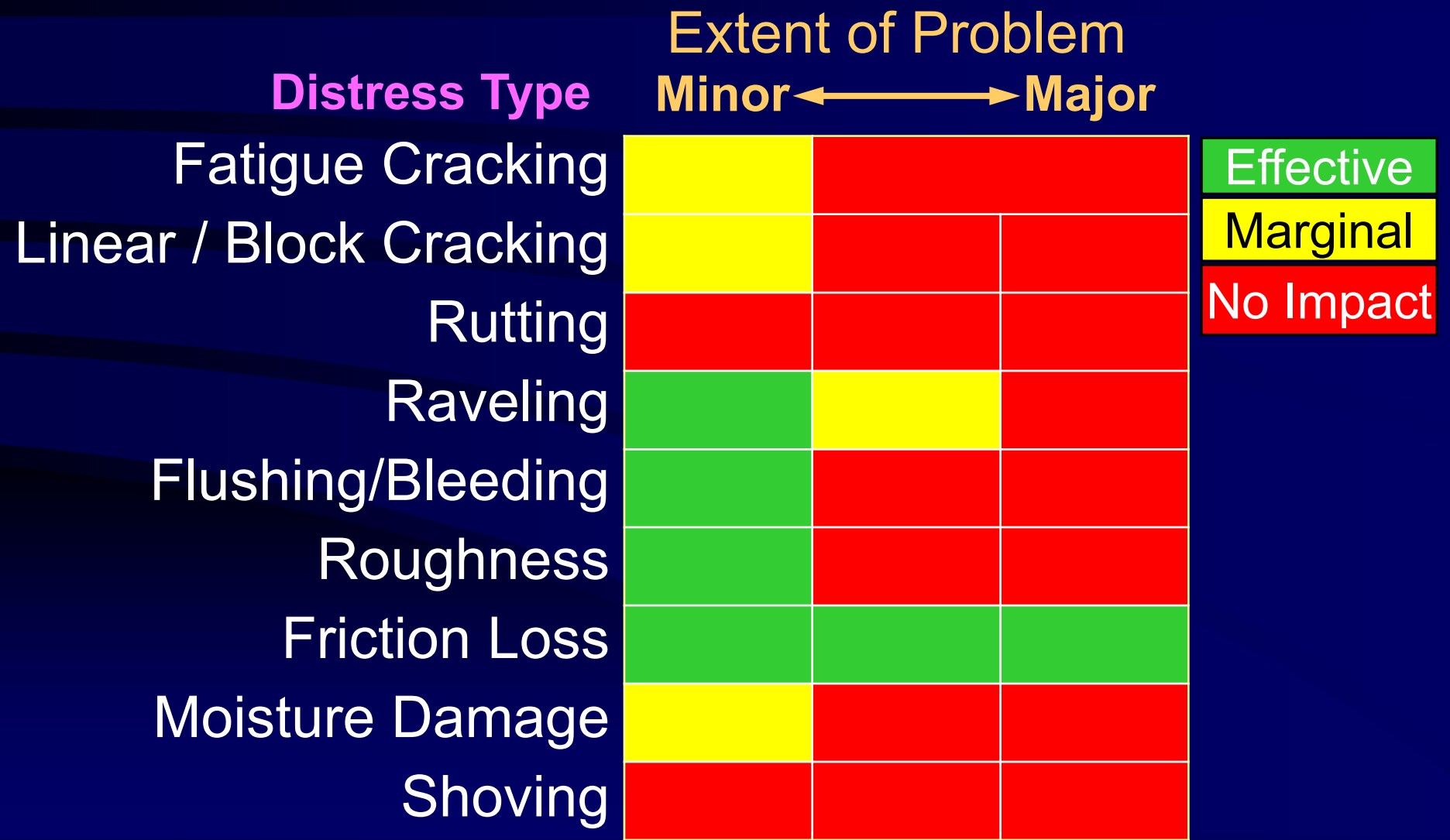
# Microsurfacing



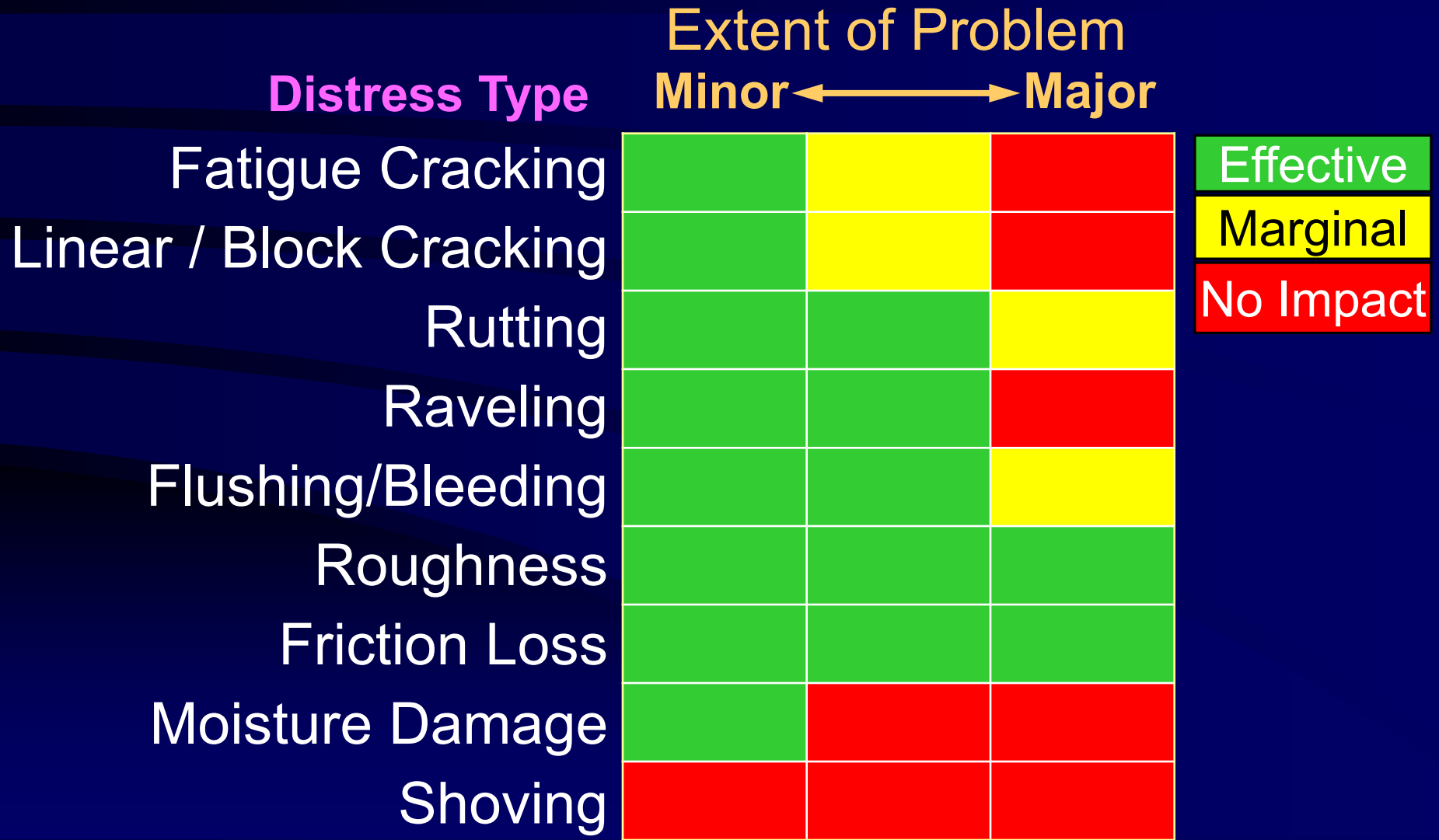
# Milling with Thin HMA Overlay



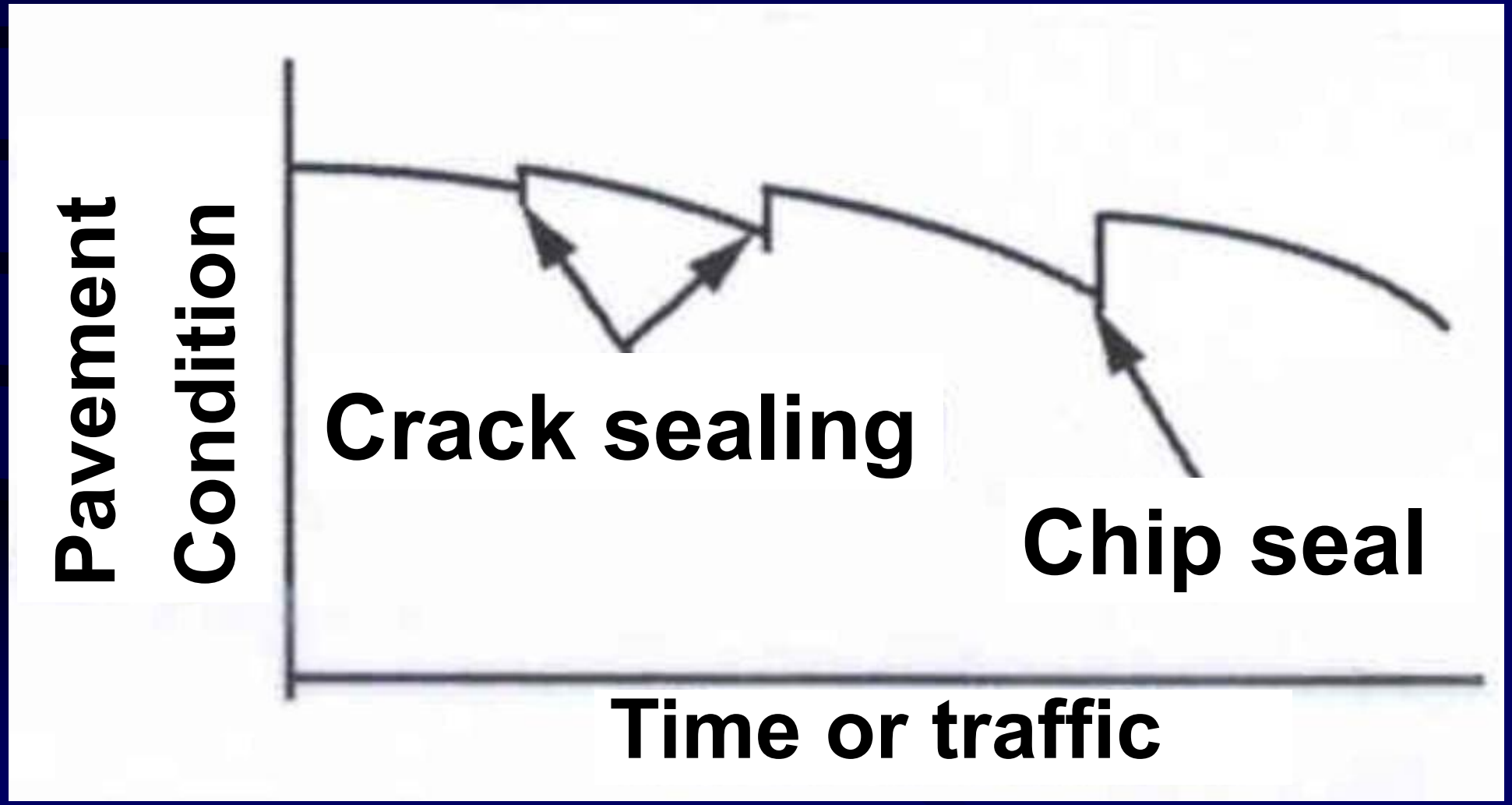
# Ultrathin Bonded Wearing Course (Novachip)



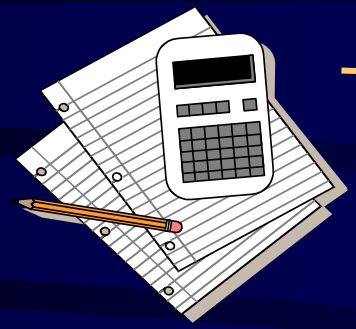
# Cold & Hot In-Place Recycling



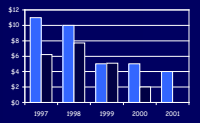
# Periodic Applications



# Monitoring Performance



Collect



Store

Analyze