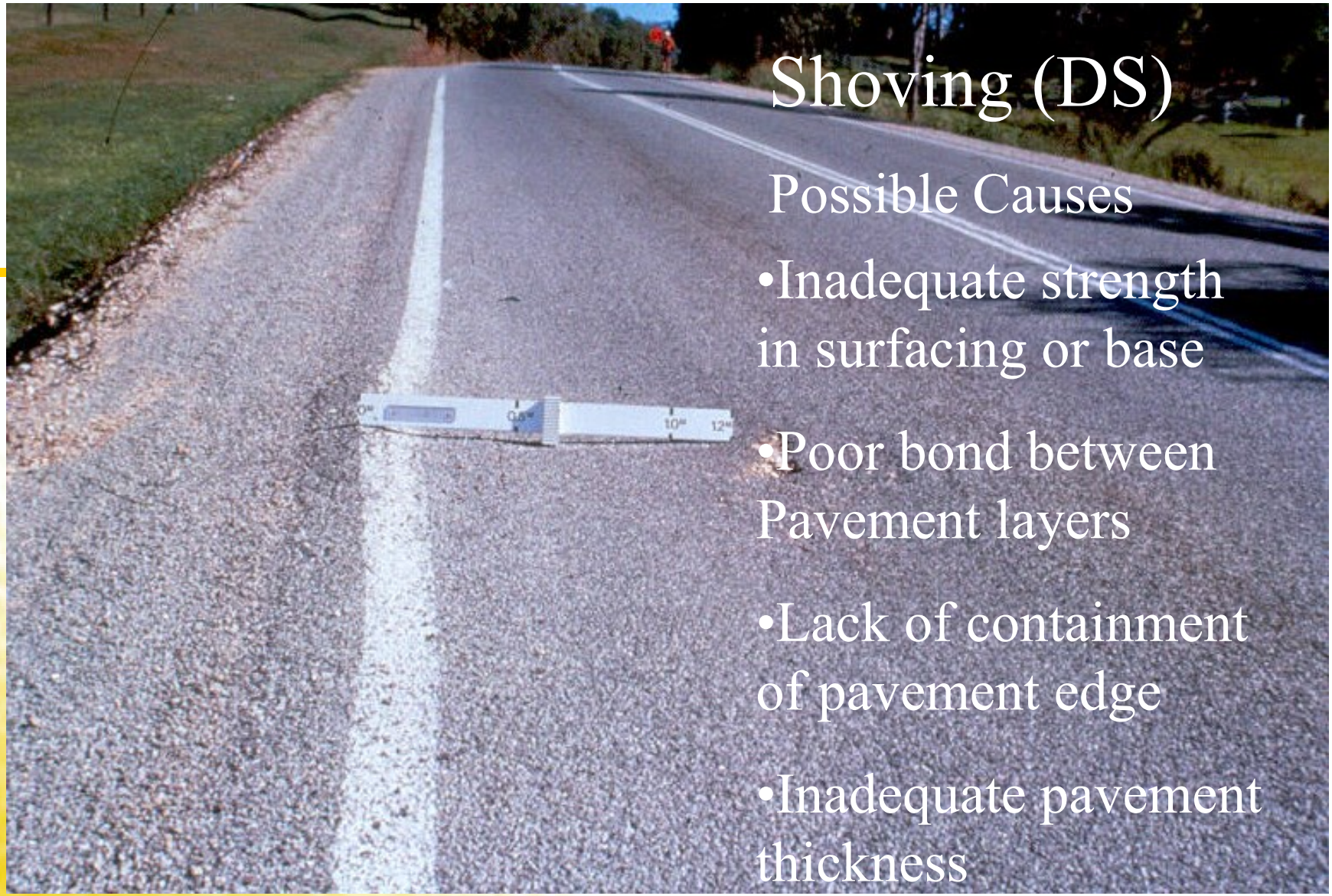
PAVEMENT REHABILITATION

DEFECTS AND CAUSES

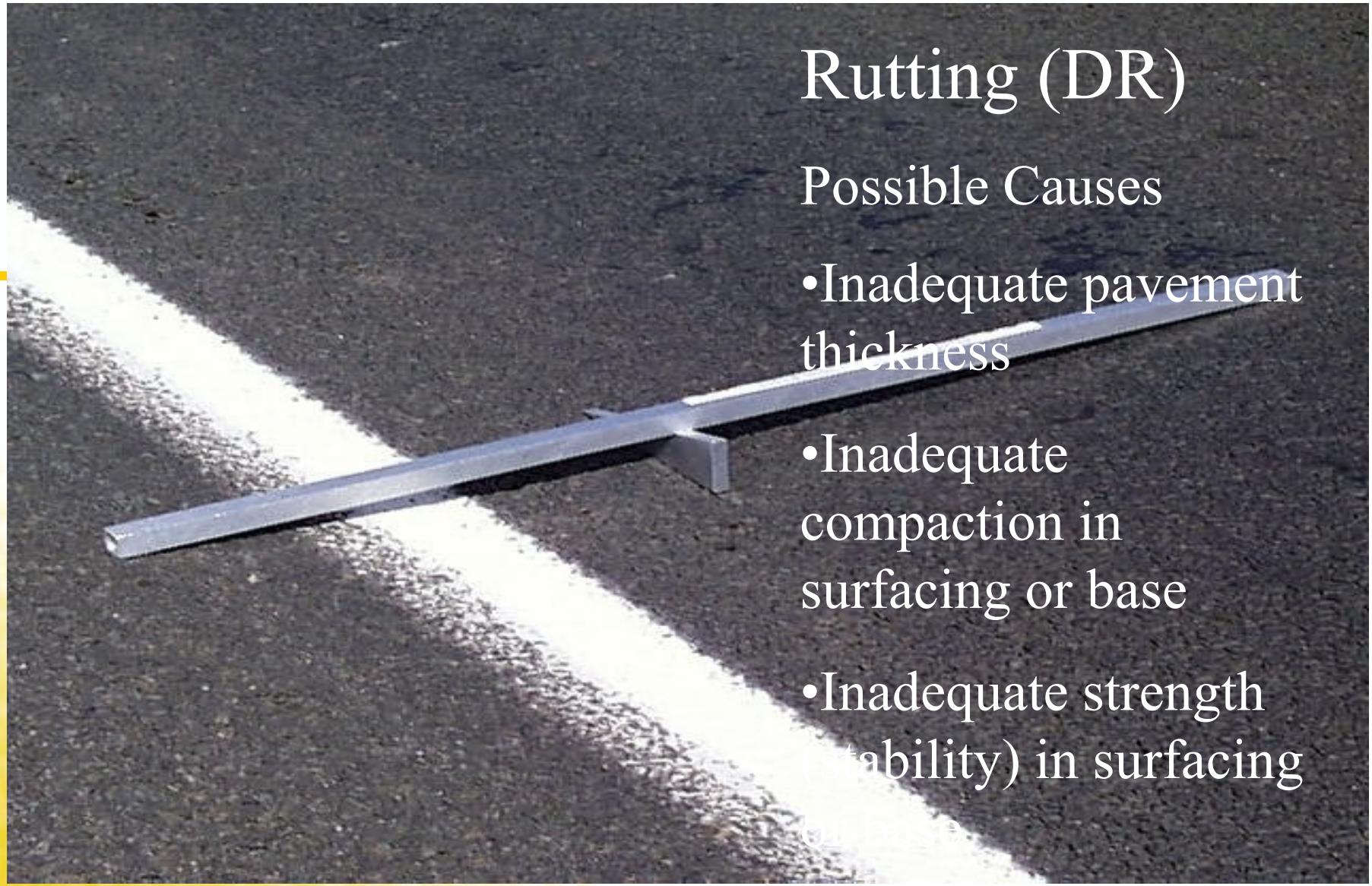
UNDERSTANDING THE REASONS FOR PAVEMENT FAILURES IS THE FIRST STEP TOWARDS MINIMISING RISKS TO GOOD PERFORMANCE



Shoving (DS)

Possible Causes

- Inadequate strength in surfacing or base
- Poor bond between Pavement layers
- Lack of containment of pavement edge
- Inadequate pavement thickness



Rutting (DR)

Possible Causes

- Inadequate pavement thickness
- Inadequate compaction in surfacing or base
- Inadequate strength (stability) in surfacing or base

Stripping (SS)

Possible Causes

- Low binder contents
- Poor binder to stone adhesion (dirty or hydrophilic aggregates, ineffective precoating adhesion agent, etc
- Aging or absorption of binder
- Stone deterioration
- Incorrect blending of binder
- Inadequate rolling before opening to traffic

Transverse Crack (CT)

Possible Causes

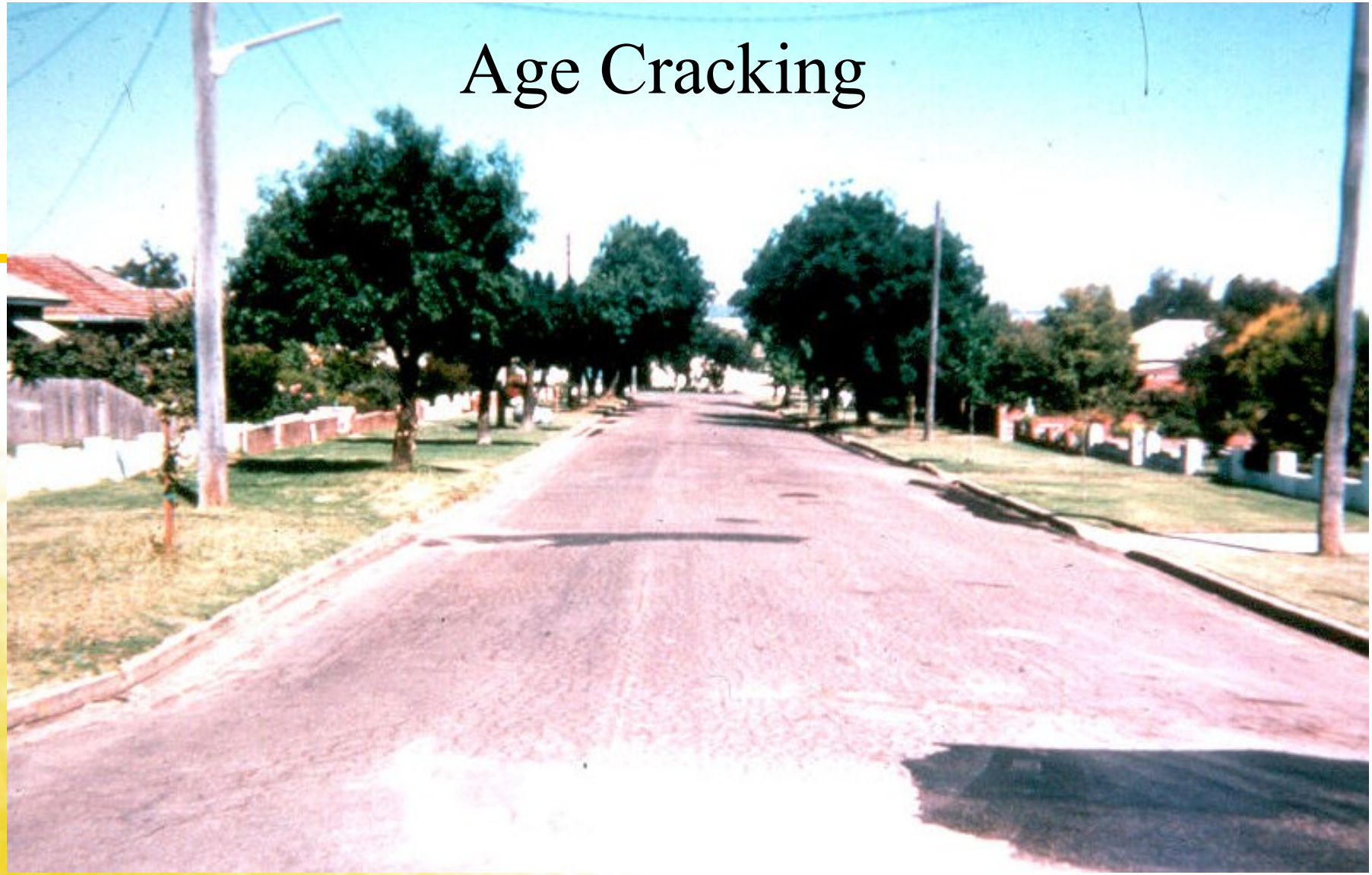
- Reflection of a shrinkage crack or joint in an underlying base (commonly port-land cement concrete or cemented materials)
- Construction joint or shrinkage crack (due to low temperature or bitumen hardening) in asphalt surfacing
- Structural failure of portland cement concrete base

Crocodile Cracks (CR)

Possible Causes

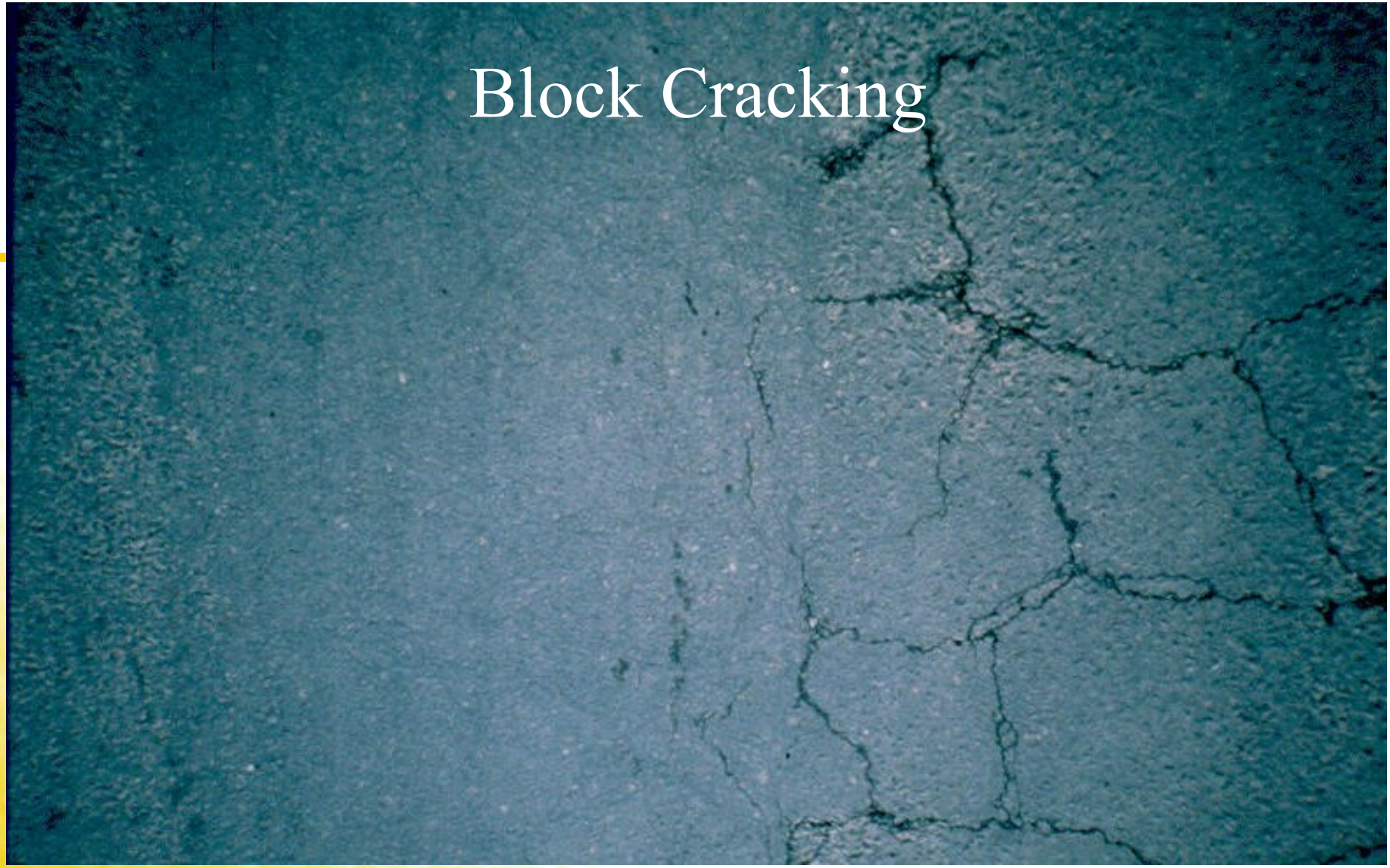
- Inadequate pavement thickness
- Low stiffness base
- Shrinkage & fatigue of brittle base or wearing course (eg. Cemented, aged)
- Shrinkage & binder oxidation in AC or sprayed surfacings due to effects of age & environment
- Fatigue cracking of AC wearing course

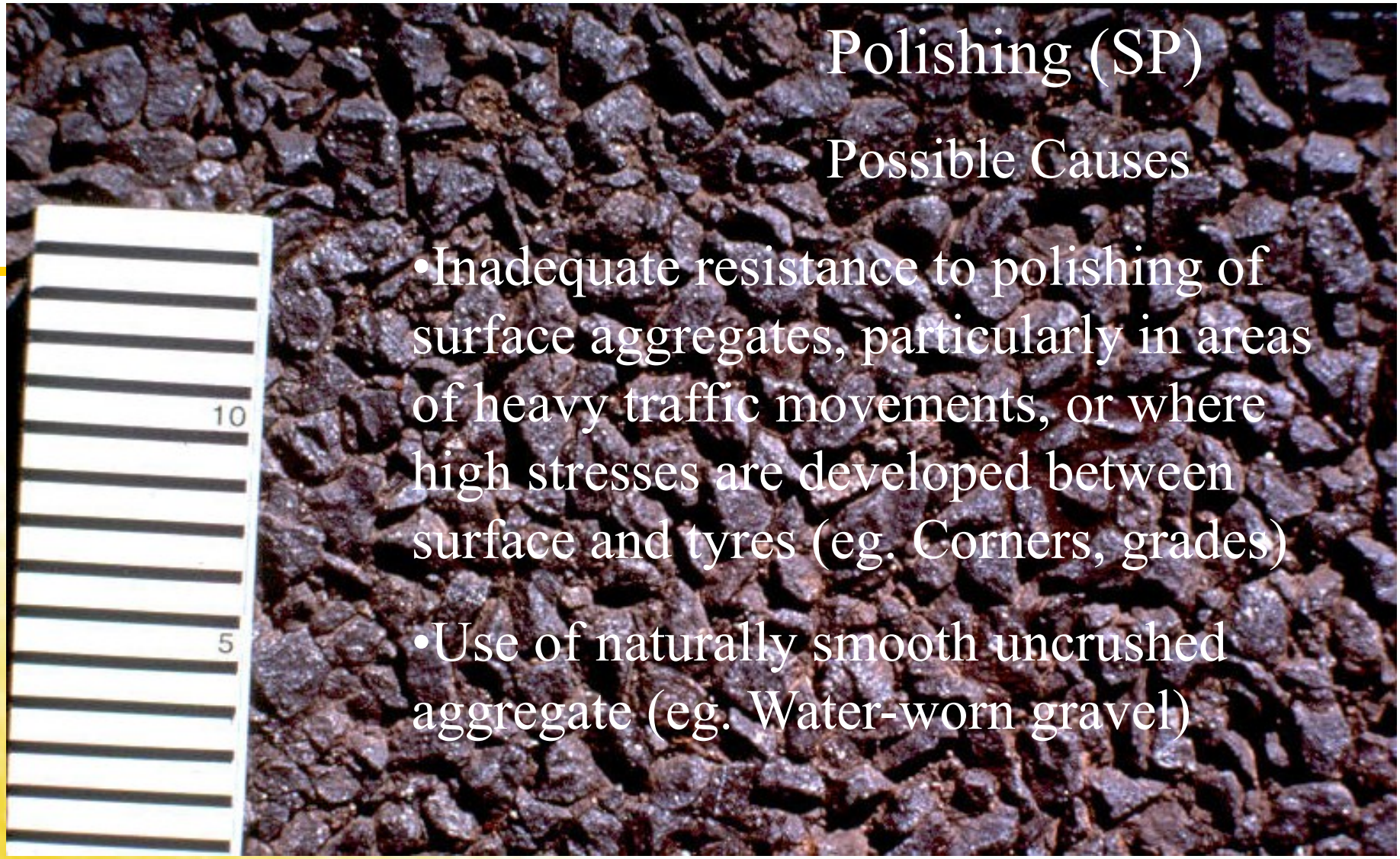
Age Cracking



Block Cracking and Pumping

Block Cracking





Polishing (SP)

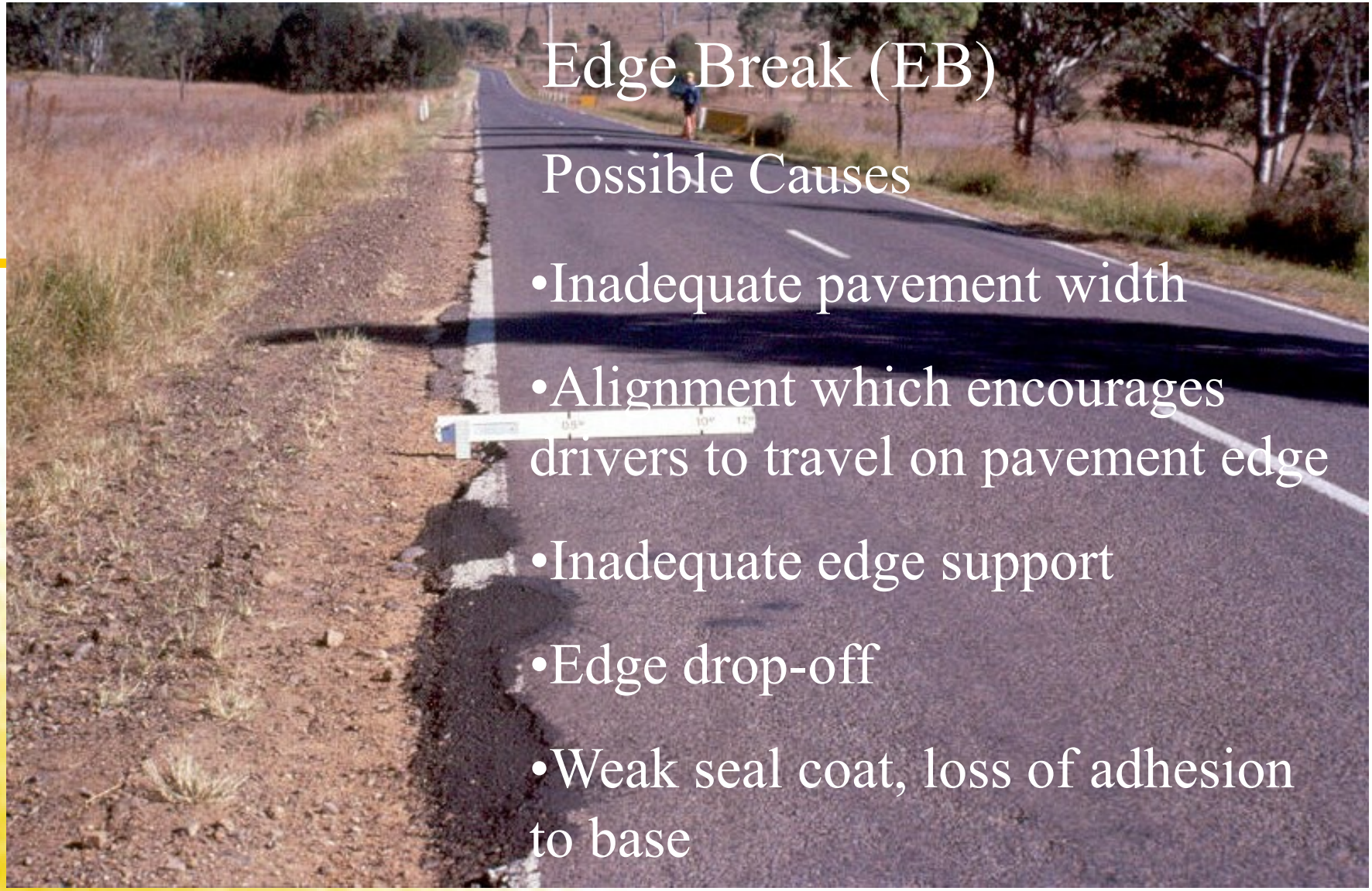
Possible Causes

- Inadequate resistance to polishing of surface aggregates, particularly in areas of heavy traffic movements, or where high stresses are developed between surface and tyres (eg. Corners, grades)
- Use of naturally smooth uncrushed aggregate (eg. Water-worn gravel)

Ravelling (SR)

Possible Causes

- Deterioration of binder and/or stone
- Inferior asphalt mix design
- Inadequate compaction, construction during wet or cold weather
- Hydrophilic aggregates



Edge Break (EB)

Possible Causes

- Inadequate pavement width
- Alignment which encourages drivers to travel on pavement edge
- Inadequate edge support
- Edge drop-off
- Weak seal coat, loss of adhesion to base

Delamination (SD)

Possible Causes

- Inadequate cleaning or inadequate tack coat before placement of upper layers
- Seepage of water through asphalt (especially in cracks) to break bond between surface and lower layers
- Weak, loose layer immediatley underlying seal
- Adhesion of surface binder to vehicle tyres

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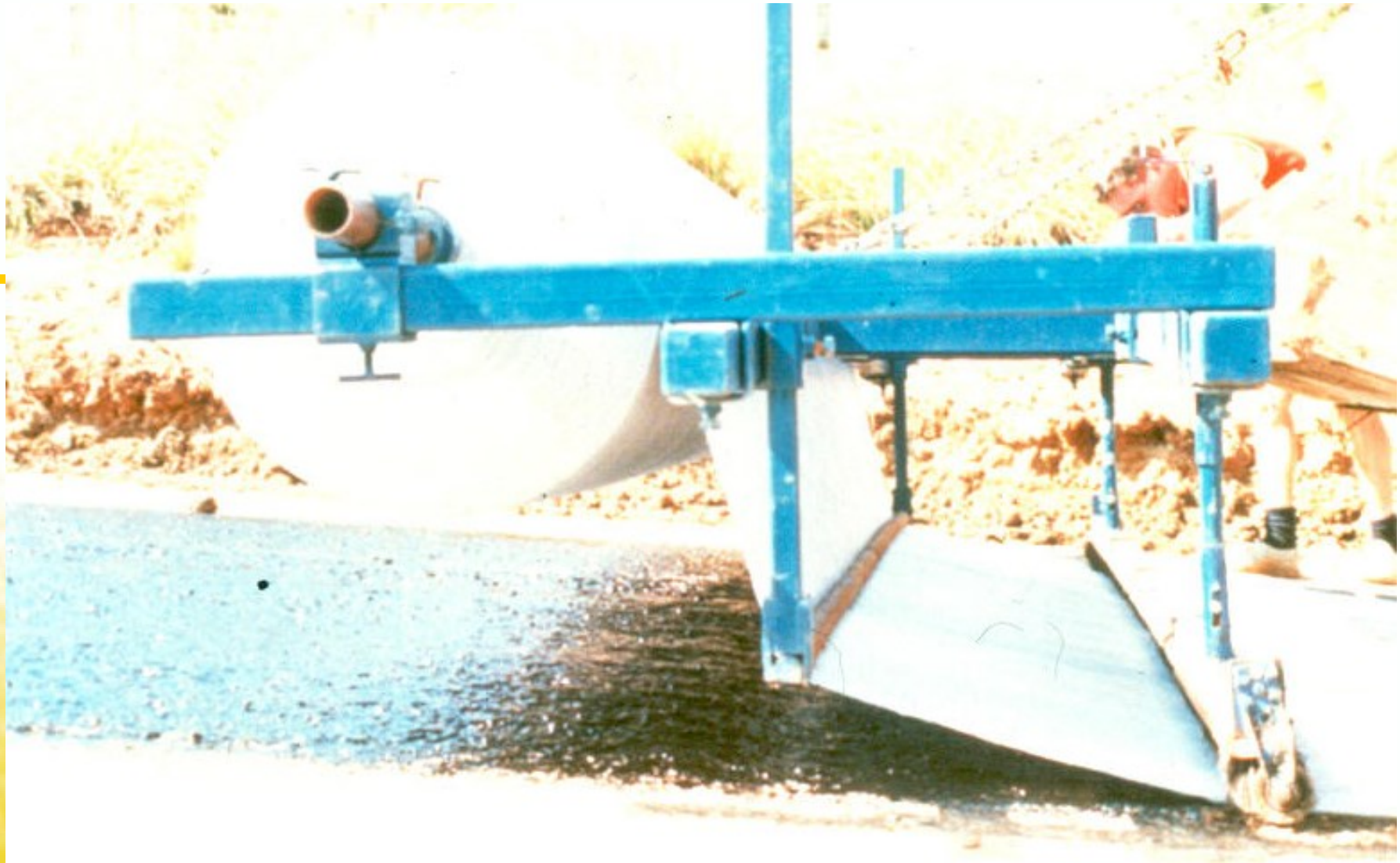

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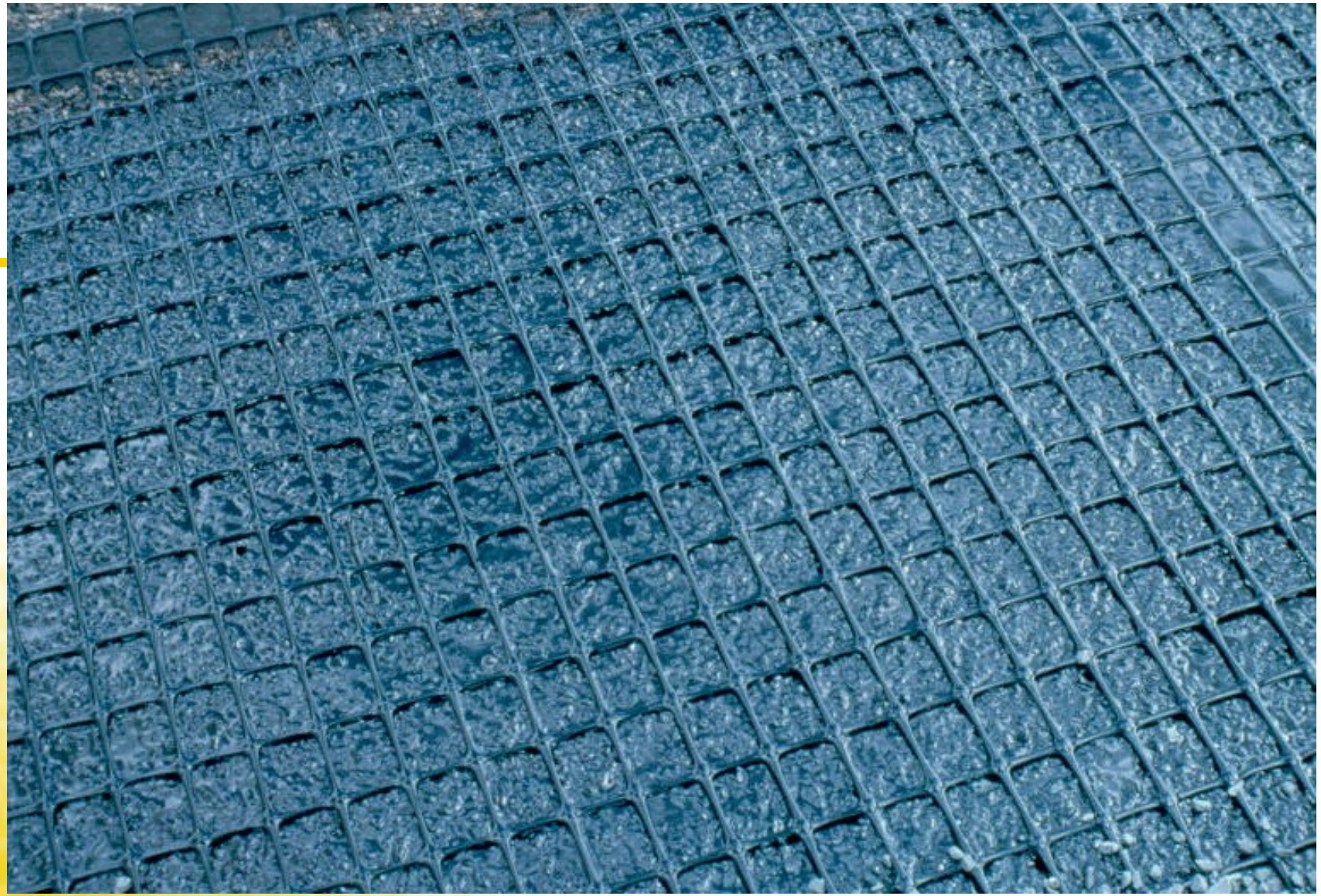

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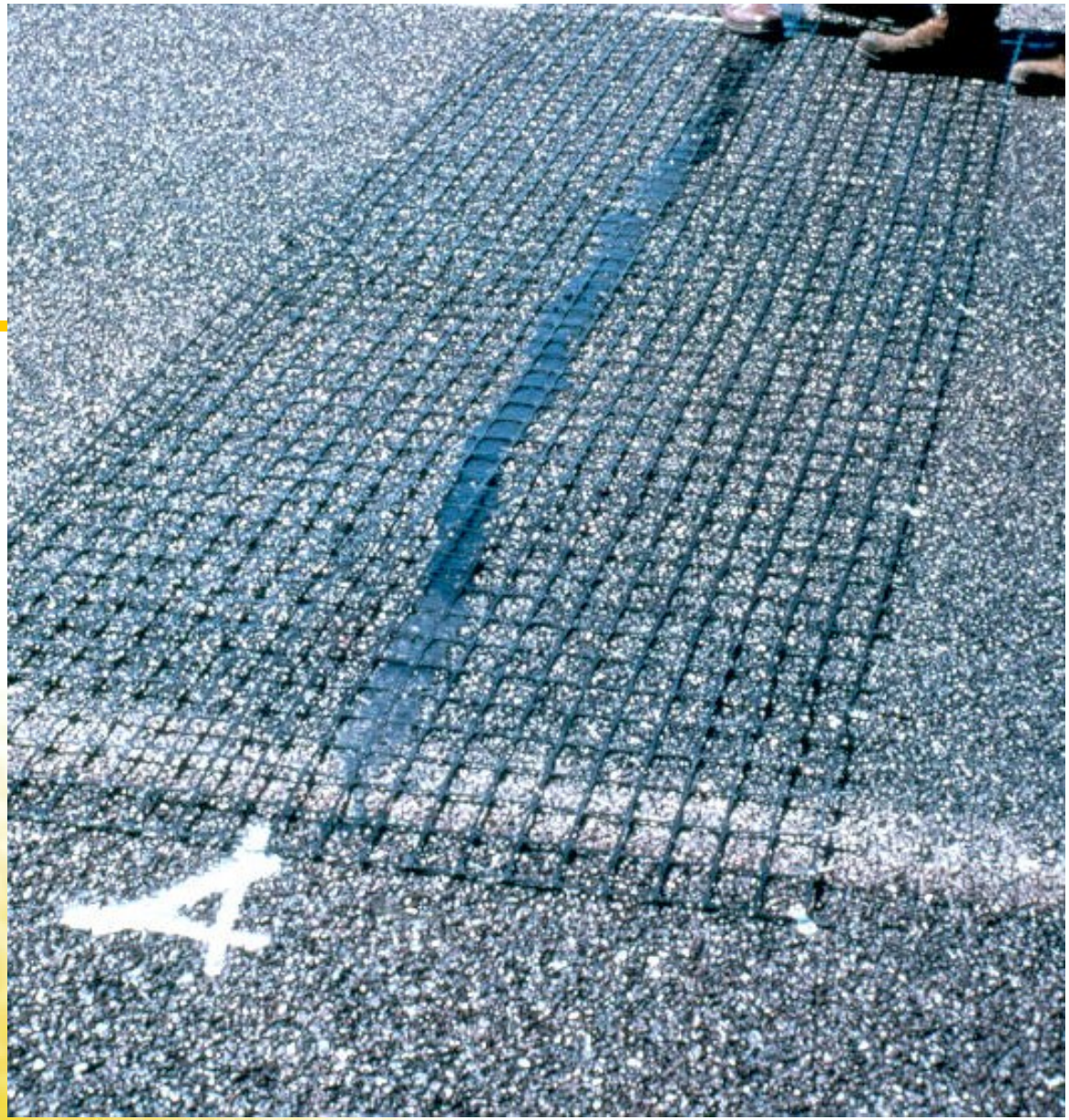

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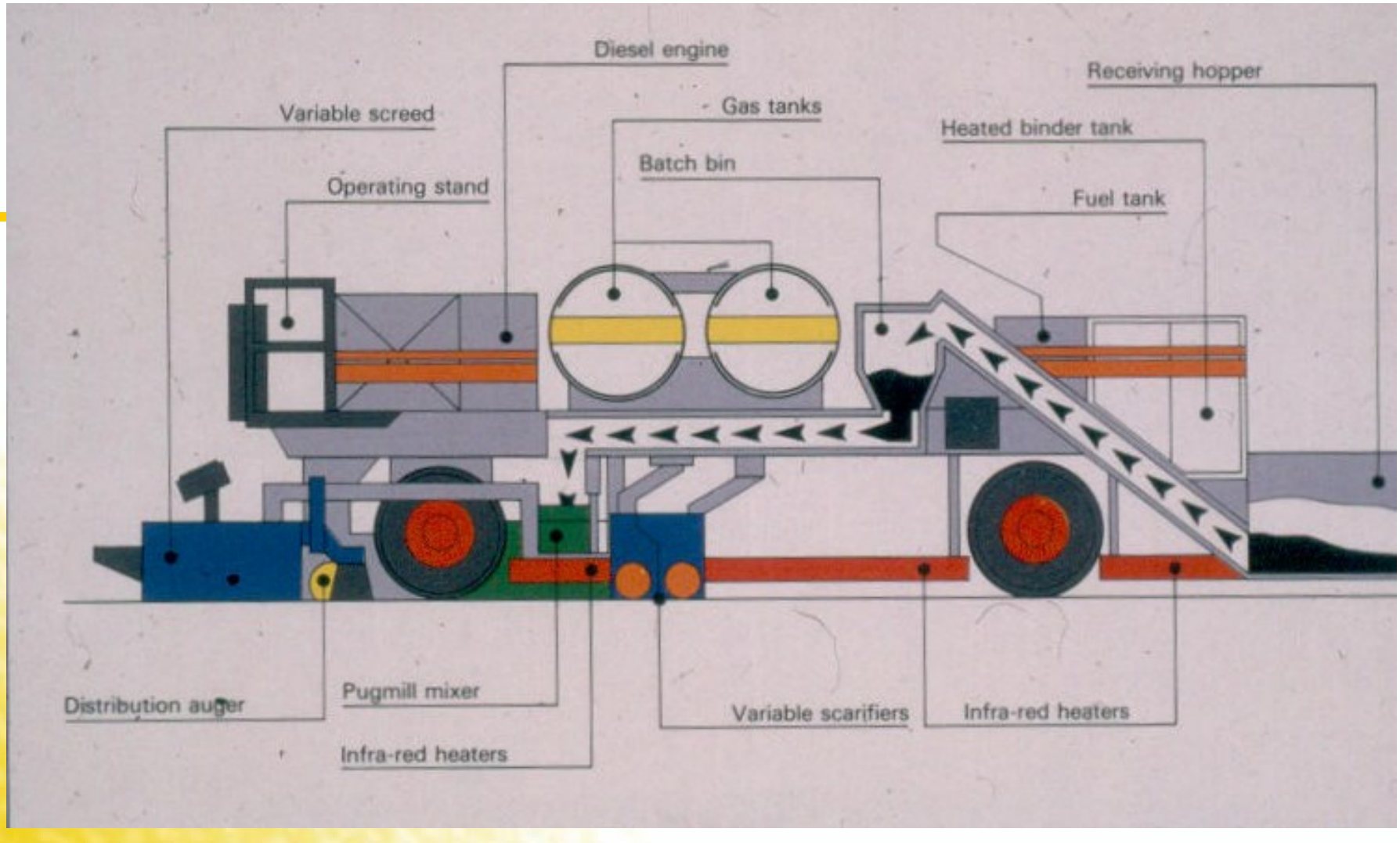
Diesel engine
Receiving hopper
Variable screed
Gas tanks
Heated binder tank
Batch bin
Operating stand
Fuel tank
Distribution auger
Pugmill mixer
Variable scarifiers
Infra-red heaters
Infra-red heaters

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RISKS AT ANY STAGE

RISK TO GOOD PERFORMANCE COULD BE RELATED TO DEFICIENCIES IN ANY ONE OR MORE OF THE FOLLOWING STAGES:

- PAVEMENT DESIGN/PAVEMENT REHABILITATION DESIGN
- SPECIFICATIONS
- QUALITY OF MATERIALS
- CONSTRUCTION
- MAINTENANCE

Location Results	Subgrade				Subgrade
	Shoulder	Edge	Center of Lane	IWP	Center of Lane
Liquid Limit (%)	122.4	118.0	111.10	104.8	36.4
Plasticity Index	77.2	81.2	64.4	59.6	20.2
Linear Shrinkage (%)	26.5	27.5	23.0	23.5	10.5

Subgrade Test Results

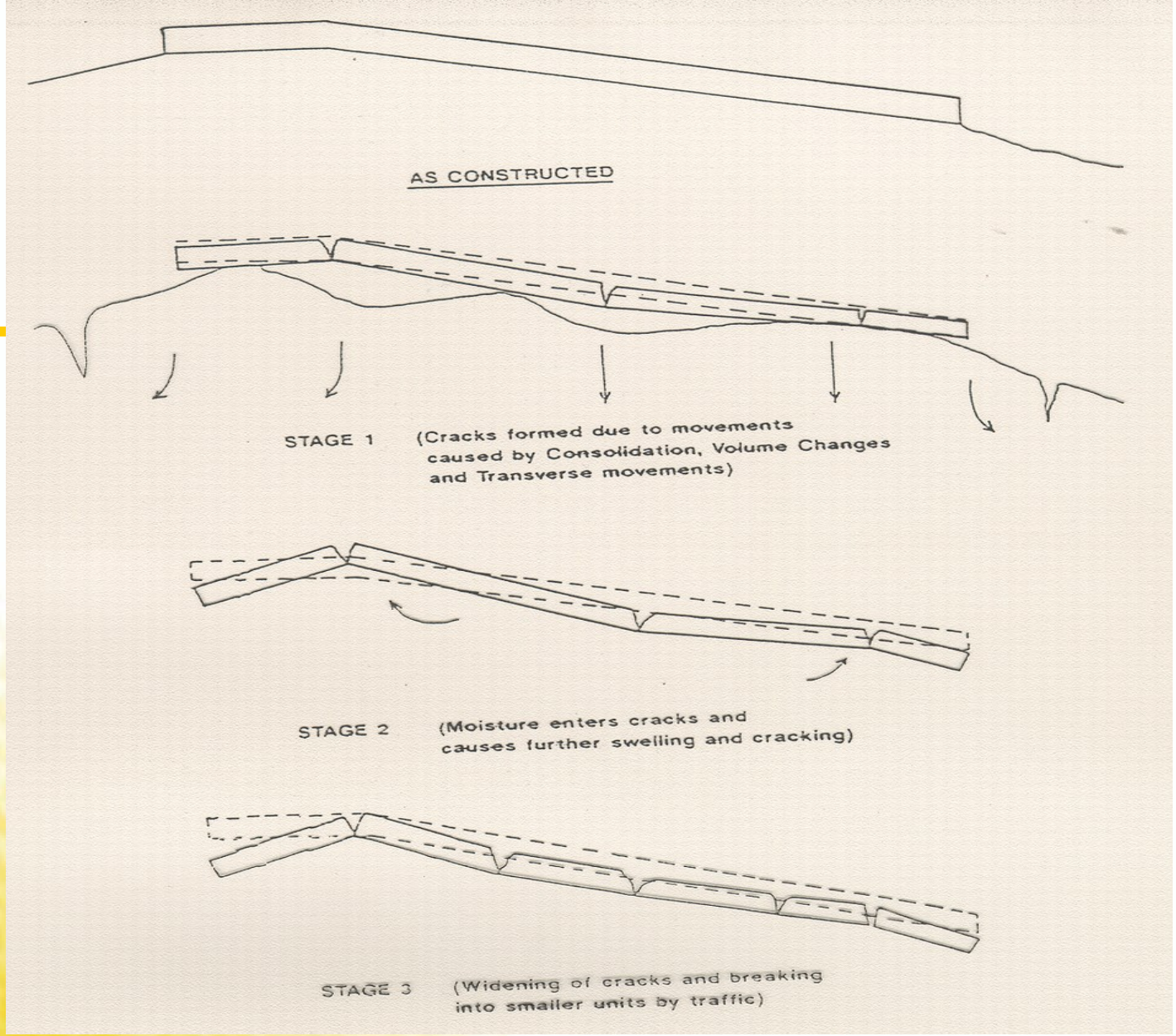

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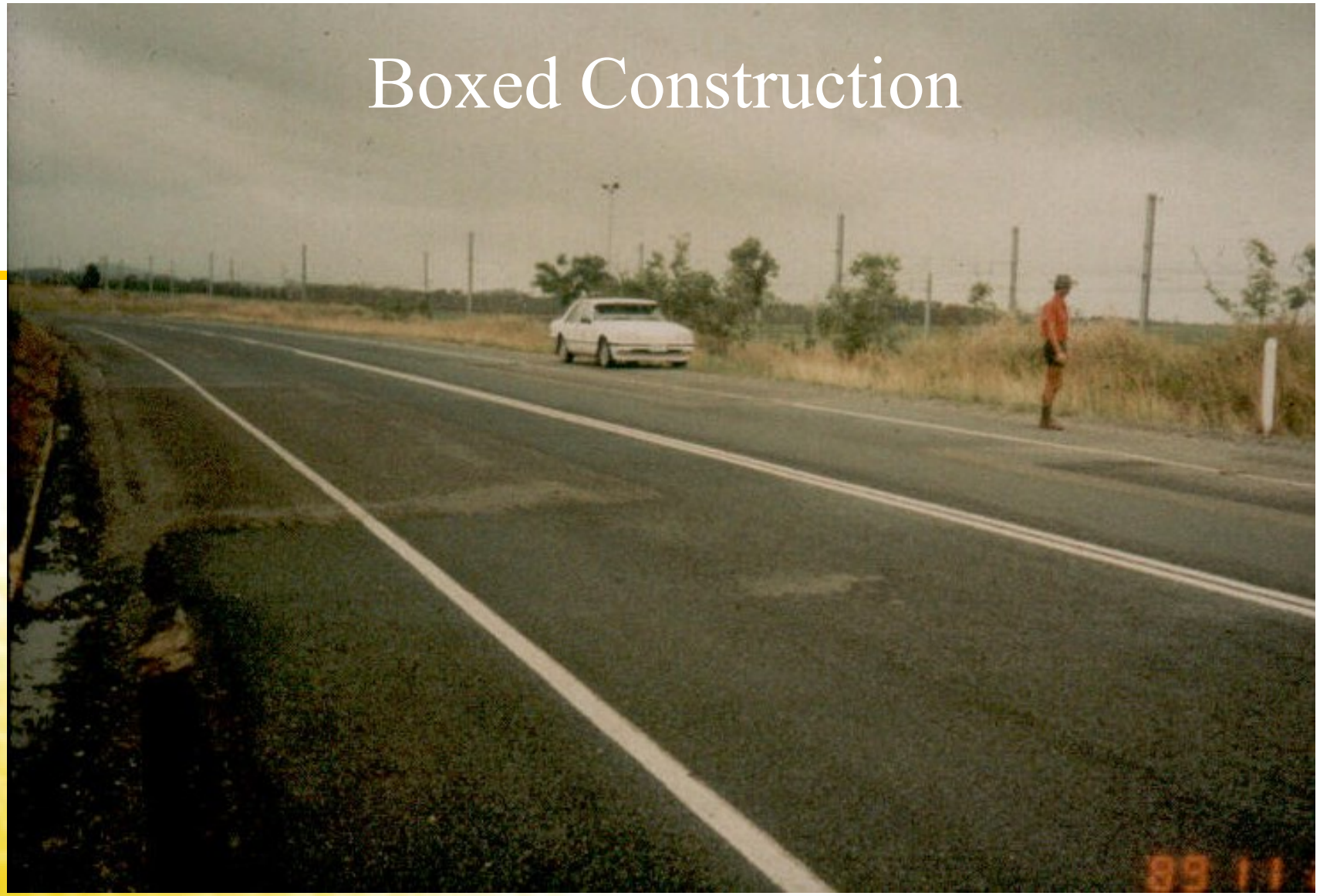
Figure 3 – Failure Mechanism

Boxed Construction



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Pulverisng prior to stabilsiation

- Breaks up wearing course (seal or thin asphalt) and any patches

Apply Lime

- Quicklime depicted here
- Dust is a hazard to constructio n personnel and public

Tray tests 1

- To check application rate
- Should be done regularly
- Usually 3 trays, each a third of a square metre

Slake Lime 1

- Necessary for quicklime only
- Multiple passes may be necessary to ensure full slaking

Slake Lime 3

- Temperature may indicate if hydration is complete

Compaction

- Follow stabilising run with compaction equipment
- Be aware if padfoot allowed too close to surface its pattern will reflect through to the seal.

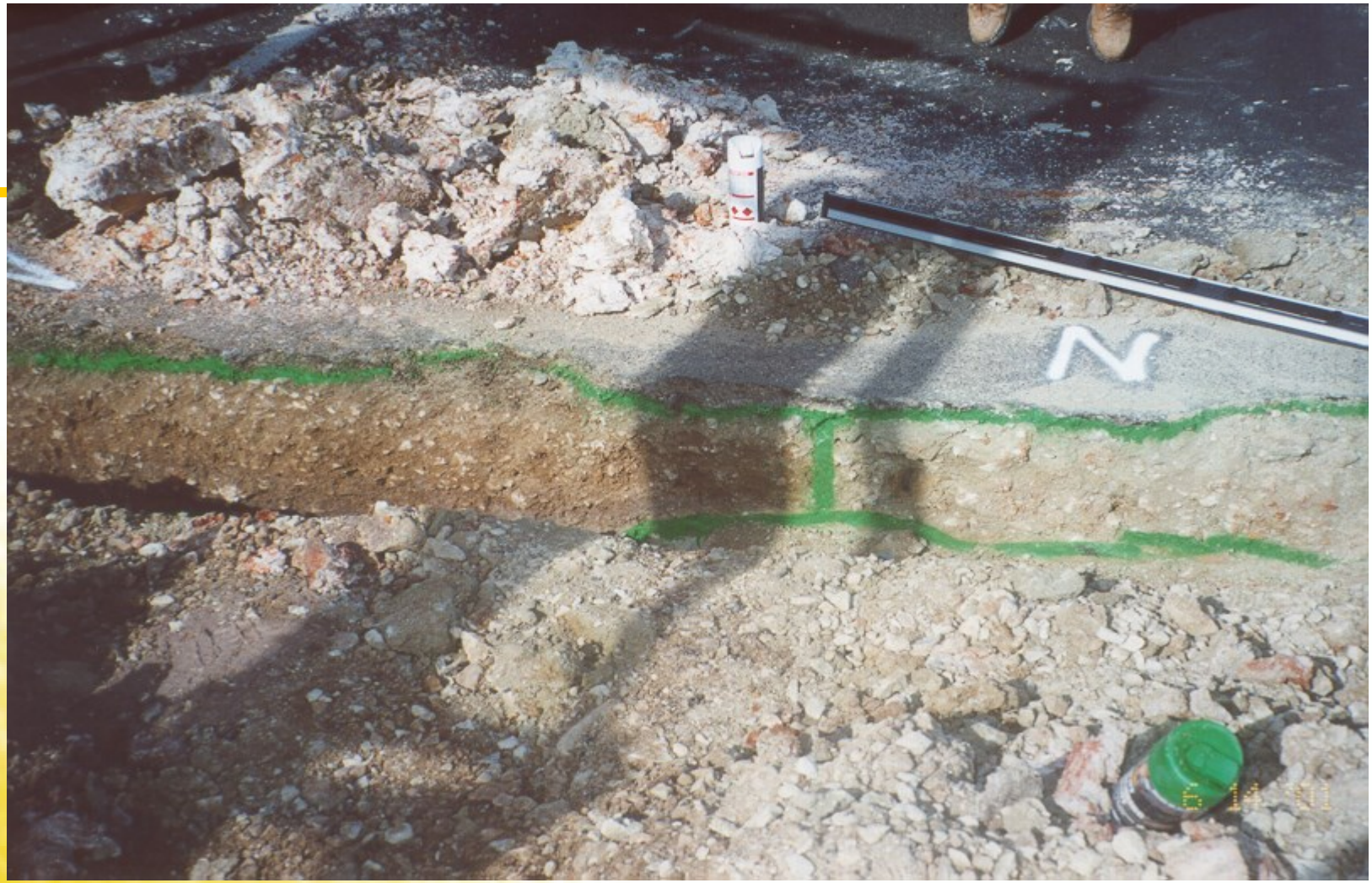
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Table 8 - Asphalt Design Requirements

Property	Unit	Limit	Value				
			Dense Graded Asphalt Nominal Size (mm)				
			DG7	DG10	DG14	DG20	DG28
Number of Marshall blows	-	-	50	50	50	50	50
Stability	kN	Minimum	6.0	7.5	7.5	7.5	7.5
Flow	mm	Minimum	2.0	2.0	2.0	2.0	2.0
Stiffness †	kN/mm	Minimum	2.0	2.0	2.0	2.0	2.0
Voids in the mineral aggregate (VMA)	%	Minimum Maximum	15.0 19.0	14.0 18.0	13.0 17.0	12.5 16.5	12.0 16.0
Voids filled with binder (VFB)	%	Minimum Maximum	58 78	58 78	58 78	58 78	58 78
Maximum density	t/m^3	-	‡	‡	‡	‡	‡

† Stiffness of the mix = $\frac{\text{Stability}}{\text{Flow}}$

‡ To be recorded for control purposes

Table 14 - Compaction Standard

Asphalt Mix Nominal Size (mm)	Characteristic Value Minimum (%)
DG7	90
DG10	90
DG14	92 (91 †)
DG20	92
DG28	92

† For specified compacted layer thickness < 50 mm