

CIVIL ENGINEERING TECHNOLOGY 2

ROAD PAVEMENTS

MAINTENANCE



CAUSES OF PAVEMENT DETERIORATION

RUTTING

Depressions or tracks in the pavement surface due to wheel loads and high temperature





PAVEMENT DETERIORATION

ALLIGATOR CRACKING

Poor drainage
Poor mix design
Subgrade failure

Heavy traffic can push the
surfacing rock pushing mud
up and causing permanent
damage





PAVEMENT DETERIORATION

RAVELLING AND PITTING

Loss or dislodgment of surface aggregate particles

Cause: oxidized asphalt binder, poor compaction, cold when paving, dirty aggregate, short quantity of asphalt, aging, etc.





CAUSES OF PAVEMENT DETERIORATION

LONGITUDINAL CRACKING

Swelling and shrinkage of sub-grades due to changes in moisture content
Reflective cracking and heaving





CAUSES OF PAVEMENT DETERIORATION

TRANSVERSE CRACKING

Shrinkage due to low temperatures
Hardening of the asphalt
Cracks in underlying pavement





CAUSES OF PAVEMENT DETERIORATION

POTHOLES

Small bowl shaped depressions

Dislodging of small pieces of surfacing due to traffic

Water collecting inside the hole causes further deterioration





CAUSES OF PAVEMENT DETERIORATION

FLUSHING

Free asphalt on the surface
Shiny, glass-like reflective Surface

caused by:

- Too many fines in the mix
- Too few voids
- Too much asphalt in patches
- Chip seal lost its rock





CAUSES OF PAVEMENT DETERIORATION

SAGS AND HUMPS

Localized depressions or elevated areas due to:

- settlement
- pavement shoving
- displacement





CAUSES OF PAVEMENT DETERIORATION

EDGE RAVELLING

When the pavement edge breaks

When built without kerbs or paved shoulders





EXERCISE

Identify the following failures of road pavement and find the best solution for repairing them.







Photo by: N. Olkonomidis
Geoengineer Website
<http://www.geoengineer.org>



ROAD PAVEMENT. MAINTENANCE











ROAD PAVEMENT. MAINTENANCE







ROAD PAVEMENT MAINTENANCE

CYCLIC MAINTENANCE

To aid movement of traffic

Grass cutting

Keep grass cut where it may inhibit drivers visibility
Stops encroachment of vegetation

Gully maintenance

Keep drainage systems operational

Weed killing

Signs repairing and renewal of markings



ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Crack sealing

Patching

Renewal of traffic signs

Renewal of carriageway markings

Surface dressing

Repaving



ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Crack sealing

Objective: prevent water from entering the subgrade and damage
Careful with over-poured cracks (you can cause motorcycle accidents)

Hot poured method

Blocks of crack pour material heated in specialized crack pouring machines

Good for large volume work and large cracks

Cold poured method

Cold liquid material applied

Not complex machinery. One person can apply it



ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Crack sealing



Cold pouring video





ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Patching

Overlay patches

Applied in areas of pavement failure or wear problems

All loose, broken asphalt is removed

Ruts, depressions or humps are repaired or pre-leveled in advance

All areas are tacked before patching



ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Patching

Overlay patches





ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Patching

Patching with base repair

“Dig-out patches” – Permanent repairs to the pavement

Steps

- Defective pavement and unstable surfacing materials are removed
- Excavation extended into the good pavement
- Patch edges cut vertically and in straight lines (pavement saw)
- Level and compact the base material
- Apply a tack coat of asphalt to the vertical edges
- Replace pavement



ROAD PAVEMENT MAINTENANCE

STRUCTURAL MAINTENANCE

Patching

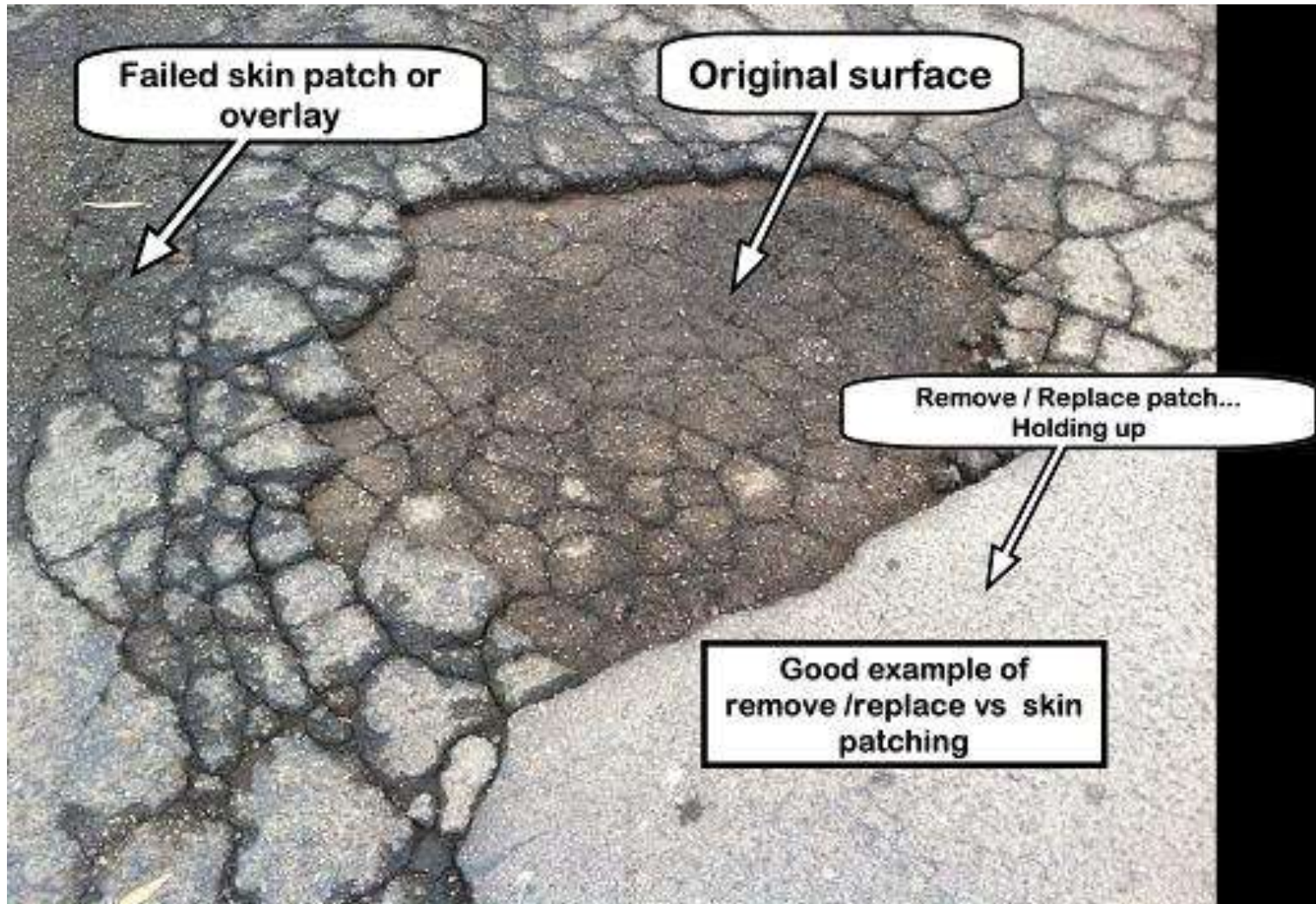
Patching with base repair





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STRUCTURAL MAINTENANCE





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Renewable of carriageway markings





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Surface dressing

Bitumen is sprayed onto the road surface
Chippings are then applied





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Repaving





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STRUCTURAL MAINTENANCE

Repaving

VIDEO Recycled pavement



Steps in a crack treatment Programme

- 1.-Obtain and review construction and maintenance records
Pavement age, design, repairs, etc.
- 2.- Perform pavement/crack survey
Record distress types, amounts, and severities
- 3.- Determine appropriate type of maintenance for cracked pavement based on density and condition of cracks
 - High density of cracks with moderate to no edge deterioration
→ pavement surface treatment.
 - Moderate density of cracks with moderate to no edge deterioration
→ crack treatment.
 - Moderate density of cracks with high level of edge deterioration
→ crack repair.
- 4.- Acquire materials and equipment
- 5.- Conduct and inspect crack treatment operations
- 6.- Periodically evaluate treatment performance



For crack treatment, determine whether cracks should be sealed or filled.

- Cracks typically show significant annual horizontal movement
→crack sealing
- Cracks typically show very little annual horizontal movement
→crack filling, a



Selection of materials and procedures for crack treatment operation based on the following considerations:

- Climate (dry-freeze, dry-nonfreeze, wet-freeze, wet-nonfreeze).
- Traffic (high, medium, low).
- Crack characteristics (width, deterioration).
- Available equipment.
- Available manpower.
- Cost-effectiveness (anticipated treatment cost and performance)



Exercise

Work in groups. Take the asphalted Surface suggested by your Lecturer and analyse the following:

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- Defects you can find in the asphalt pavement
- Possible causes
- Solutions and methods for repairing