Florida Department of Transportation
AVIATION AND SPACEPORT OFFICE

AIRFIELD PAVEMENT DISTRESS REP MANUAL

2015

STATEWIDE AIRFIELD PAVEMENT MANAGEMENT PROGRAM

Use of Manual

This Airfield Distress Repair Manual has been updated with the latest information from the FAA and the ASTM 150/5380-6A. Additional distress pictures were added for clarity and easy recognition for maintenance repair performers while on the field. This PMP Airfield Pavement Inspection Manual has been developed by the Florida Department of Transportation Central Aviation Office.

Examples of various pavement distress types identified in this airfield distress repair manual are presented by name in order to assist airfield maintenance repair performers. The various illustrations, charts and supporting information descriptions are presented to aid in the identification, severity, location, extent, and probable causes of pavement distresses for both flexible and rigid pavement types.

The majority of the photographs of various pavement conditions were collected and assembled specifically for the development of this Airfield Pavement Inspection Manual. A limited number of photographs are also presented and referenced that were developed by the sources listed in the References section of this manual

Disclaimer:

THIS MANUAL HAS BEEN APPROVED BY THE FLORIDA DEPARTMENT OF TRANSPORTATION AND IS BASED ON INFORMATION FROM VARIOUS SOURCES. WHILE REASONABLE CARE HAS BEEN TAKEN IN PREPARING THIS DOCUMENT, NO RESPONSIBILITY OR LIABILITY IS ACCEPTED FOR ERRORS OR FACTS OR FOR ANY OPINION EXPRESSED HEREIN.

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CLASSIFICATION OF AIRFIELD PAVEMENTS

Flexible Pavements

- Asphalt cement and aggregates
- Strength affected by temperature
- Relatively easy to repair
- Composed of 5 layers: HMA Surface/Base course/Sub-base (*)/Frost Protection (*) & Sub-grade

Rigid Pavements

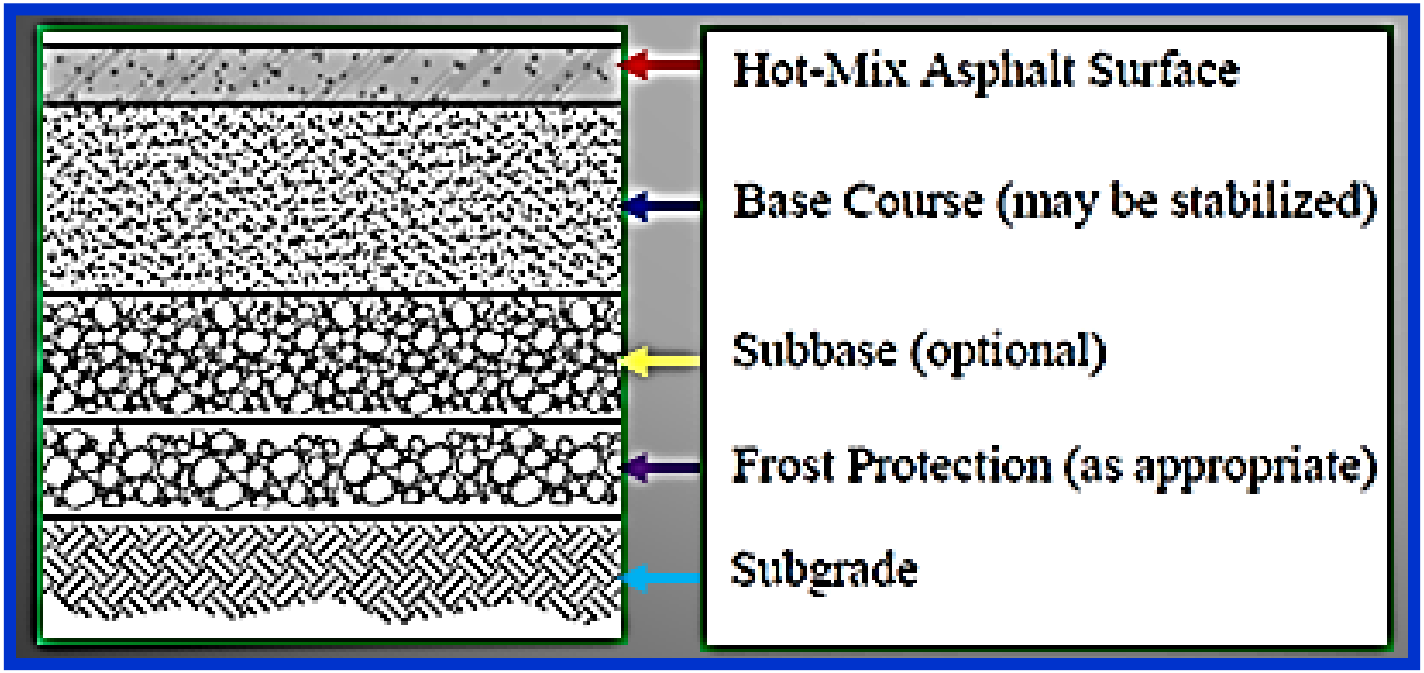
- Portland cement and aggregates
- Very strong, durable
- Expensive to repair
- Composed of 4 layers: PCC Slab/ Sub-base / Stabilized Sub-base(**)/Frost Protection(*) & Sub-grade.

Composite Pavements

- Asphalt over Concrete

(*) As needed, (**) May be stabilized if accommodating $\geq$ 100,000lbs

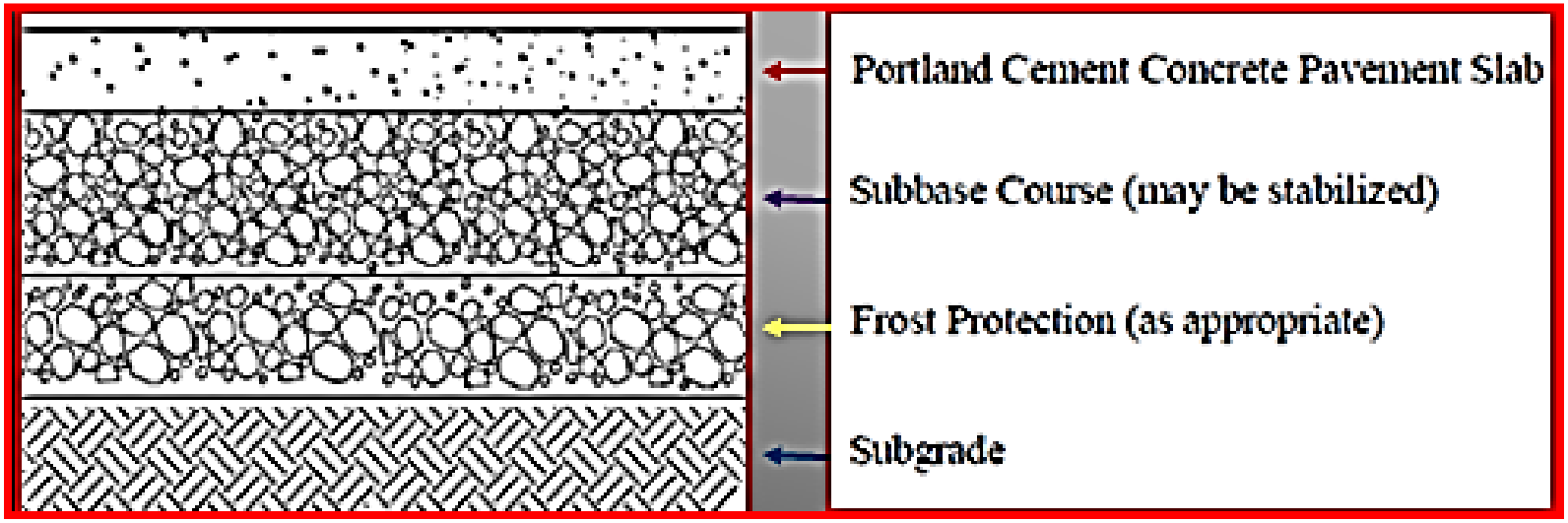
FLEXIBLE PAVEMENT COMPOSITION & STRUCTURE



- Asphalt cement and aggregates
- Strength affected by temperature
- Relatively easy to repair
- Composed of 5 layers: HMA Surface/Base course/Sub-base **(*)** Frost Protection **(*)** & Subgrade

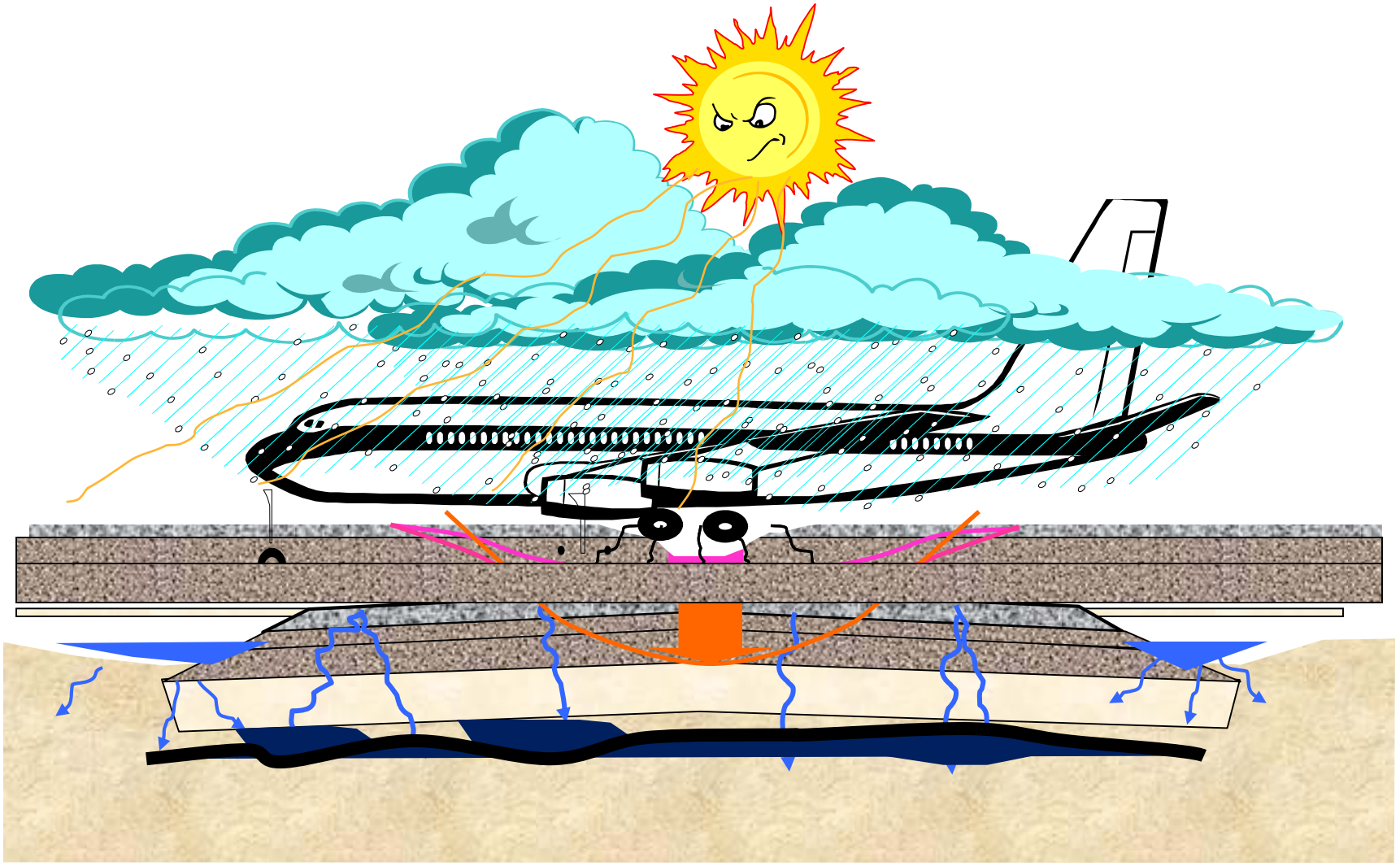
(*) = As needed

RIGID PAVEMENT
COMPOSITION & STRUCTURE



- Portland cement and aggregates
- Very strong, durable
- Expensive to repair
- Composed of 4 layers: PCC Slab/ Sub-base / Stabilized Sub-base **(****)/Frost Protection**(*)** & Subgrade

(*), (****) = As needed



CAUSES OF FAILURE

CAUSES OF FAILURE

Environment: (Non-Load, including drainage and environmental effects)

- Swell
- Blowups

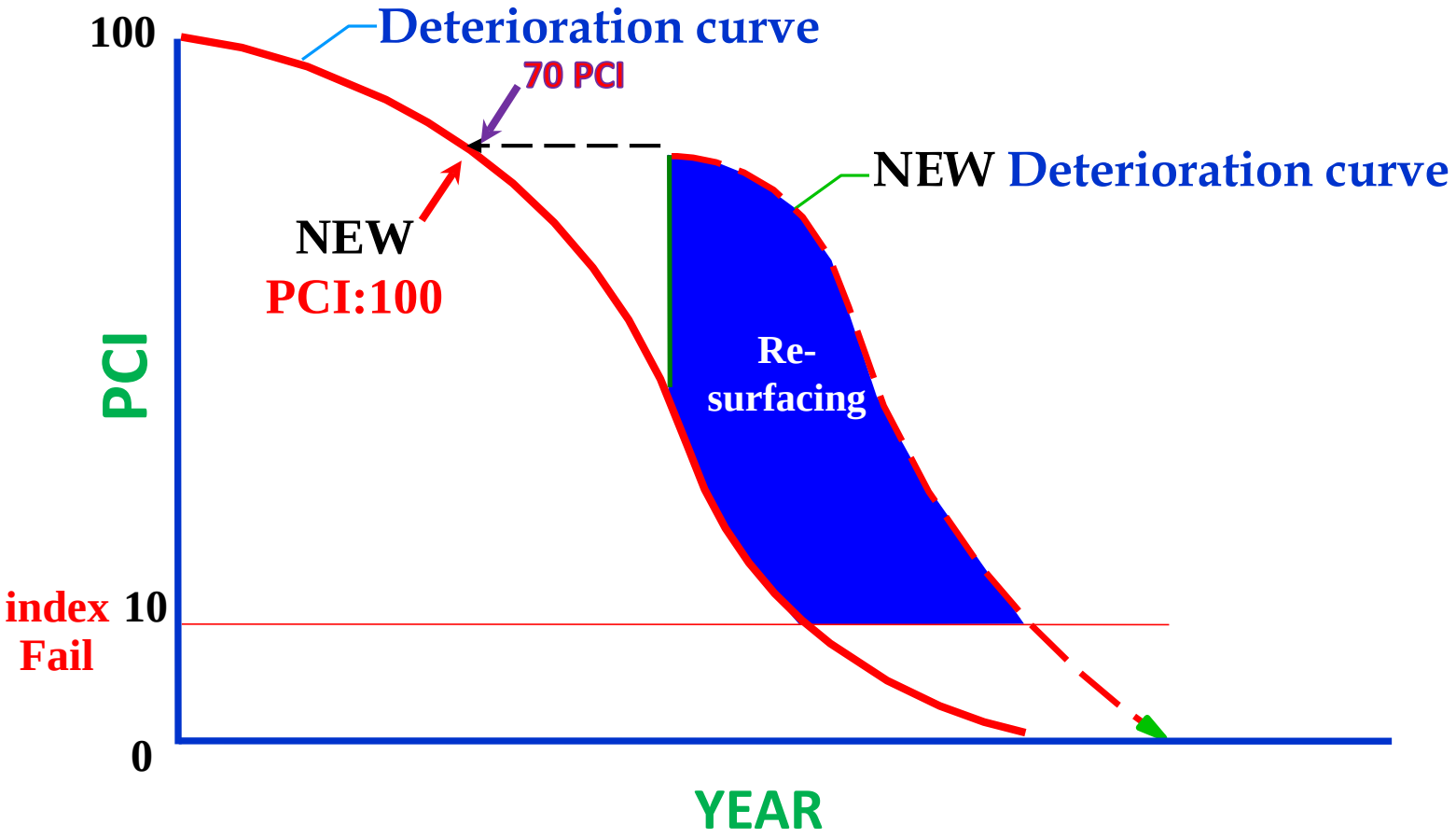
Load : (too much traffic or weak structure (or both):

- Alligator cracks
- Corner breaks
- Joint spalls

Construction/materials related:

- Bleeding
- Crazing/map cracking

RENEW THE LIFE OF PAVEMENT



Pavement deterioration is inescapable fact. When you renew the pavement, you actually extend its life.

AIRFIELD PAVEMENT DISTRESS (AC & PCC)

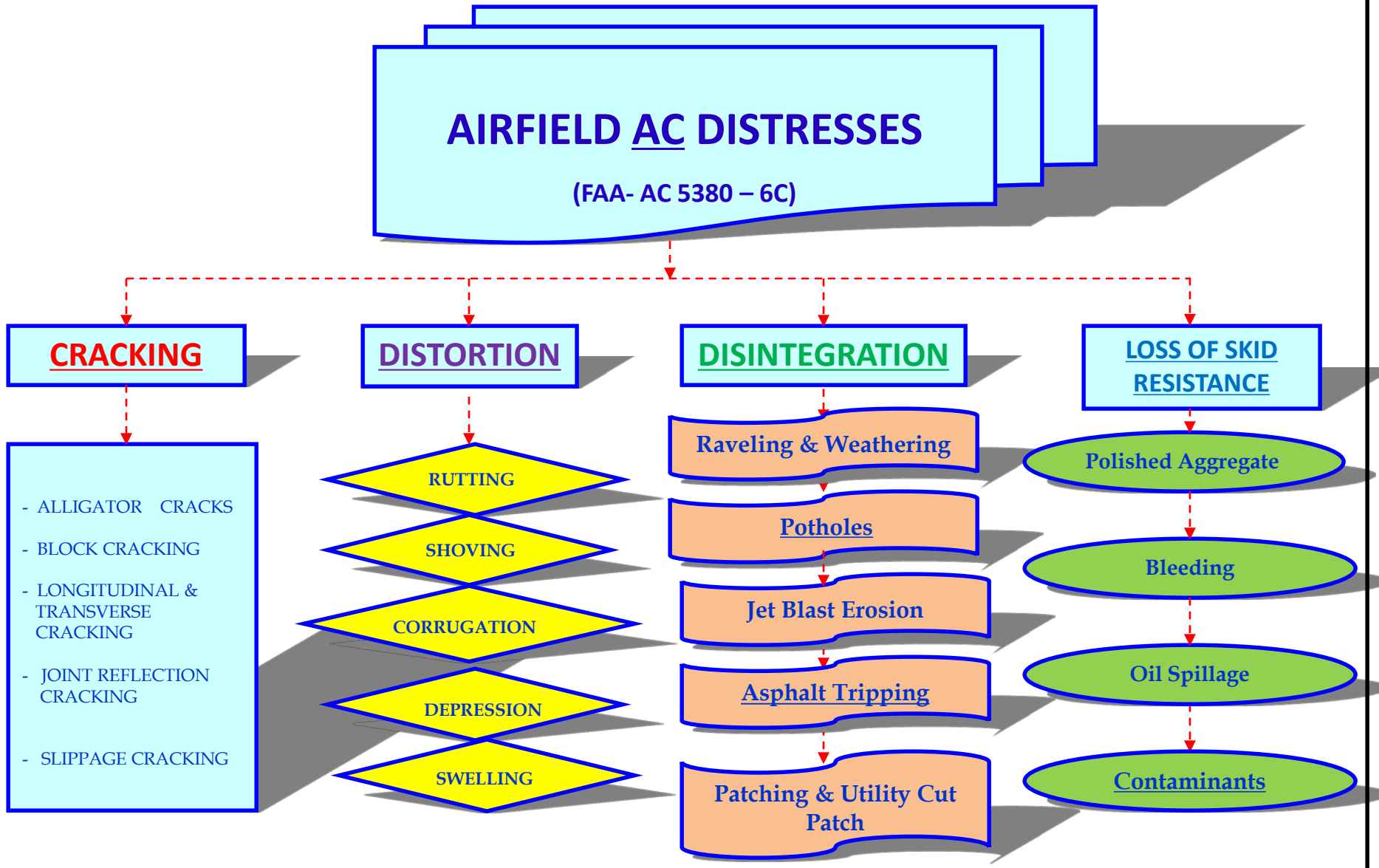
- **CRACKING**
- **JOINT SEAL DAMAGE**
- **DISINTEGRATION**
- **DISTORTION**
- **LOSS OF SKID RESISTANCE**

AIRFIELD PAVEMENT DISTRESS

(AC & PCC)

DISTRESS TYPE:	AC	PCC
CRACKING	- Longitudinal, Transverse Cracks - Block Cracking, - Reflection Crack - Alligator Crack - Slippage Crack	- Longitudinal, Transverse, and Diagonal Crack - Corner Breaks - Durability "D" Cracking - Shrinkage Cracking
JOINT SEAL DAMAGE	N/A	- Joint Seal Damage
DISINTEGRATION	- Raveling and Weathering - Potholes - Asphalt Stripping - Jet Blast Erosion - Patching & Utility Cut Patch	- Scaling, Map Cracking, and Crazing, - Joint Spalling - Corner Spalling - Shattered Slab/Intersecting Cracks - Blowups - Pop-outs - Patching: Small, Large and Utility
DISTORTION	- Rutting - Corrugation -Shoving -Depression - Swelling.	- Pumping - Settlement or Faulting
LOSS OF SKID RESISTANCE	- Polished Aggregates - Contaminant - Bleeding - Fuel/Oil Spillage	- Polished Aggregates, - Contaminants

AC DISTRESS CATEGORIZATION



* Underlined distresses are recognized by the FAA but not by the ASTM

CRACKING

DEFINITION:

Break without completely separating. These distresses may include ALLIGATOR, BLOCK CRACKING, LT CRACKING, REFLECTION CRACKING, and SLIPPAGE CRACKING.

METHODS OF REPAIR:

Cracking takes many forms. In some cases, simple crack filling may be the proper corrective action. Some cracks, however, require complete removal of the cracked area.

DISTORTION

DEFINITION:

Distortion is any change of the pavement surface from its original shape. Distortions in an asphalt pavement are caused by instability of an asphalt mix or weakness of the base or sub-grade layers. These distresses may include RUTTING, SHOVING, DEPRESSIONS, SWELLING, and PATCH FAILURE.

METHODS OF REPAIR:

Repair techniques for distortion range from leveling the surface by filling with new material to completely removing the affected area and replacing with new material. Cold milling can be employed prior to overlaying for many of these distresses.

DISINTEGRATION

DEFINITION:

Disintegration is the breakup of a pavement into small pieces that are lost with time and traffic . RAVELING and POTHOLES are the most common types of **disintegration**.

METHODS OF REPAIR:

If not impeded in its early stages, disintegration can progress rapidly until the pavement requires complete rebuilding. Permanent repairs by patching may be carried out. Sealer-rejuvenator products can be applied to retard disintegration. The products help reverse the aging process of the surface asphalt. Deterioration from raveling may also be impeded by applying a light fog seal or a slurry seal.

SKIDDING HAZARDS

DEFINITION:

Skidding hazards are caused by water on the surface of the pavement, polished aggregates, or excess asphalt or other lubricants on the pavement' s surface.

METHODS OF REPAIR:

Treatment for loss of skid resistance includes removal of excess asphalt for bleeding conditions, resurfacing, grooving to improve surface drainage, and removing of rubber deposits.

PCC DISTRESS CATEGORIZATION

AIRFIELD PCC DISTRESSES (FAA-AC 150/5380 – 6C)

CRACKING

- -Corner Breaks
- -Longitudinal, Transverse, and Diagonal Cracking
- -Shrinkage Cracking
- -Durability "D" Cracking

DISTORTION

- Settlement or Faulting
- Pumping

DISINTEGRATION

- Blowup
- Scaling, (**) Map Cracking, Crazing
- Joint Spalling
- Corner Spalling
- Shattered Slab & Intersecting Cracks
- Pop-outs
- Patching, Small
- Patching Large & Utility Cut

JT. SEAL DAMAGE

- Jt. Seal Damage

LOSS OF SKID RESISTANCE

- Polished (***) Aggregate
- Contaminants (***)
- Slipperiness (***)

(*) Missing distress from ASTM
(**) Named by ASTM
(***) Does not recognize by ASTM

CRACKING

DEFINITION:

Break without completely separating. These distresses may include LONGITUDINAL, TRANSVERSE & DIAGONAL CRACKS, CORNER BREAKS, DURABILITY “D” CRACKING, SHRINKAGE CRACKING.

METHODS OF REPAIR:

This type of repair first requires establishing a properly shaped sealant reservoir followed by application of an appropriate joint sealing compound and backer rod as appropriate. The reservoir should be cut with a saw rather than a router as routers us a mechanical impact to remove material and may cause micro-cracks in the concrete.

DISINTEGRATION

DEFINITION:

Disintegration is the breaking up of a pavement into small, loose fragments. This includes the dislodging of aggregate particle. If not stopped in its early stages, it can progress until the pavement requires complete rebuilding.

METHODS OF REPAIR:

The follow up repair procedure for this category depends on whether full-depth repair or partial depth repair is performed. (See full-depth or partial-depth repair for concrete on page 108 and 117)

DISTORTION

DEFINITION:

Distortion is any change of the pavement surface from its original shape, such as FAULTING, PUMPING etc.

METHODS OF REPAIR:

If not too extensive, some forms of distortion, such as that caused by settlement, can be remedied by raising the slab to the original grade. An option for repairing some types of settlement or faulting, which are not extensive in grade variation, is to micro-mill the pavement surface to true and level.

JOINT SEAL DAMAGE

DEFINITION:

The definition for Jt. Seal Damage is: "any condition that enables soil or rocks to accumulate in the joints or that allows infiltration of water."

METHODS OF REPAIR:

Remove old joint material and any foreign material in the joint and reseal the joint.

SKID HAZARD

DEFINITION:

A number of things can make a pavement slippery when wet. A major cause of slippery Portland cement concrete pavement is polished aggregate in the surface. The aggregate particles may be smooth, uncrushed gravel. Slipperiness also may develop from surface contamination.

METHODS OF REPAIR:

Rehabilitation treatment includes resurfacing, milling, diamond grinding, and surface cleaning. Grooving may be considered when a loss of skid resistance is observed. Grooving thus minimizes the potential for hydro- planing during wet conditions.

REPAIR SELECTION CATEGORIZATION

PERMANENT REPAIRS:

Permanent repairs are conducted on pavement areas that are in good condition in order to restore the life cycle of those that need to be repaired.

SEMI-PERMANENT REPAIRS:

Semi-permanent repairs have a typical life expectancy of one or two years. Usually, the area does not need to be saw cut, and may be repaired with cold mix.

TEMPORARY REPAIRS:

Temporary repairs are used to hold the pavement until it can be resurfaced or permanently repaired.

EMERGENCY REPAIRS:

Emergency repairs are applied when the pavement condition may become a hazard to airplane operations.

Legend for the repair section:

Recommendation: R
Permanent Repair: P
Temporary Repair: T
Emergency Repair: E
Semi-Permanent Repair: S/P

Legend for the distress severity levels:

Low Severity: L
Medium Severity: M
High Severity: H

FAA's REPAIR METHODOLOGIES

- MICRO - MILL
- DIAMOND GRINDING
- MICRO SURFACING
- ASPHALT LEVELING COURSE
- ASPHALT SURFACING TREATMENT
- RANDOM CRACKING SAW
- VERTICAL SPINDLE ROUTER
- SAND – BLASTING
- WATER - BLASTING

REHABILITATION

- **The selection of a specific rehabilitation method involves both economic and engineering considerations.**

- **In the maintenance and repair of airport pavement, the long -term effects, rather than a short-term remedy, should be compared over some finite period of time (life cycle).**

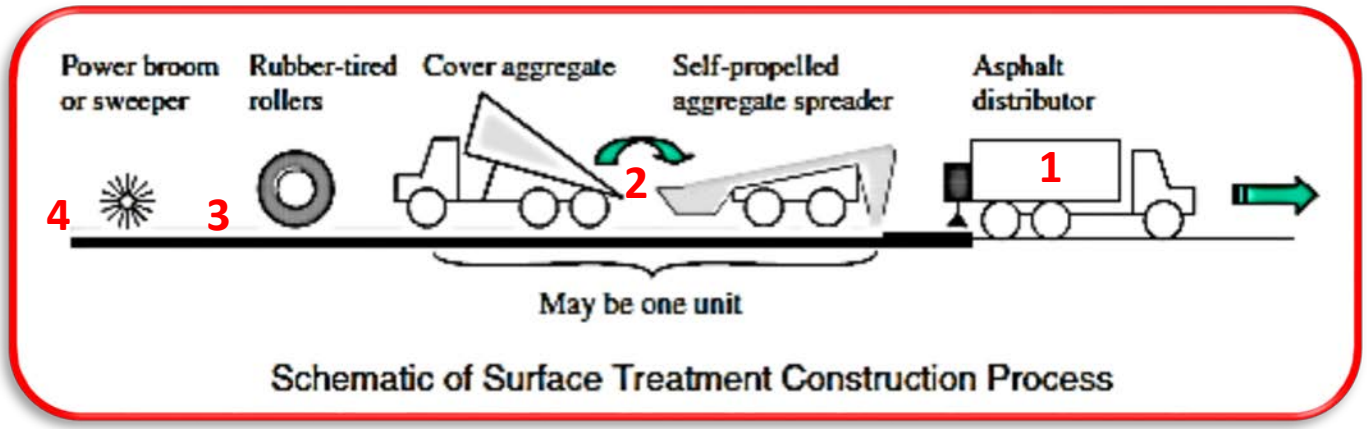
COMMON TECHNIQUES AND MATERIALS FOR MAINTENANCE AND REPAIR

- PORTLAND CEMENT CONCRETE (PCC)
- HOT- MIX ASPHALT (HMA)
- ASPHALT EMULSIONS
- TACK COAT
- PRIME COAT
- FOG SEAL
- AGGREGATE SEAL
- SLURRY SEAL
- COAL-TAR SEALER

PROCEDURES FOR MAINTENANCE AND REPAIR OF AC AIRFIELD PAVEMENTS

- ASPHALT SURFACE TREATMENT
- ASPHALT LEVELING COURSE
- HOT-MIX OVERLAY OF ASPHALT PAVEMENT
- MICRO SURFACING
- MICRO MILLING
- FOG SEAL PROCESS
- CHIP SEAL PROCESS
- SLURRY SEAL PROCESS
- MACHINE PATCHING OF PCC PAVEMENT WITH AC MATERIAL

ASPHALT SURFACE TREATMENT



Schematic of Surface Treatment Construction Process

Asphalt surface treatment is an application of asphalt materials to any type of pavement surface, **with or without** a cover of mineral aggregate, which produces an increase in thickness of less than one inch.

If with a cover of mineral aggregate such as surface seal, chip seal etc., then it is the application of asphalt binder, immediately followed by an application of cover aggregate, to any type of pavement surface.

Surface treatments can also be applied to AC pavements as a preventive or corrective maintenance treatment.

FIGURE 18-4 Pneumatic tire roller.

FIGURE 13-5 Material transfer vehicle.

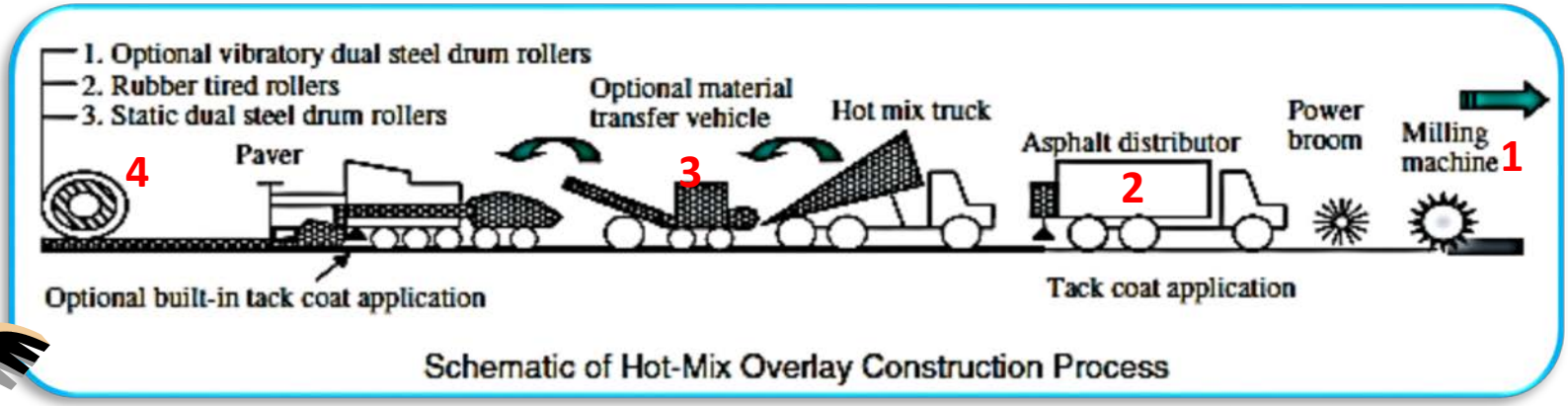
FIGURE 14-7 Distributor applying tack coat.

ASPHALT LEVELING COURSE

A layer (asphalt aggregate mixtures) of variable thickness used to eliminate irregularities in the contour of an existing surface prior to conducting treatment or construction.

Irregularities in the asphalt surface

HOT-MIX OVERLAY of ASPHALT PAVEMENT



Schematic of Hot-Mix Overlay Construction Process

Hot-mix overlay of AC pavement consists of placing a layer or layers of hot mix over the existing AC surface.

The construction of an overlay includes:

- milling of the pavement surface
- application of a tack coat
- the use of a Hot-Mix material transfer vehicle
- paving the surface
- compact with the roller

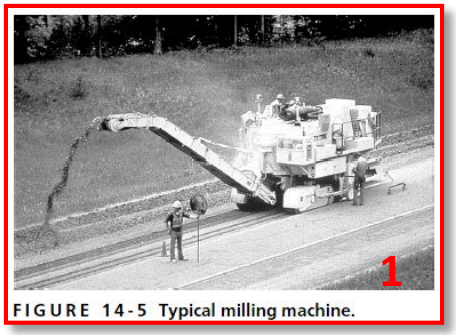


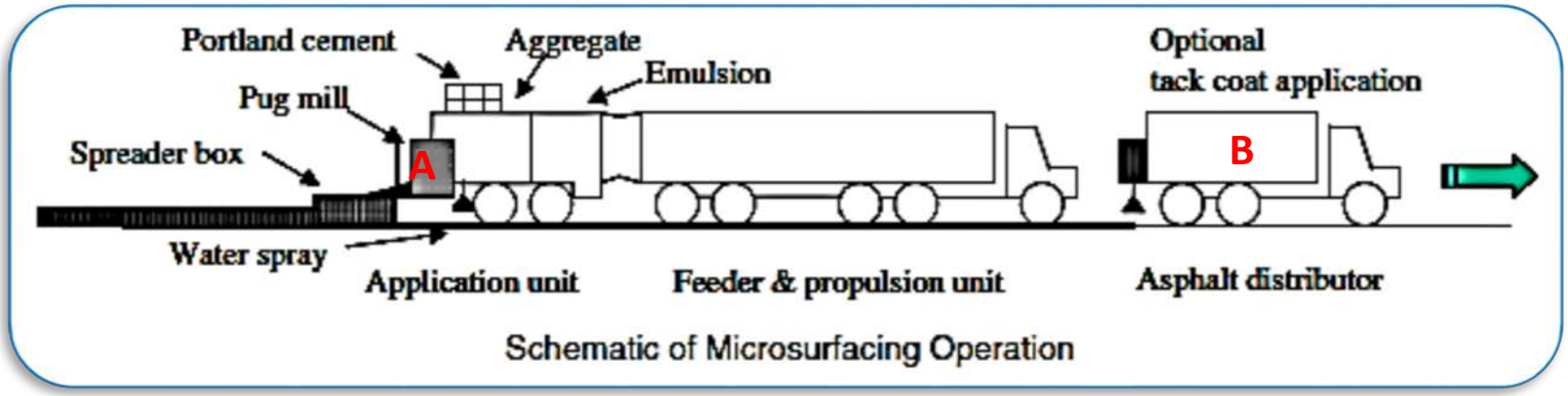
FIGURE 14-5 Typical milling machine.

FIGURE 17-15 Compaction of longitudinal joint with pneumatic tire roller.

FIGURE 13-5 Material transfer vehicle.

FIGURE 14-7 Distributor applying tack coat.

MICRO SURFACING



Schematic of Microsurfacing Operation

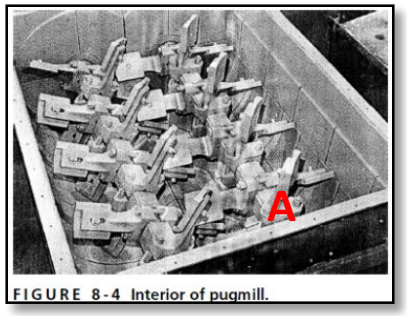


FIGURE 8-4 Interior of pugmill.

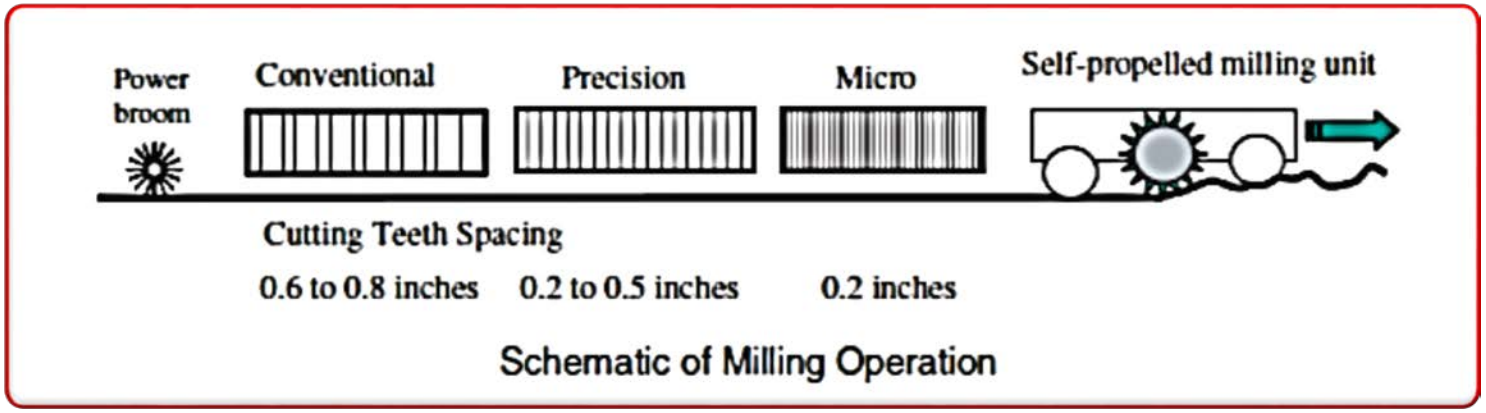
FIGURE 14-7 Distributor applying tack coat.

Micro-surfacing is an unheated mixture combination of polymer-modified asphalt emulsion, high-quality frictional aggregate, mineral filler, water, and other additives, mixed and spread over the pavement surface as a slurry.

The construction of micro-surfacing using a self-propelled truck-mounted continuous-feed mixing machine is illustrated by the diagram above.

MICRO MILLING

(Texturization Using Fine Milling)



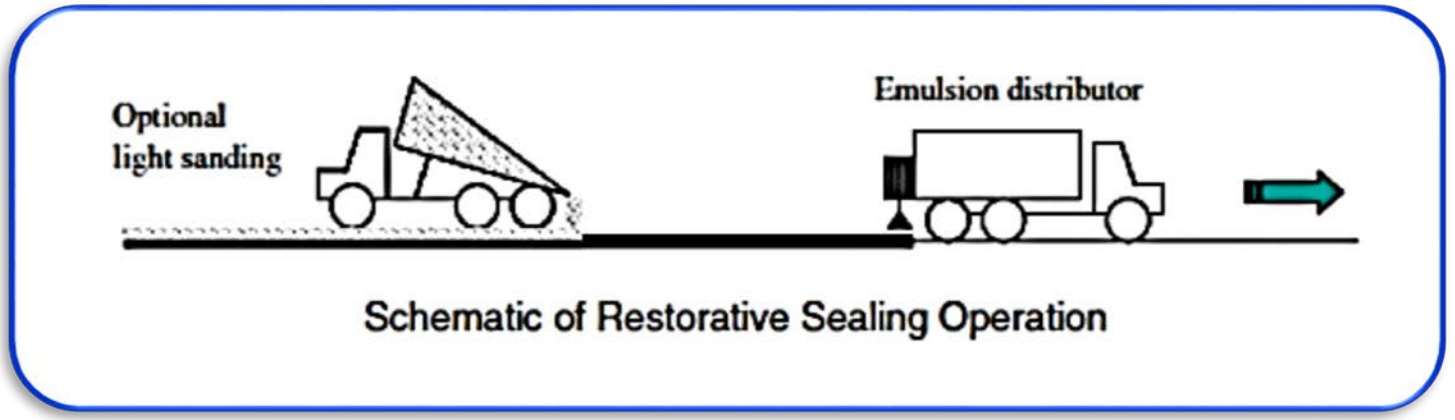
Schematic of Milling Operation

Texturization techniques include conventional milling, precision milling, and fine milling. **Fine milling, also called micromilling**, removes unevenness from the pavement surface or improves its texture, and leaves an abraded surface that can be used as a driving surface.

Milling is done by a cylindrical milling drum with closely spaced carbide-tipped tools (teeth). The techniques differ by the spacing of the cutting teeth, as shown on the above illustration, and by the degree of control over the profile of the milled surface.

FOG SEALS

(Restorative Seals)

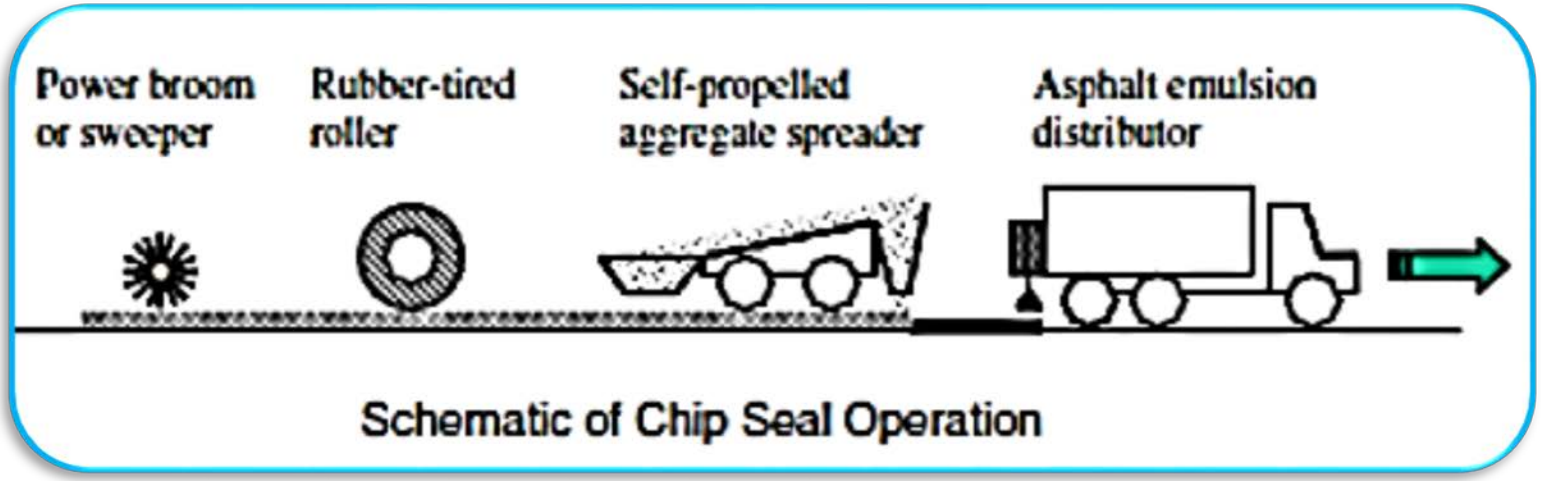


Schematic of Restorative Sealing Operation

Fog Seals consist of an application of a bituminous or coal-tar material, typically emulsion-based, to the surface of AC pavement as shown above.

Some agencies or suppliers recommend light sanding of fog seals (approximately 1 lb of sand per square yard).

CHIP SEAL PROCESS



Schematic of Chip Seal Operation

Surface treatment (also known as surface seal, seal, and **chip seal**) is the application of asphalt binder, immediately followed by an application of cover aggregate, to any type of pavement surface.

If the aggregate is of uniform size, the treatment is usually called chip seal.

SLURRY SEAL PROCESS

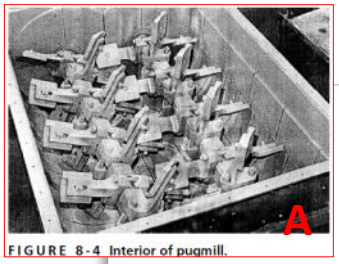
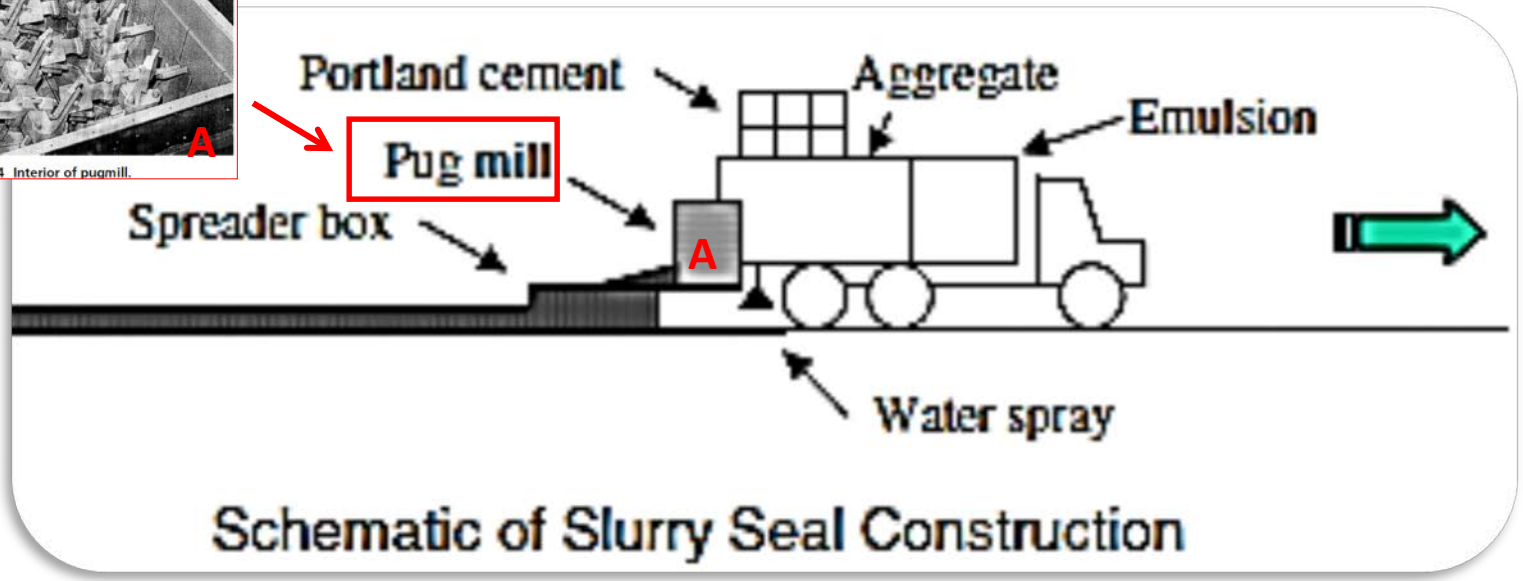


FIGURE 8-4 Interior of pugmill.

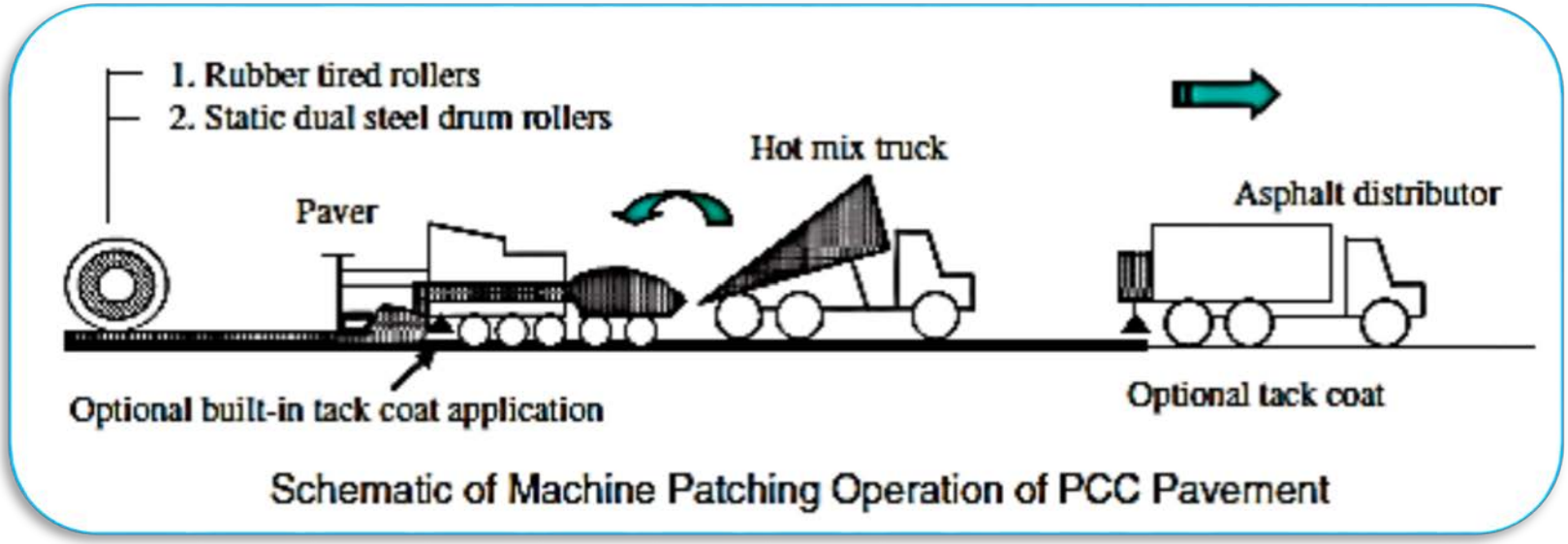


Schematic of Slurry Seal Construction

Slurry seal is an unheated mixture of a combination between asphalt emulsion, graded fine aggregate, mineral filler, water, and other additives, mixed and uniformly spread over the pavement surface as slurry.

The construction of slurry seal using a self-propelled truck-mounted mixing machine is illustrated above.

MACHINE PATCHING OF PCC PAVEMENT WITH AC MATERIAL



Schematic of Machine Patching Operation of PCC Pavement

Machine patching of PCC pavements is a maintenance technique that involves the placing and spreading of AC mix using a paver on parts of a pavement section. Machine patching includes the preparation of the patching area, addition of the patching material, and compaction as shown on the illustration above.

PREPARATION FOR JOINT/ CRACK REPAIR (PCC)

- CRACK PREPARATION FOR PCC
- RANDOM CRACK SAW
- VERTICAL SPINDLE ROUTER
- SAND - BLASTING
- WATER - BLASTING
- DIAMOND GRINDING

CRACK PREPARATION for PCC

- Cracks **less than 3/16** (.2”) wide and without any surface spalling **do not** require repair or sealing.
- Seal all cracks between 3/16 in and 2 in.(.2” – 2”) wide.
- Cracks **larger than 2 in**. require full-depth patching.
- Use of a **backer rod** is recommended for all crack sealing, unless other wise.
- **Rout or saw** the cracks to the proper depth and width according to the shape factor, or as designated by the manufacturer’s recommendations for the particular sealant being employed.
- After completion of the **sawing operation**, sandblast the crack face to remove laitance, sawing debris, and other foreign material.
- Conduct the **sandblasting operation** with a multiple-pass technique in which one side of the sawed crack face is abraded, followed by the other face.
- The pavement surface directly adjacent to the sawed crack may also **be blasted to remove any debris or materia**l that may cause problems during crack sealing.
- **Cracks are sealed as soon as possible** to prevent contamination before sealant application. If vegetation is growing in the cracks, remove it.

RANDOM CRACK SAW

A. Sawing is the preferred method for preparing cracks for sealing.

B. This device is essentially a concrete saw but has a smaller rear-mounted blade approximately 7 inches in diameter.

C. These saws are generally self-propelled machines with caster wheels that allow more freedom of movement than an ordinary concrete saw for following the path of cracks.

D. Use diamond blades manufactured for tracing cracks, which are wide enough to cut each edge of the crack and will not warp during operation.

Random Crack Saw

A freshly sawed crack.

VERTICAL SPINDLE ROUTER

A. Cracks may be routed out if a saw is not available.

B. The vertical spindle router has a vertically mounted router bit and is constructed such that the device can caster and easily follow the contours of a crack.

C. The bit must be the proper size for the sealant reservoir and be belt-driven for safety considerations arising from jamming of the bit if the router is forced along the crack.

D. Use proper size bits that yield the proper shape for the sealant reservoir and do not cause spalling or raveling along the crack path.

ROUTER USED TO SHAPE SEALANT RESEVOIR FOR CRACKS

SAND - BLASTING

A. Clean the crack faces by light sand-blasting using the multiple pass technique.

B. While standing to one side of the crack, pass the wand along the crack face at an angle to allow a strong blast on one crack face; then step to the other side of the crack and reverse direction.

C. Direct the nozzle to the location where the sealant will bond to the concrete, and not above or below this region.

WATER - BLASTING

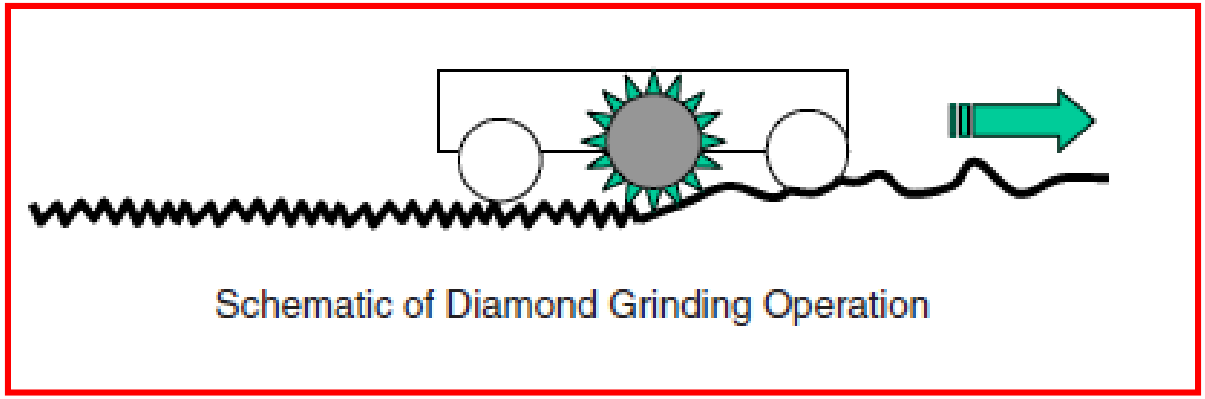
A. Water-blasting is another technique for cleaning crack faces. It is sometimes employed as an alternative to sandblasting due to local air regulations, or where the sand and debris might create additional problems.

B. After water-blasting is completed, dry the entire crack prior to sealant installation.


HIGH-PRESSURE WATER CLEANING

NOTE: Water-blasting is not necessary when sand-blasting is employed.

DIAMOND GRINDING



Diamond grinding is a rehabilitation technique that removes a shallow depth of pavement surface material. The process is similar to a wood plane; the front wheels pass over a fault/bump, the cutting head shaves it off, and the rear wheels ride in a smooth path left by the cutting head.

The purpose of diamond grinding is to enhance the pavement smoothness, improve the pavement surface friction, and correct faulting on the aging pavements.


Figure 9.1. Diamond grinding equipment.

PCI – DISTRESS CONDITION – REPAIR SOLUTION

PCI Rating	Description	Applicable Pavement Preservation Treatments
86–100	Good—only minor distresses	Routine maintenance only
71–85	Satisfactory—low and medium distresses	Preventive maintenance
56–70	Fair, some distresses are severe	Corrective maintenance and rehabilitation
41–55	Poor—severity of some of the distresses can cause operational problems	Rehabilitation or reconstruction
26–40	Very poor—severe distresses cause operational problems.	Rehabilitation and reconstruction
11–25	Serious—many severe distresses cause operational restrictions	Immediate repairs and reconstruction
0–10	Failed—pavement deterioration prevents safe aircraft operations	Reconstruction

SEVERITY → MAINTENANCE TREATMENT (AC / PCC)

EXAMPLE OF MAINTENANCE POLICY FOR CRACKING

Severity of Pavement Cracking	Recommended Maintenance Treatment	
	AC pavements	PCC pavements
Low	None—continue to monitor	None—continue to monitor
Medium	Crack routing and sealing	Crack sealing
High	Crack repairs	Full-depth repairs

PROBABLE CAUSES & REPAIR SOLUTIONS

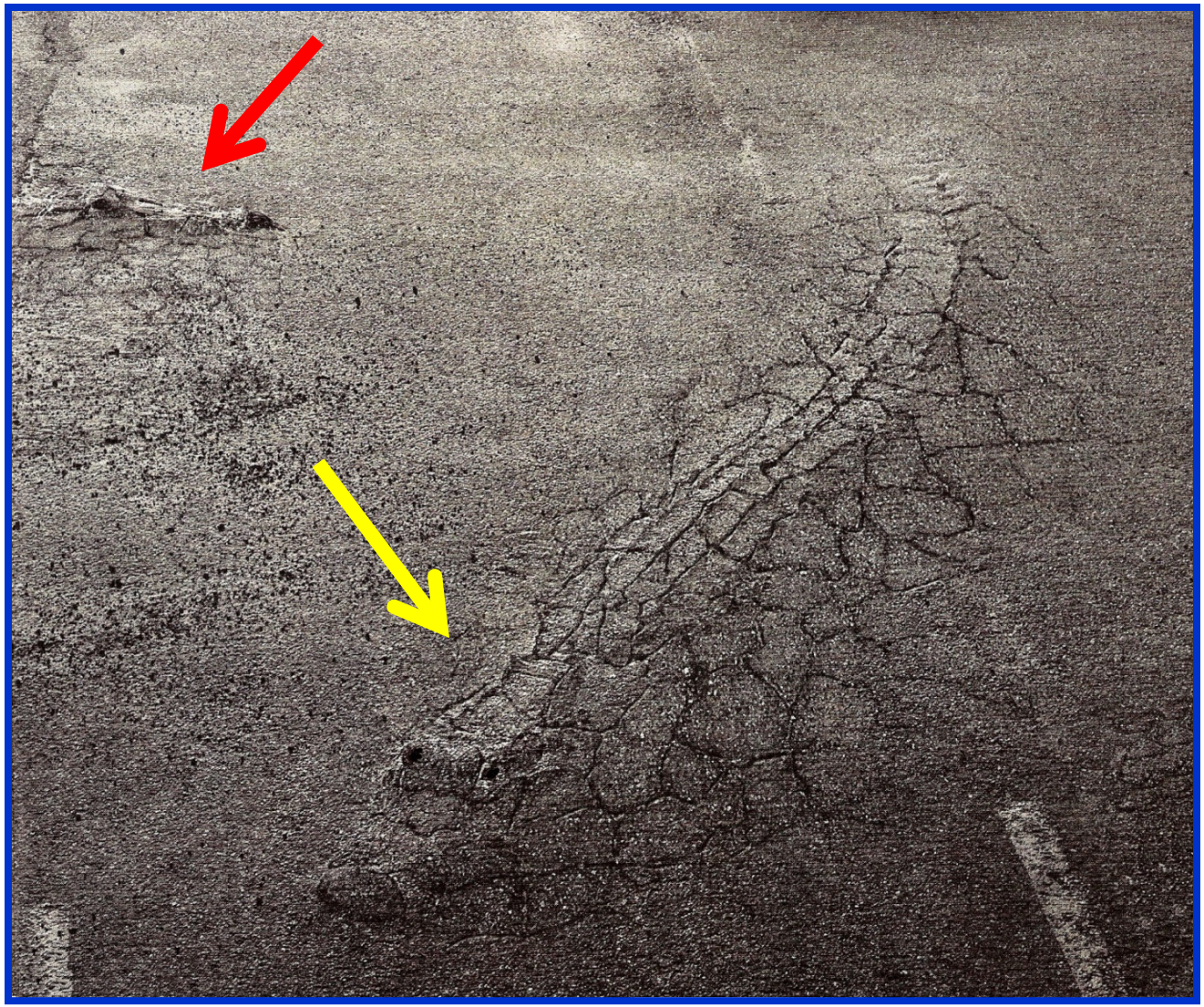
FOR

AIRFIELD AC SURFACES

DISTRESSES IN FLEXIBLE AIRFIELD PAVEMENTS

1. ALLIGATOR CRACKING
2. BLEEDING
3. BLOCK CRACKING
4. CONTAMINANTS
5. CORRUGATION
6. DEPRESSION
7. JET BLAST EROSION
8. JOINT REFLECTION CRACKING
9. LONGITUDINAL / TRANSVERSE CRACKING
10. OIL SPILLAGE
11. PATCHING
12. POLISHED AGGREGATE
13. RAVELING
14. RUTTING
15. SHOVING FROM PCC SLAB
16. SLIPPAGE CRACKING
17. SLIPPERINESS
18. SWELLING
19. WEATHERING

ALLIGATOR CRACKING



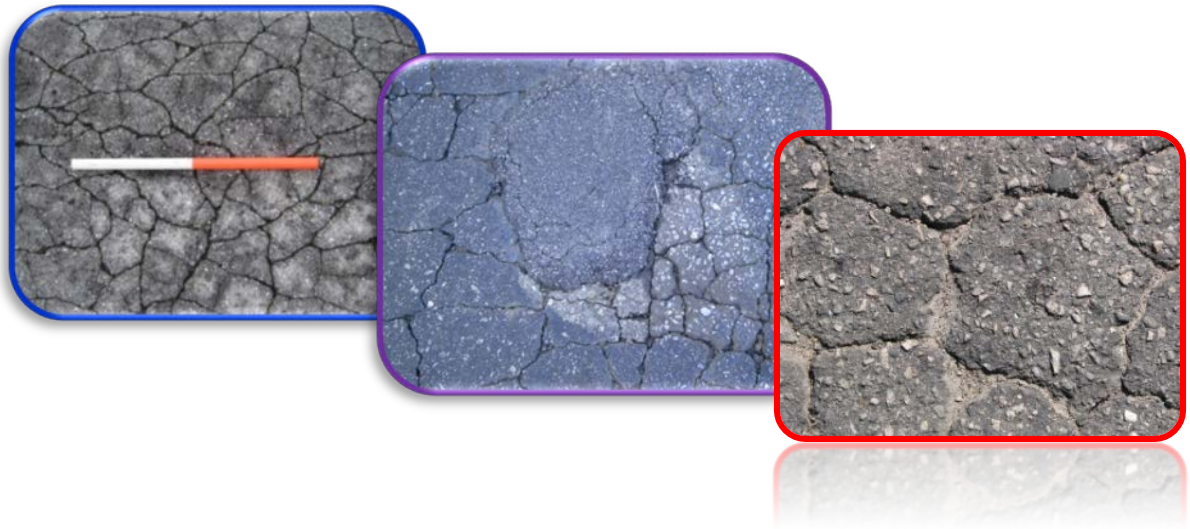
ALLIGATOR CRACKING

PROBABLE CAUSE	REPAIR
Alligator is caused by: - Overload - Oxidized binder - Under-designed surface course (too thin)	**T/E:** - Slurry seal (emulsified asphalt) - Seal coat (coal-tar pitch emulsion) **P** : - Saw cut area, remove and replace (State DOT modified surface mix) (*)

Note:

Sometimes alligator cracking is also the result of saturated bases or sub-bases, therefore correction may include removing the wet material and installing needed drainage.

(*) State DOT modified surface mix" refers to a modified standard mix with a minimum of **5%** retained on the **1/2-inch** (12.7 mm) sieve and 0% passing the **3/4-inch** (19 mm) sieve.



BLEEDING

PROBABLE CAUSE	REPAIR
The most common cause of bleeding: - too heavy a prime or tack coat - too rich a mix, and/or - improperly constructed seal coat	**R/P:** - Scrap surface and blotter-sand-roll (blotter-sand) - Mill and repave (FAA P- 401)

Also, traffic may cause added compression of a pavement, containing too much asphalt, forcing it to the surface.

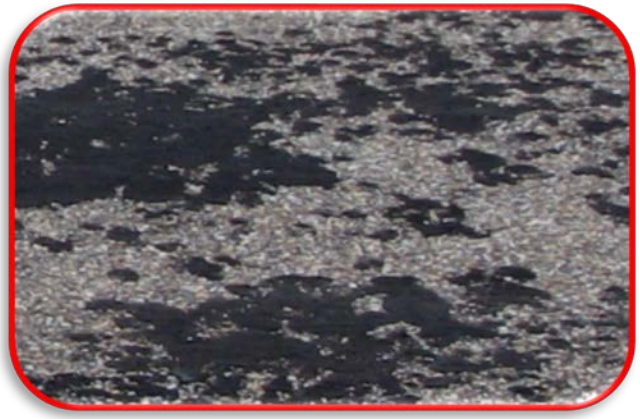


Figure II-67—Bleeding asphalt

BLOCK CRACKING

PROBABLE CAUSE	REPAIR
The cause of Block Cracking is: - aging - shrinkage of the asphalt concrete (AC), and, - daily temperature cycling (oxidation).	**Low**: <1/8": R/P: No action. T/E: Seal coat, Slurry seal or Fog seal **Medium**: ≥1/8"<3/4" R/P: Rout, clean & seal **High**: ≥3/4"<1-1/4" R/P: Saw, mill, remove & replace T/E: Rout edges only, clean & seal **High**: ≥ 1-1/4" - 2-1/4" R/P: Remove & replace T/E: Rout edges only, clean, install backer rod & seal

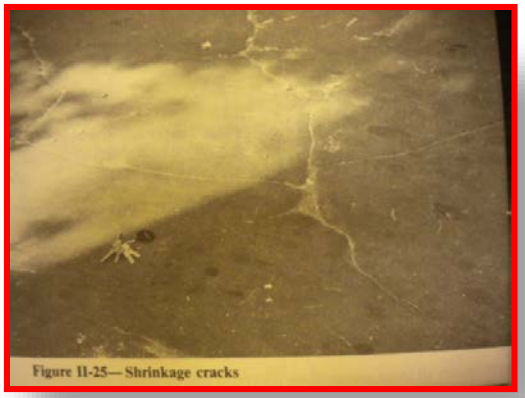


Figure II-25— Shrinkage cracks

CONTAMINANTS

PROBABLE CAUSE	REPAIR
A contaminant is usually caused by: - Aircraft take off and landing	**L:** R/P: Clean surface (Biodegradable chemicals) **M:** R/P: - Clean surface and apply coal-tar/ emulsion seal coat (coal-tar pitch emulsion) **H:** R/P: - Remove and replace (State DOT modified surface mix) FAA P401

Rubber deposits may be removed by the use of high -pressure water or biodegradable chemicals.

CORRUGATION

PROBABLE CAUSE	REPAIR
Corrugations usually occurs in asphalt layer that lack stability which may be caused by: - a mixture that is too rich in asphalt - has too high a proportion of fine aggregate - has asphalt cement that is too soft, or - excessive moisture, contamination due to oil spillage	**R/P :** - Saw cut area, remove and replace (State DOT modified surface mix) (FAA P 401) **T/E :** - Slurry seal (emulsified asphalt) - Seal coat (coal-tar pitch emulsion)

Also, traffic action combined with an unstable pavement surface or base usually causes this type of distress.

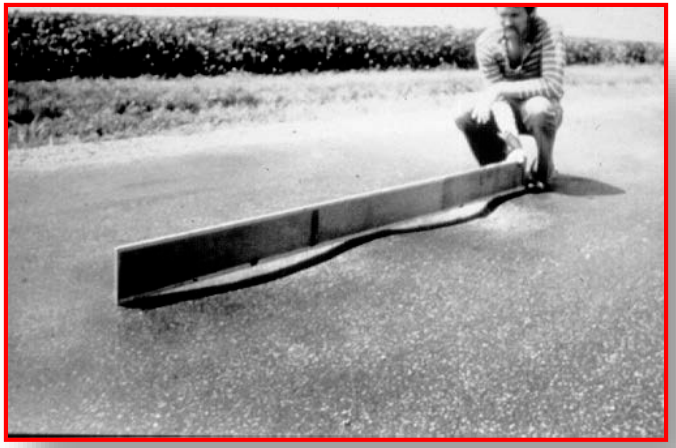


Figure II-45—Corrugations

<u>According to the AC150/5380-6:</u> The repair procedure for **Corrugation** is the same as for patch repair of **Shoving**.

DEPRESSION

PROBABLE CAUSE	REPAIR
The cause of Depression is: - traffic heavier than what it was originally designed for - by settlement of the lower pavement layers, or - poor construction methods - lack of compaction - Unstable mix (too rich, poor aggregate gradation)	**R/P:** - Remove and replace (State DOT modified surface mix) (FAA P401)

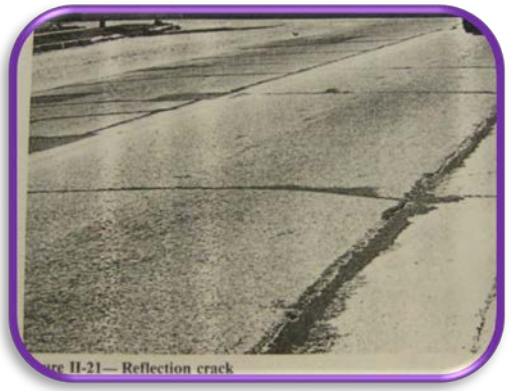
JET BLAST EROSION

PROBABLE CAUSE	REPAIR
Jet blast erosion is caused by: - the heat, - burns, or - carbonization, which resulted in jets landing at the airport. It may vary in depth, but normally ≤ .5”.	**T** : - No action / Apply rejuvenator **P**: - Partial-depth patch

JOINT REFLECTION CRACKING FROM PCC

(From Longitudinal and Transverse Of PCC Slabs)

PROBABLE CAUSE	REPAIR
Joint Reflection Cracking from PCC is caused by: - Vertical or horizontal movements of the PCC slabs beneath the AC surface . - Traffic loading may also cause a breakdown of the AC near the crack, resulting in spalling and FOD potential.	**See:** Repair for **Block** or **LT Cracking**



NOTE: According to the AC150/5380-6B:
The repair procedure for **Joint Reflection Cracking** is the same as for the **L.T.** and **Block Cracking**.

LONGITUDINAL & TRANSVERSE

(NON-PCC Joint Reflective)

PROBABLE CAUSE	REPAIR
LONGITUDINAL may be caused by: 1. A poorly constructed paving lane joint 2. Shrinkage of AC surface or hardening of the asphalt 3. A reflective crack caused by cracks beneath the surface course, including cracks in PCC slabs **TRANSVERSE** may be caused by: (2) or (3)	**See:** Repair for **Block** or **Joint Reflection Cracking**

OIL SPILL

PROBABLE CAUSE	REPAIR
It's caused by: - the spilling of oil, - fuel, or - other solvents	**R/P**: <u>Isolated Areas :</u> L: Clean w/ application of biodegradable chemicals M: Clean and application of coal-tar emulsion seal coat <u>Areas of continuous spillage</u> H: Remove and replace

PATCHING & UTILITY CUT PA

PROBABLE CAUSE	REPAIR
The causes of utility-cut depressions are: - inadequate backfill compaction - too much backfill results in an utility cut that is raised above the pavement level - to correct or improve the existing airfield pavement condition.	**L:** - No action **M:** T/E: - Seal crack - Repair distressed area (small) only R/P: - Remove and replace the patch **H:** R/P: - Remove and replace the patch (see SAW CUT, REMOVE, AND REPLACE..)

POLISHED AGGREGATE

PROBABLE CAUSE	REPAIR
The cause of Polished Aggregate is: • Soft aggregates such as limestone, will become polished quickly under traffic • Naturally polished. • Heavy repeated traffic.	**R/P** - Slurry seal (emulsified asphalt) - Micro-milling - Diamond grinding - Grooving - Overlay (P 401)

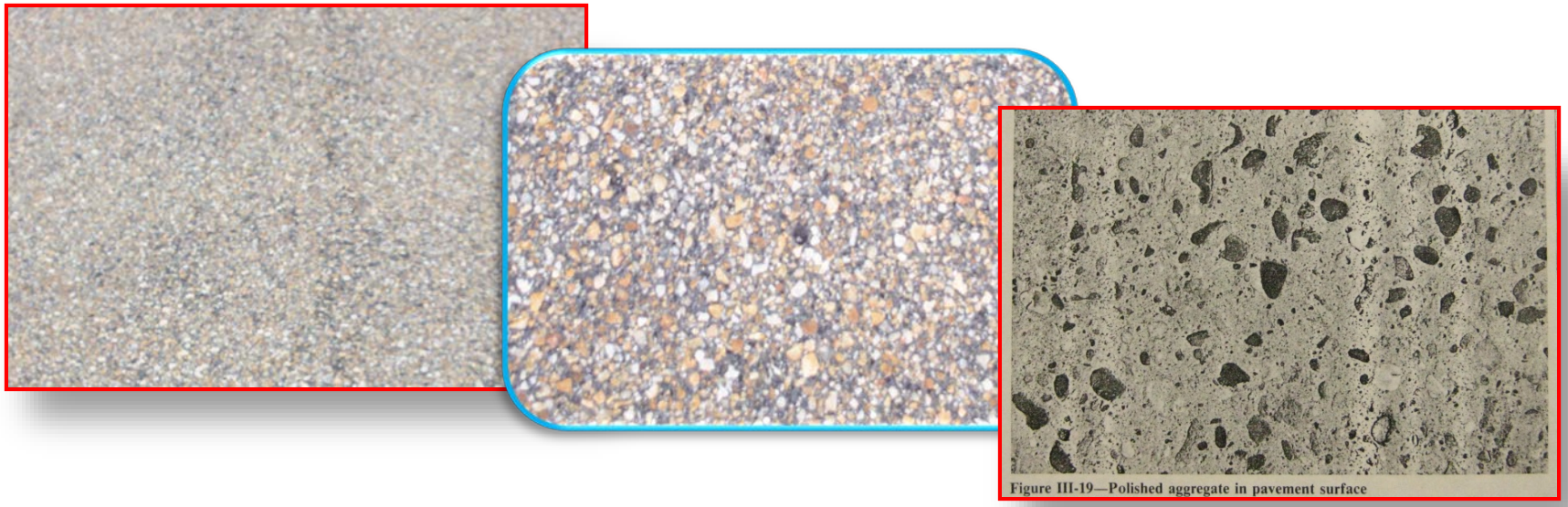


Figure III-19—Polished aggregate in pavement surface

PROBABLE CAUSE	REPAIR
Raveling is caused by: - lack of compaction - construction activity during cold weather - unsuitable aggregate (dirty or disintegrating) - lack of asphalt in the mix, or over-heating of the asphalt mix. - Surface treatment deterioration	<u>For small area</u>: **R/P :** - Remove and replace **T/E :** - Seal coat (coal-tar pitch emulsion) - Slurry seal (emulsified asphalt) - Apply rejuvenator (sealer-rejuvenator) <u>For large area</u>: **R/P :** - Overlay **T/E :** **(**As for the small area)

High-Severity Raveling, Dense Mix

RUTTING

PROBABLE CAUSE	REPAIR
Rutting is caused by: - a permanent deformation of one or more underneath layers. - lack of compaction during construction. - consolidation or lateral movement of the materials due to traffic loads.	**R/P :** - Remove and replace **T/E :** - Patch w/ elastomeric compound w/ aggregate

SHOVING OF ASPHALT PAVEMENTS

PROBABLE CAUSE	REPAIR
Shoving is the localized bulging of a pavement surface. It can be caused by: - lack of stability in the mix, or - lateral stresses produced by adjacent PCC pavement during expansion.	**R/P :** - Saw cut area, remove and replace (State DOT modified surface mix) (FAA P401) **T/E :** - Slurry seal (emulsified asphalt) - Seal coat (coal-tar pitch emulsion)

According to the AC150/5380-6B: Repair procedure for **SHOVING** is the same as for **CORRUGATION**

SLIPPAGE CRACKING

PROBABLE CAUSE	REPAIR
Slippage cracks appear when: - braking or turning wheels cause the pavement surface to slide and deform - low-strength surface mix, or - poor bond between the surface and the next layer of the pavement structure.	**R/P :** - Remove and replace (State DOT modified surface mix) (FAA P401) **T/E :** - Crack seal (hot/cold –applied) - Slurry seal (emulsified asphalt)

These cracks are crescent or half-moon-shaped with the two ends pointing away from the direction of traffic.

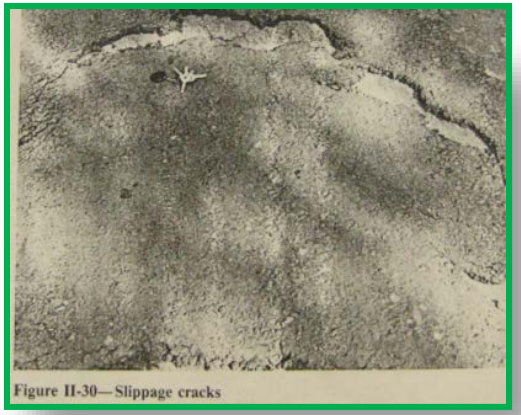


Figure II-30—Slippage cracks

SLIPPERINESS

PROBABLE CAUSE	REPAIR
A Slipperiness is usually caused by: - Overly rich mix - Poorly designed mix - Polished aggregate - Improperly applied seal coat - Wrong kind of seal coat - Rubber deposits	- Apply textured seal coat - Grooving - Remove rubber.

SWELL

PROBABLE CAUSE	REPAIR
A swell is usually caused by: - frost action surrounding dissimilar material types in the subgrade, or - swelling soil.	**R/P :** - Saw cut area, remove and replace (State DOT modified surface mix) (FAA P401) **T/E :** - Slurry seal (emulsified asphalt) - Seal coat (coal-tar pitch emulsion)

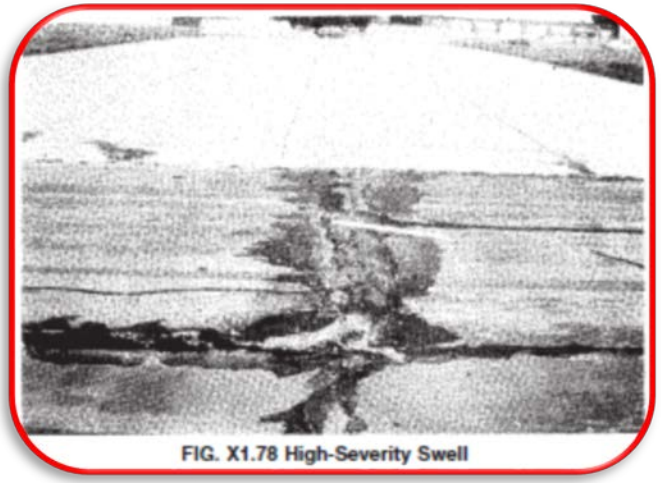
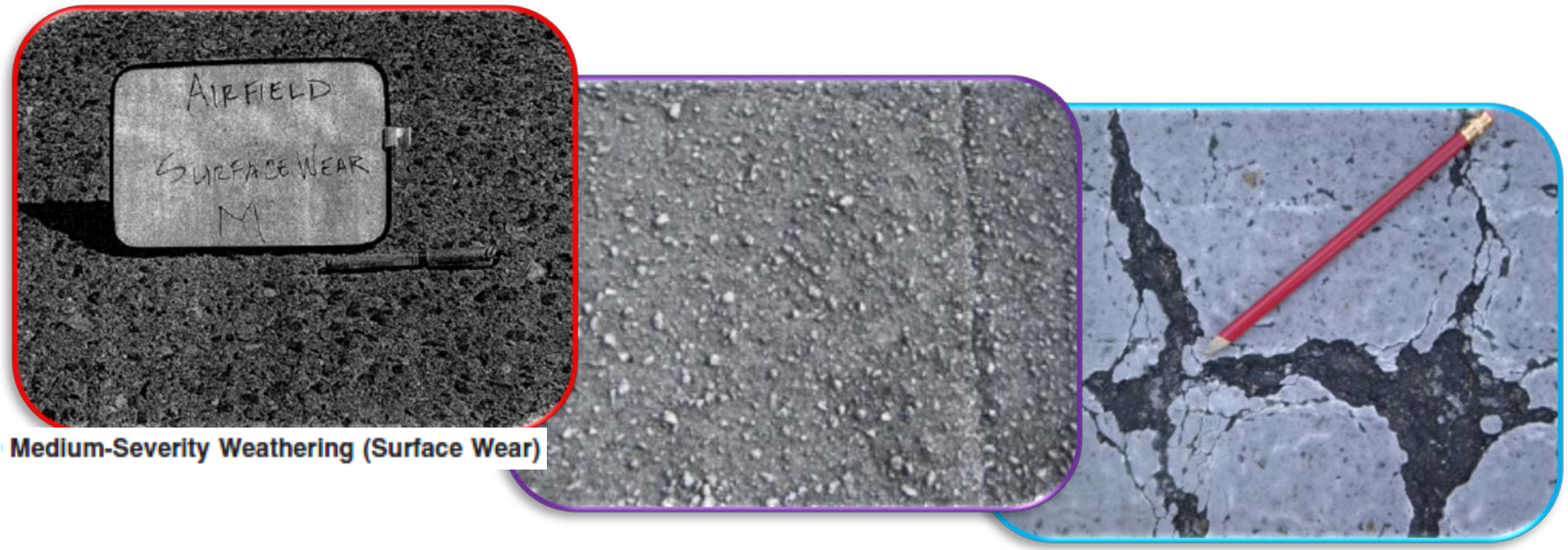


FIG. X1.78 High-Severity Swell

NOTE: Corrugation and Shoving or Swelling. The repair procedure for these types of distresses is the same as for **patch repair of alligator cracking,(p. 31 AC 150/ 5380-6B).**

WEATHERING

PROBABLE CAUSE	REPAIR
PROBABLE CAUSE: Weathering is caused by: - aging - climatic weather condition	<u>For small area</u>: **R/P :** - Remove and replace **T/E : -** Seal coat (coal-tar pitch emulsion) - Slurry seal (emulsified asphalt) - Apply rejuvenator (sealer-rejuvenator) <u>For large area</u>: **R/P :** - Overlay **T/E :** **(**As for the small area)



Medium-Severity Weathering (Surface Wear)

<u>Note</u>: Surface wear is not recorded if medium or high severity raveling is recorded.

Field repair application for Distress Repair was conducted at the Orlando Executive Airport

Classroom session for Distress Repair was conducted at the Orlando FDOT Aviation Office

PROBABLE CAUSES & REPAIR SOLUTIONS

FOR

AIRFIELD PCC SURFACES

DISTRESSES IN RIGID AIRFIELD PAVEM

1. BLOW UP
2. CONTAMINANTS
3. CORNNER BREAK
4. LTD CRACKING
5. “D” CRACKING
6. JOINT SEAL DAMAGE
7. SMALL PATCH
8. LARGE PATCH
9. POPOUTS
10. PUMPING
11. SCALING/ MAP CRACKING/CRAZING
12. FAULTING (SETTLEMENT)
13. SHATTERED SLAB
14. SHRINKAGE CRACKING
15. JOINT SPALLING
16. CORNER SPALLING
17. ALKALIS SILICA REACTIVITY
18. POLISH AGGREGATE
19. SLIPPERINESS

BLOWUP

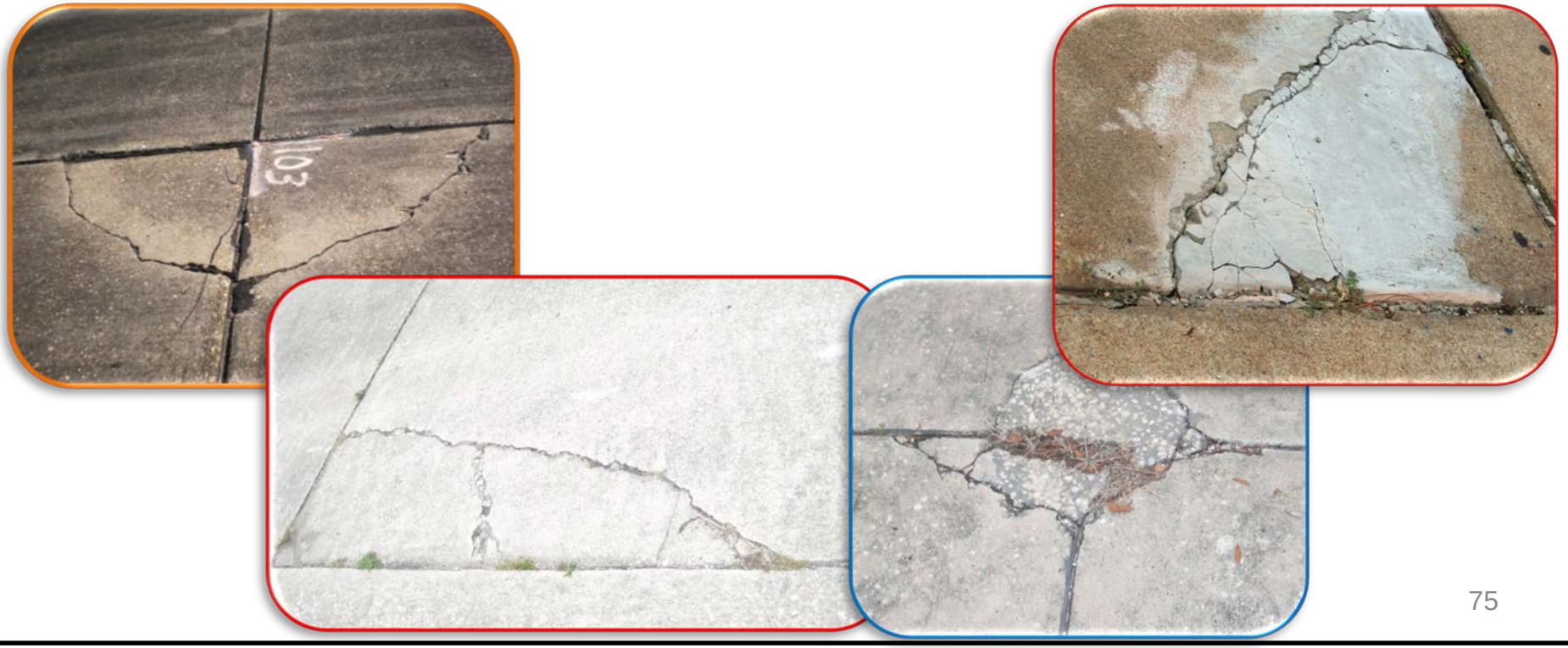
PROBABLE CAUSE	REPAIR
Most Blow-up are caused by: - excessive expansion of the slab during hot weather. - The pressure builds up until the slab can not resist it any longer and they either buckle or shatter, crumbling along the transverse joint or crack. - Incompressible material in joints preventing slab from expanding - Alkali-Silica-Reactivity	**R/P:** - Remove and replace concrete full-depth - clean, and - reseal joints.

CONTAMINANTS

PROBABLE CAUSE	REPAIR
It's caused by: - the spilling of oil, - rubber deposits - fuel, or - other solvents.	**P:** - surface cleaning: - high-pressure water - biodegradable chemicals

CORNER BREAK

PROBABLE CAUSE	REPAIR
Corner cracks can be caused by: - traffic loads on unsupported corners or curled or warped slabs - they may also be caused by loads over weak spots in the sub-grade under the slabs.	**R/P:** - Pavement < 12” : Full-depth repair w. #4 rebar - Pavement > 12” : Full-depth repair w. #5 rebar - Joints parallel to the center line : Full-depth repair w. dowel bars



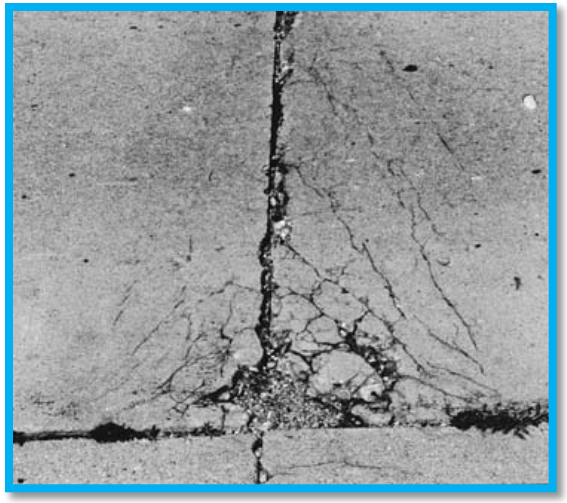
LTD

PROBABLE CAUSE	REPAIR
Some causes of Longitudinal Cracking are: - shrinkage of the concrete (if the pavement is too wide and has no Longitudinal joint) - expansive sub-base or sub-grade - warping stresses in combination with loads - loss of support from edge pumping **The causes of Transverse Cracks are:** - overloads - repeated bending of pumping slabs - soft foundations - lack of joints - too shallow joints, and - shrinkage of concrete	**R/P:** Low: - surface crack: No action Medium: - <1/8" : No action High: - ≥ 1/8" : Rotary-random saw and seal


Random Crack Saw

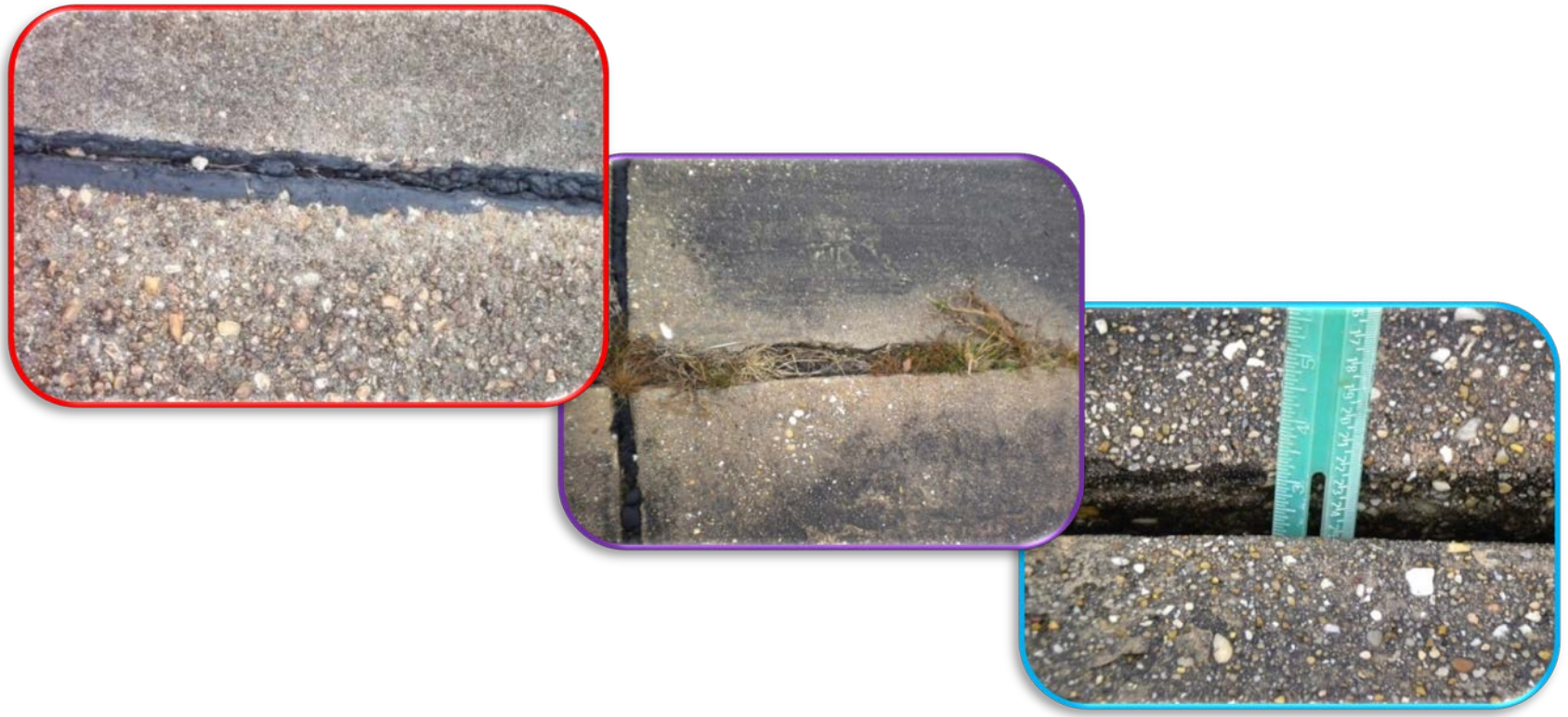
D-CRACKING

PROBABLE CAUSE	REPAIR
Durability cracking is caused by: The concrete's inability to withstand environmental factors, such as freeze-thaw cycles. This type of cracking may eventually lead to disintegration of the concrete within 1-2 feet of the joint or crack.	**R/P:** - Remove and replace entire slab **T/E:** - Same repair as Corner Breaks, Scaling, Map Cracking, or Crazing - Partial depth repair, mill 2-3" - See FULL-DEPTH REPAIR



JOINT SEAL DAMAGE

PROBABLE CAUSE	REPAIR
Joint Seal Damage is caused by: - Improper joint width - Use of the wrong type of sealant - Incorrect application - Not properly cleaning the joint before sealing	**R/P:** - Remove old and reseal joint



PATCHING (<5 SQ. FT.)

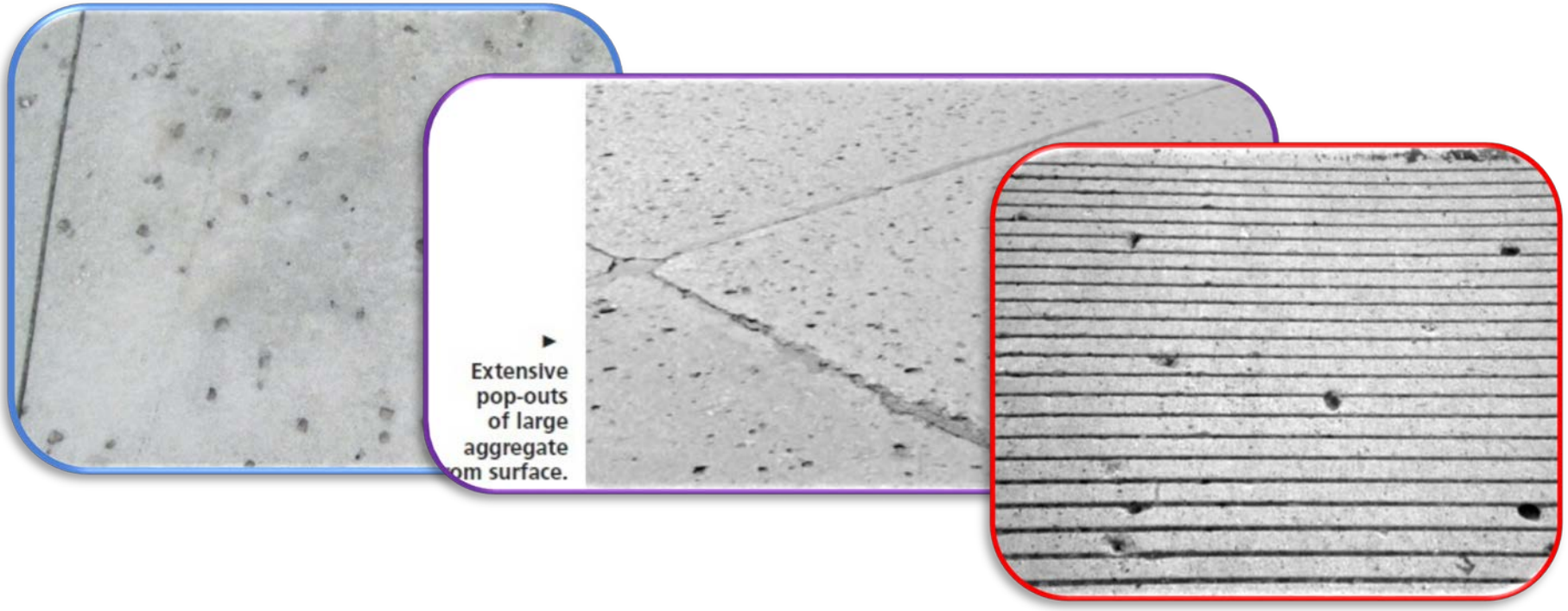
PROBABLE CAUSE	REPAIR
The reason of patching is: - To improve the existing pavement distresses' condition	**SMALL:** **L:** - No action **M**: R/P: - Remove and replace the patch T/E : - Seal cracks within patch **H**: R/P: - Remove and replace the patch

PATCHING (>5 SQ. FT.)

PROBABLE CAUSE	REPAIR
The reason of patching is: - To improve the existing pavement distresses' condition	**LARGE and UTILITY CUT:** **L:** - No action **M:** T/E : - Seal cracks within patch R/P: - Repair distress area only - Remove and replace the patch **H**: R/P : - Remove and replace the patch - (see FULL-DEPTH REPAIR)

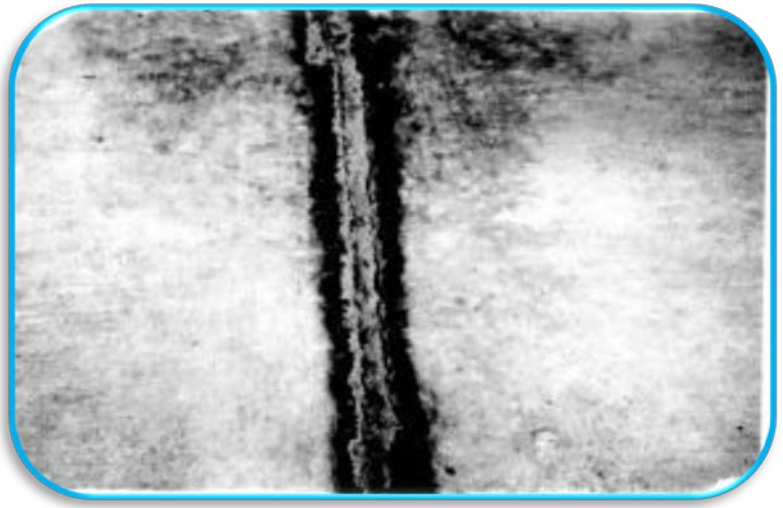
POP OUTS

PROBABLE CAUSE	REPAIR
Pop outs are caused due to: - freeze-thaw action in combination with expansive aggregates.	**R/P:** **L:** ≤ 2” diameter: - Seal (elastomeric compound) **M/H:** >2” diameter: - Patch w/ elastomeric compound with aggregate



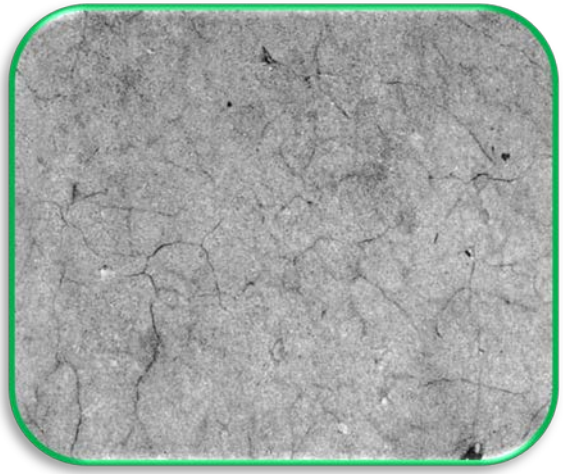
PUMPING

PROBABLE CAUSE	REPAIR
Pumping out of fine material is caused by: - Presence of free water on or in the sub-grade, or the sub-base along with heavy loads passing over the pavement surface and deflecting the slab	**R/P:** **L/M:** - base stabilization - slab leveling with cementitious grout pump under pressure through holes cored in pavement into void - expandable foam injection **H**: - base stabilization - slab leveling with cementitious grout pump under pressure through holes cored in pavement into void - install load transfer devices

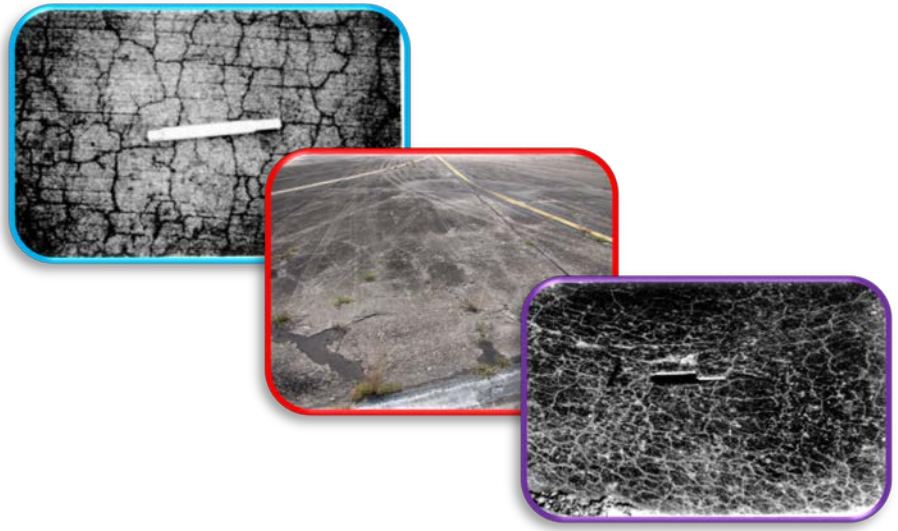


SCALING/ MAP CRACKING

PROBABLE CAUSE	REPAIR
Major causes of scaling are: - the chemical action of deicing salts - over finishing, improper mixing - unsuitable aggregates, and improper curing.	**L: R/P: -** Seal/ No action **M**: **T/E**: - Micro-mill and seal **H**: **R/P**: - Micro-mill to grade, install thin bonded overlay - Remove and replace if extensive area



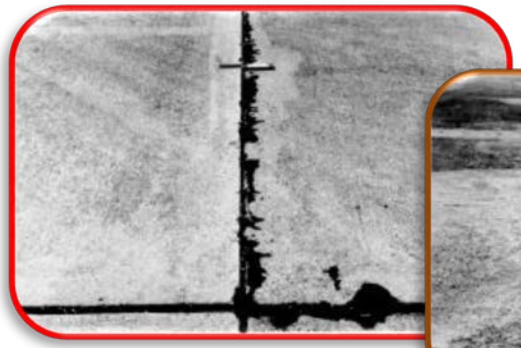
Map Cracking indicates a problem with the quality of the aggregate known as ASR (alkali-silica reactivity). If severe, cracks may spall or the surface may scale.



Medium-severity **scaling**

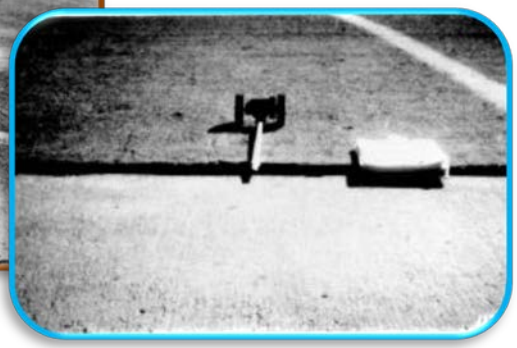
FAULTING (or SETTLEMENT)

PROBABLE CAUSE	REPAIR
Faulting usually develops from: - inadequate load transfer between slabs along with consolidation, or - shrinkage in volume with courses underlying the slabs. - pumping out of the foundation materials, or - upheaval - ASR	**R/P:** **L:** (w. no movement) - Micro-mill surface to true and level **M/H:** (movement) - Slabjacking with cementitious grout pump under pressure through holes cored in pavement into void - expandable foam injection



Low-severity settlement, 3/8".

Medium-severity settlement on apron >1/2 in.



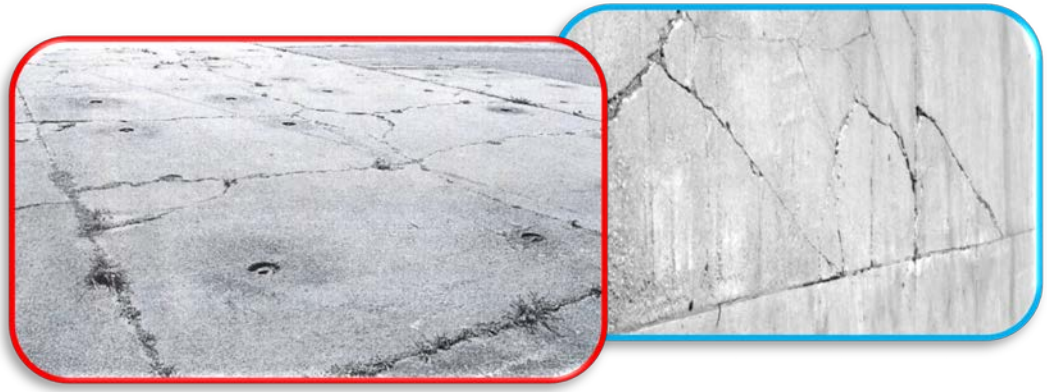
High-severity settlement on taxiway/runway, 3/4 in.

SHATTERED SLAB/INTERSECTINGCRACKS

PROBABLE CAUSE	REPAIR
Similar to the LTD, **some causes of shattered slabs are:** - shrinkage of the concrete - lack of joints, frozen" joints, too shallow joints - expansive sub-base or sub-grade, - warping stresses in combination with loads - overloading - weak foundations, or - loss of support from repeated bending of pumping slabs	**R/P:** - Remove and replace entire slab

Note:

A shattered slab requires replacing the full slab. Follow the same procedures used for blowup repairs except remove unstable sub-grade materials and replace with select material. Correct poor drainage conditions by installing drains for removal of excess water . Also: (see Full-Depth repair).



Shattered slab

Medium-severity intersecting *cracks*

Relationship between LTD, Intersecting Crack & Shattered Sla

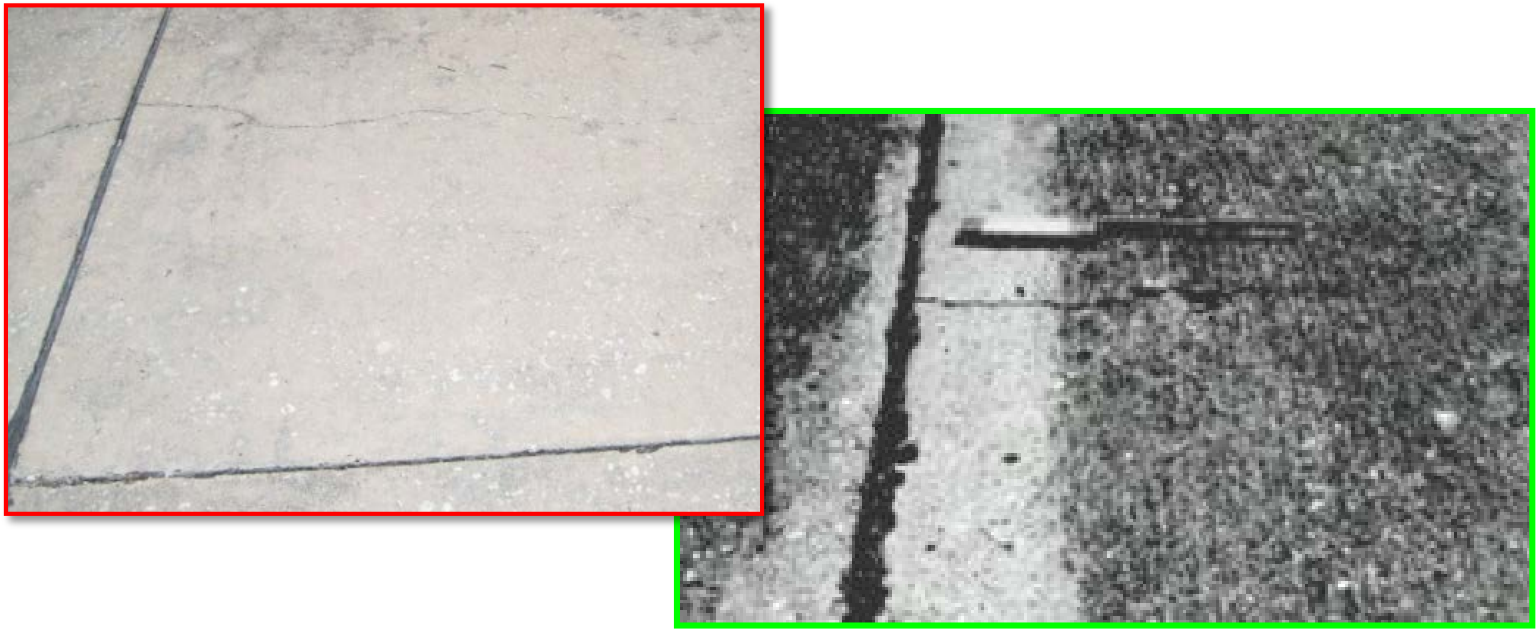
RELATIONSHIP BETWEEN THE NAMES & THE NUMBER OF BROKEN PIECES

Number of Pieces	Number of %	Cracks' Severity	Final Severity	Name of Cracks
≤ 3	n/a	n/a	n/a	LTD crack
4 or 5	>85	L	LOW	Intersecting Cr
4 or 5 ≥ 6	>15 >85	M (no H) L	MEDIUM MEDIUM	Intersecting C. Intersecting C.
4 or 5 ≥ 6	n/a >15	Some or all= H M or H	HIGH HIGH	Shattered Sl. Shattered Sl.

LTD ➡ INTERSECTING CRACK ➡ SHATTERED SLAB

SHRINKAGE CRACK

PROBABLE CAUSE	REPAIR
Shrinkage Cracks are non-structural and non-propagating. These types of cracks should be considered cosmetic and not subject to conventional repairs.	**R/P:** - No action - Fill voids w/ cement paste or epoxy cement



JOINT SPALLING

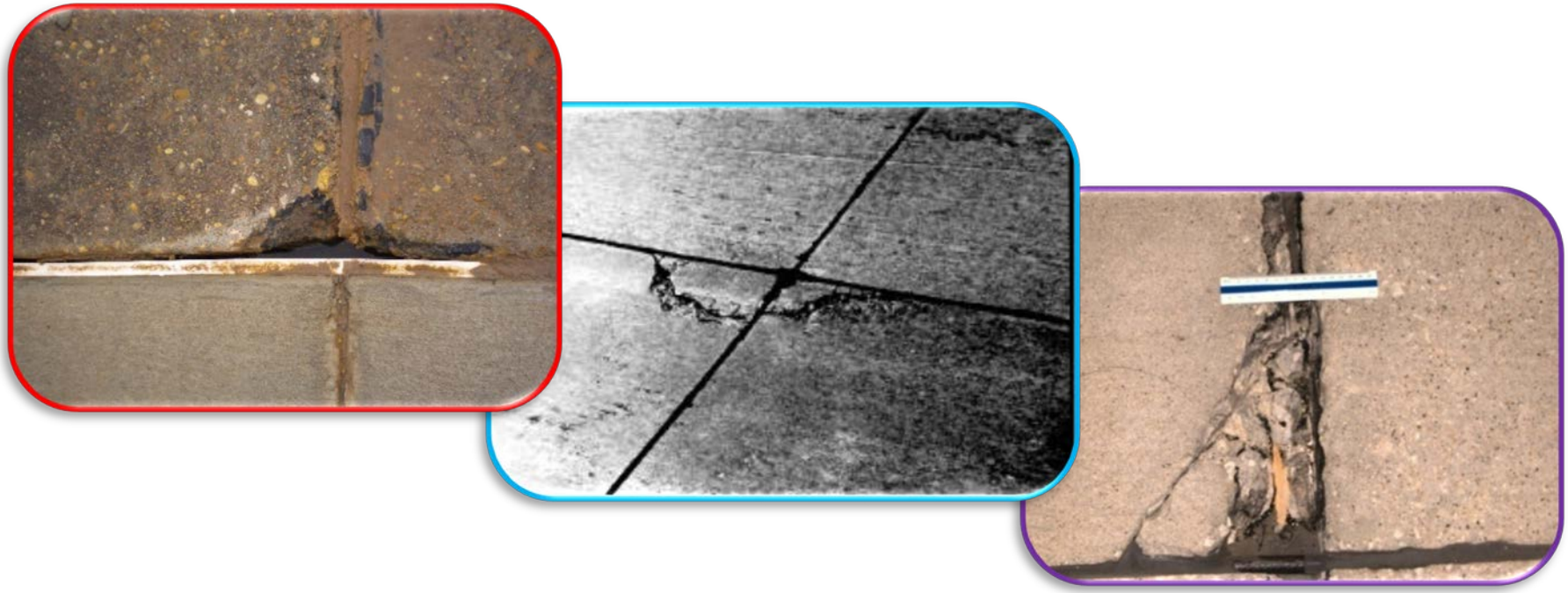
(TRANSVERSE AND LONGITUDINAL JOINTS)

PROBABLE CAUSE	REPAIR
Joints spalling result from: - excessive stress at the joint - infiltration of incompressible materials - traffic load - weak concrete at the joint (cause by over working) combined with traffic loads is another cause of spalling.	**R/P:** - Saw cut, remove unsound concrete and patch **T/E:** - Remove unsound concrete, patch

NOTE: Make sure a fray is not counted as a spall, unless it is greater than 2-ft long. A fray is when the edge becomes rough. Minimum width of spall is ½”

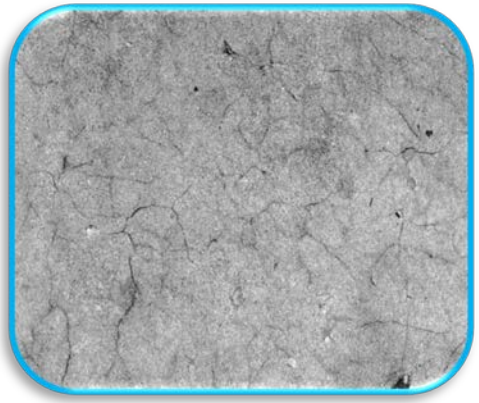
CORNER SPALLING

PROBABLE CAUSE	REPAIR
Corner spalling result from: - excessive stress at the corner - crack caused by infiltration of incompressible materials - traffic load, or - weak concrete at the corner (cause by over working) combined with traffic loads is another cause of spalling..	**R/P:** - Saw cut, remove unsound concrete and patch **T/E:** - Remove unsound concrete, patch



ALKALI SILICA REACTIVITY

PROBABLE CAUSE	REPAIR
Major causes of scaling are: - the chemical action of deicing salts - over finishing, - improper mixing - unsuitable aggregates, and - improper curing.	**L:** **R/P:** - Seal/ No action **M**: **T/E**: - Micro-mill and seal **H**: **R/P**: - Micro-mill to grade, install thin bonded overlay - Remove and replace if extensive area



Map Cracking indicates a problem with the quality of the aggregate known as ASR (alkali-silica reactivity). If severe, cracks may spall or the surface may scale.

POLISH AGGREGATE

PROBABLE CAUSE	REPAIR
It's caused by: • Naturally polished. • Heavy repeated traffic • Aging	**R/P:** - Micro-mill entire surface - Diamond grind entire surface - Grooving - Resurfacing * HMA pavement overlay * thin bonded PCC overlay

SLIPPERINESS

PROBABLE CAUSE	REPAIR
A Slipperiness is usually caused by: - Improper type of curing membrane - Excessive curing membrane - Polished aggregate - Rubber deposits	- If finish too smooth, resurfacing required to provide texture - Wire broom to remove curing membrane - Grooving - Remove rubber.

FIELD WORK FOR AC

- PARTIAL PATCH PARTIAL DEPTH
  - TEMPORARY REPAIRS
  - EMERGENCY REPAIRS
- DEEP PATCH FULL DEPTH
  - PERMANENT REPAIRS

PARTIAL PATCH PARTIAL DEPTH

- TEMPORARY REPAIRS
- EMERGENCY REPAIRS

- Locate the affected area

- Use the appropriate tools such as a broom or blower to clean the surface area …..

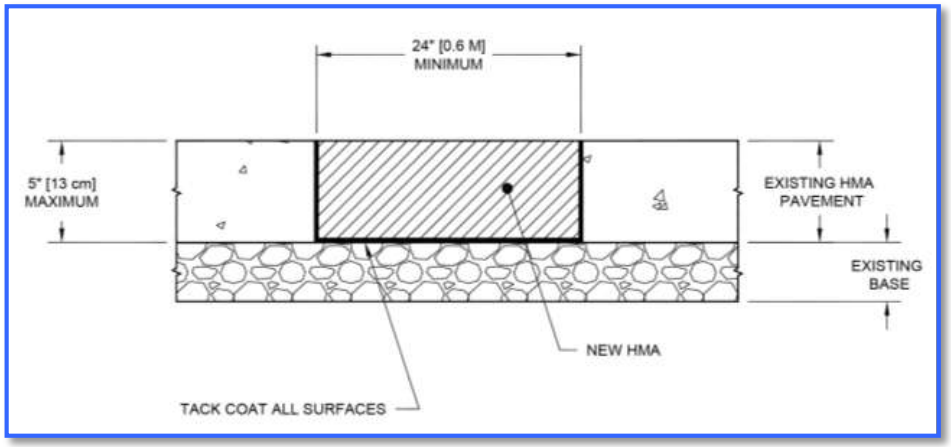
- Remove the surface as deep as necessary to reach firm support. Some of the sub-grade may also have to be removed.

- Apply an application of prime or tack coat to protect the base course

- Fill and spread the asphalt carefully. The field materials should cover a minimum of 2-3 inches wider in diameter compared to the original affected area in order to seal the borders of the affected area.

- Use the appropriate tools to compact the patched area. Try to have the patch surface even with the existing surface pavement.

DEEP PATCH FULL DEPTH



Use this procedure to conduct full depth repairs of flexible pavements and to repair cracks greater than 1 inch (2.5 cm) in flexible pavements 5 inches (13 cm) or less in thickness

AC 150/5380-6C

Review the construction safety and phasing plan (CSPP). Ensure all pavement closures have all required items in place, such as lighted Xs, barricades, etc.; and all NOTAMS have been issued for affected areas of the airfield.

Mark the limits of the area of crack repair.

Saw cut or mill out an area 24 inches (0.6 m) wide to the full depth of the HMA centered on the crack. Extend the saw cut or mill out an area a minimum of 12 inches (30 cm) beyond the limits of the distressed pavement area.

Use the appropriate tools to remove the existing materials. Also remove the materials as deep as necessary to reach firm support . Repair and re-compact the base as necessary.

Some of the sub-grade may also have to be removed and replaced.

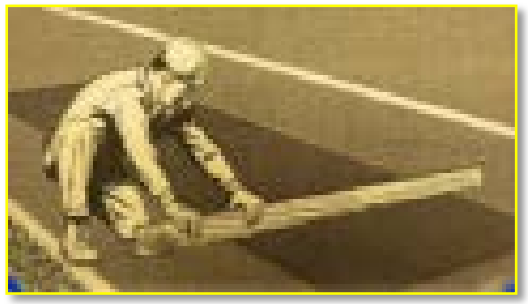
Apply a tack coat to the bottom and sides of the repair area. Make sure the tack meets the requirements of P-603 and ASTM D3628.

Fill the patch area with HMA equivalent to or better than the existing pavement. Use P-401, P-403 or equivalent State DOT dense mix and compact to the minimum density specified.

Use the appropriate tools to distribute the materials to the same level of the surrounding area

Make the cut square or rectangular with faces straight and vertical. One pair of faces should be at right angles to the direction of traffic. Use a straight-edge to verify that the patch is flush with adjacent pavement

A vibratory plate compactor is good for small patches but a roller may be more practical for larger areas.



Use a straight-edge to verify that the patch is flush with adjacent pavement.

Do not allow traffic until HMA has cured.

Completely clean the work area before opening to aircraft traffic.

REPAIR PROCEDURE for BLEEDING

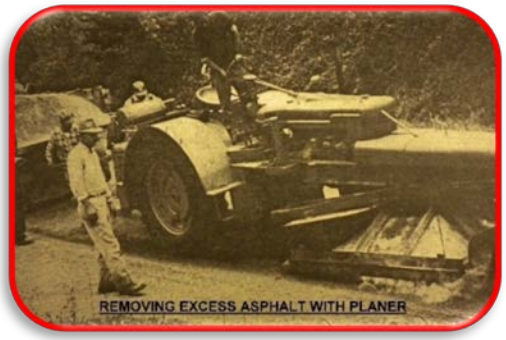
(**OPTIONAL ALTERNATIVE,** Source: Asphalt Institute)

For minor bleeding:

- a pavement milling or grinding machine may be used to remove the excess asphalt by milling off 1/8 inch to 1/4 inch of pavement.

Prior to milling or grinding, the use of infrared heaters to soften the HMA pavement surface should be used. After heating of the pavement surface:

- scrape the asphalt binder from the surface,
- apply blotter-sand,
- roll with a steel-drum roller,
- remove any excess blotter-sand from the surface.



REMOVING EXCESS ASPHALT WITH A PLANER

Repeat the process if bleeding re-occurs through the blotter-sand.

FAA:
R/P:

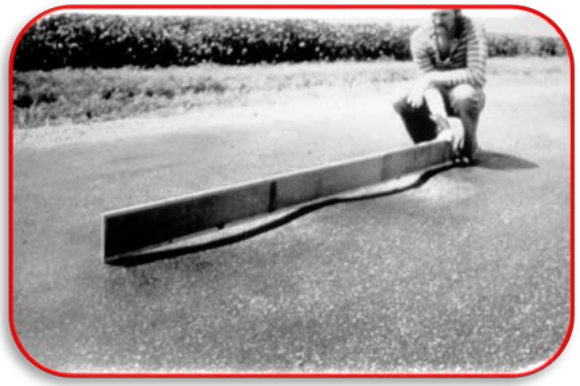
- Scrap surface and blotter-sand-roll (blotter-sand)
- Mill and repave (FAA P- 401)

INFRARED PATCH HEATER

REPAIR PROCEDURE for CORRUGATION:

(**OPTIONAL ALTERNATIVE,** Source: Asphalt Institute)

Temporary:
If the corrugated pavement has an aggregate base with a thin surface treatment, a satisfactory corrective measure is:



- scarify the surface,
- mix it with the base, and
- re-compact the mixture before resurfacing.

If the pavement has more than 2” of asphalt surfacing and base:

- remove with a pavement planning machine.
- follow with a seal coat or plant-mixed surface.

Permanently:
For effective repair, shoved areas must be removed and patched.

FAA:
R/P : - Saw cut area, remove and replace (State DOT modified surface mix) (FAA P 401)

T/E : - Slurry seal (emulsified asphalt)
- Seal coat (coal-tar pitch emulsion

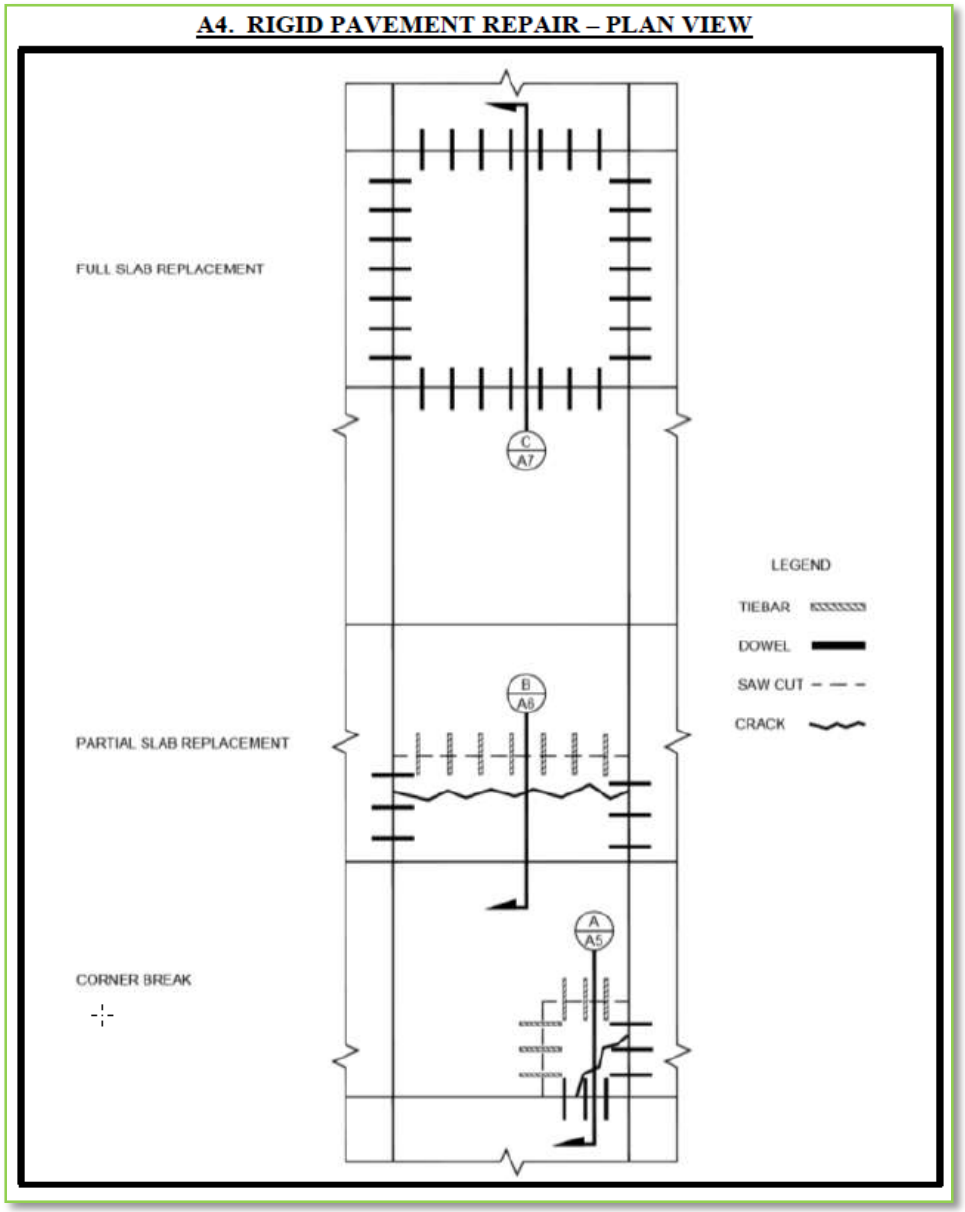
FIELD WORK FOR PCC

- **FULL SLAB REPLACEMENT**
- **PARTIAL SLAB/ FULL DEPTH REPAIR**
  (Corner Break, LTD Cracking, etc.)
- **PARTIAL SLAB/ PARTIAL DEPTH REPAIR**
  (Joint spall, Corner spall, Pop-outs, etc.)

RIGID PAVEMENT REPAIR

- FULL DEPTH REPAIR IN RIGID PAVEMENT
- PROCEDURES FOR REPAIRING PARTIAL SLAB REPLACEMENT
- PROCEDURES FOR REPAIRING CORNER BREAKS
- **PROCEDURES FOR REPAIRING BLOW-UP**

RIGID PAVEMENT REPAIR – Plan View (AC150/5380-6C)



FULL DEPTH REPAIR IN RIGID PAVEMENT

FULL SLAB REPLACEMENT(AC150/5380-6C)

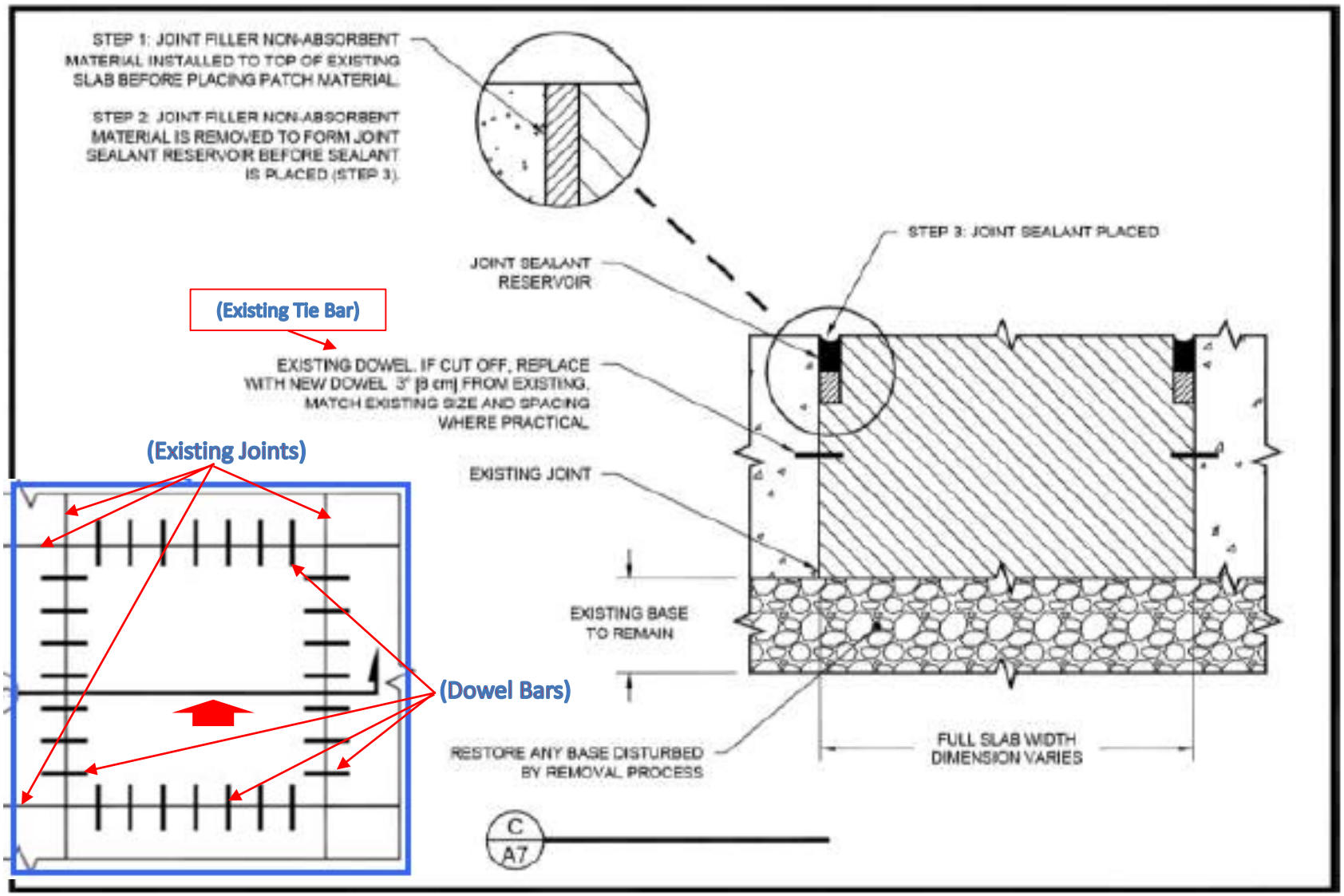
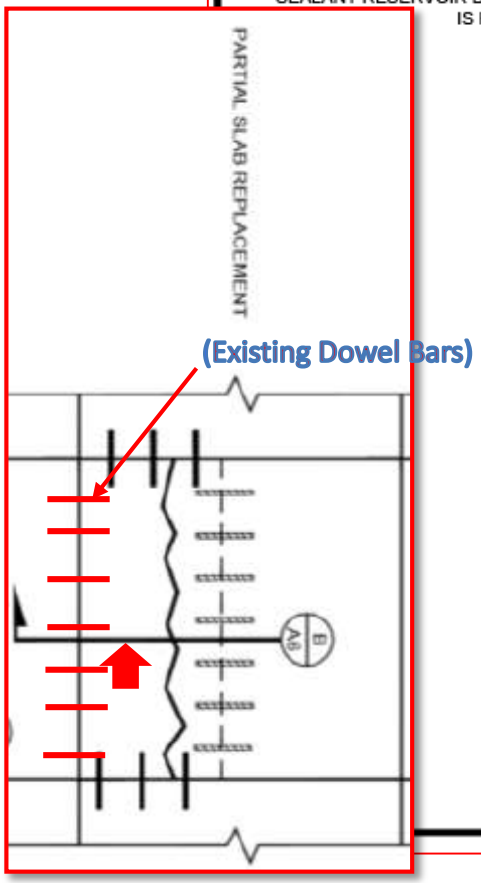


Figure A-7. Full depth repair in rigid pavement – full slab replacement

PROCEDURES FOR REPAIRING PARTIAL SLAB REPLACEMENT

(REPAIR FOR TRANSVERSE CRACKING)



(Existing Dowel Bars)

(AC150/5380-6C)

PROCEDURES FOR REPAIRING PARTIAL SLAB REPLACEMENT

(REPAIR FOR TRANSVERSE CRACKING)

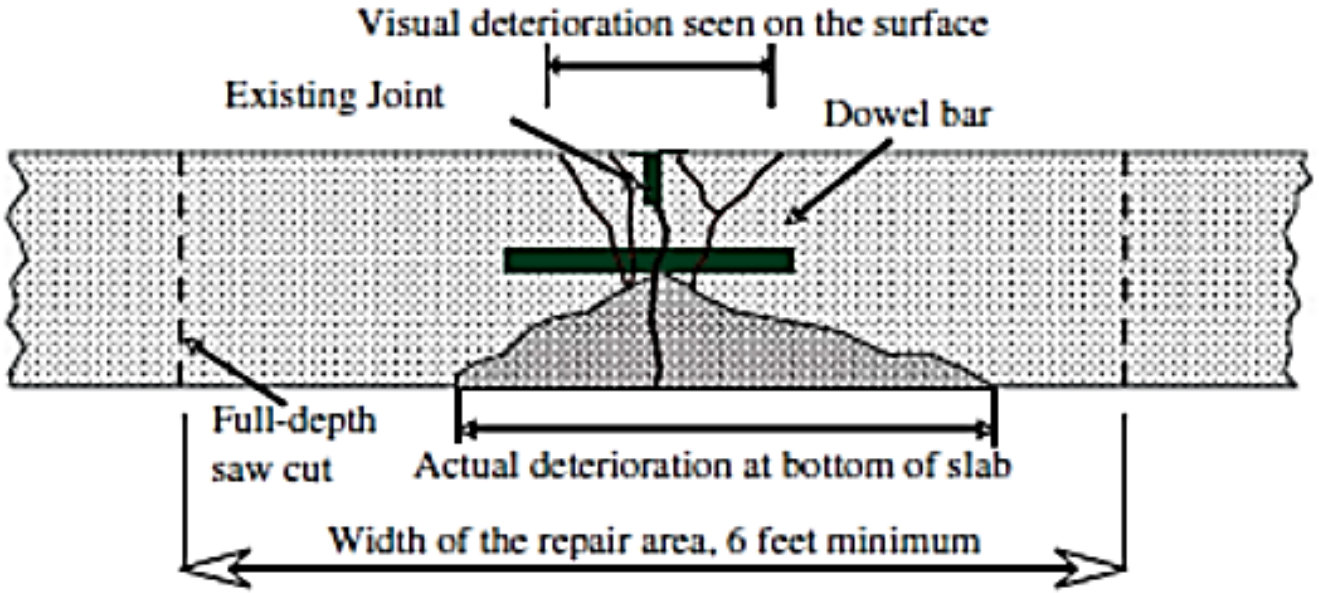


FIGURE B12 Cross section of deteriorated transverse joint.

PROCEDURES FOR REPAIRING CORNER BREAKS

These are considered structural failures and require full-depth repairs. The procedures for repairing these types of distresses are as follows:

(1) Make full-depth saw cuts at constructed joints. The full-depth cuts should be made at a distance of at least 2 feet beyond the limits of the break. Make the saw cuts so the repair area is rectangular. For corner cracks, cut the repair area square.

(2) Use appropriate-sized impact equipment (e.g., jackhammer) to remove material within the limits of the saw cuts. Make a second saw cut inside the perimeter cuts to provide expansion. Remove by hand any loose materials that remain. During the repair, try to minimize any disturbance to the sub-grade soils or base materials.

(3) Restore sub-grade or sub-base materials if needed.

(4) Use #4 tie-bars for pavements < 12" and #5 tie-bar for pavements >12" thick in the faces of the parent panel. Install by drilling into the face and using an epoxy bonding agent. Use equal distance spacing for the bars with **< 24"** apart.

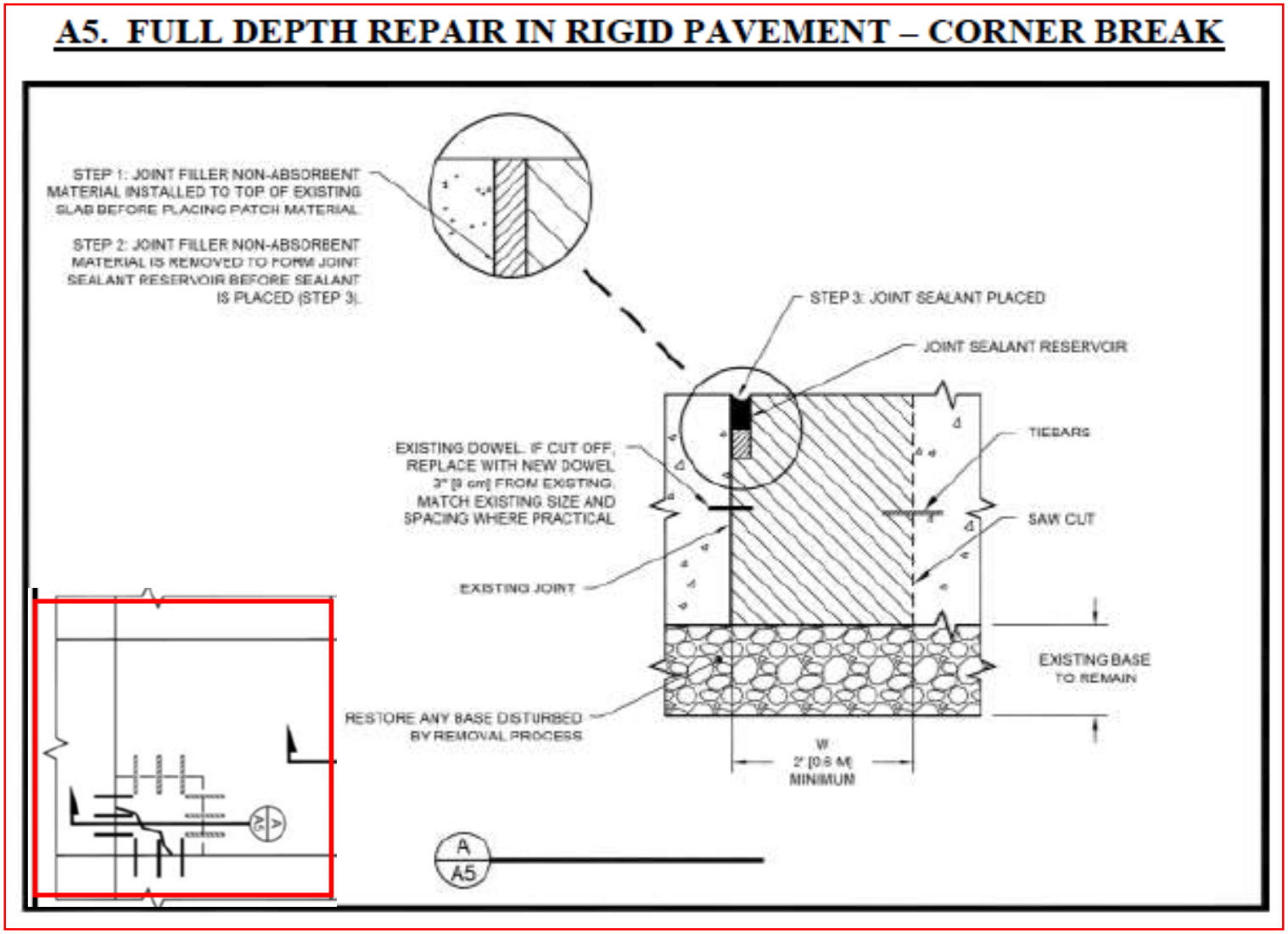
(5) Use dowel bars, of the type and size of the existing dowel bars, in the joint that parallels the direction of traffic. Dowels are installed by drilling and epoxying.

(7) Fill the repair area with concrete, being sure to consolidate the concrete along the limits of repair. Exercise caution when working adjacent to existing concrete faces, particularly during consolidation, and watch for segregation of the concrete. Finish the surface to match existing surface when practical.

(8) Reinstall joint seal.

PROCEDURES FOR REPAIRING CORNER BREAKS

(AC150/5380-6C)



PROCEDURES FOR REPAIRING BLOW-UP

a. Remove the damaged portion of the slab by sawing the straight, neat cut with a pavement saw.

b. Level the sub-base, if required, and prime it.

c. Apply tack coat to the sides of the slab **(A)**

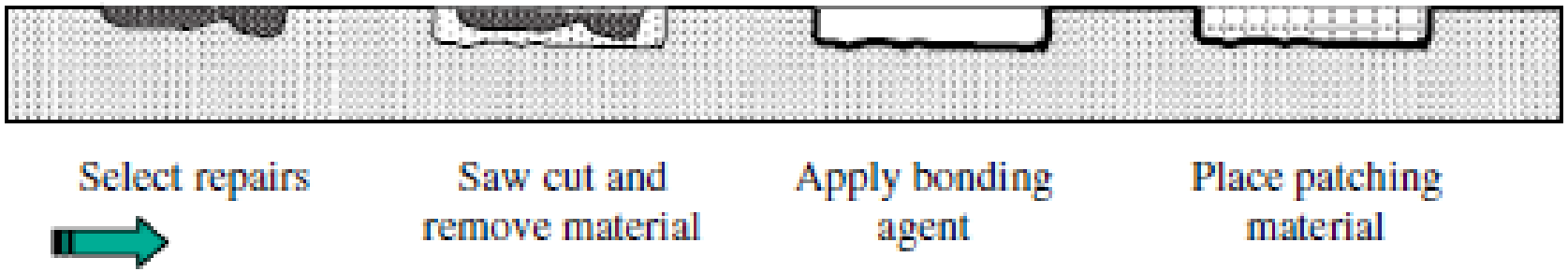
d. Place and compact dense-graded asphalt concrete in layers not exceeding 4” each. If the area is not large enough for a full size roller, mechanical rammers and/or vibrating plate compactors should be used.

e. The surface should be finished flush with surrounding pavement.

RIGID PAVEMENT REPAIR

- PARTIAL- DEPTH REPAIR PROCESS
- PROCEDURES FOR POPOUT
- PROCEDURES FOR REPAIRING PUMPING
- PROCEDURES FOR REPAIRING JOINT SPALLING
- DOWEL & TIEBAR PLACEMENT
- SEALING OF JOINTS & CRACKS

PARTIAL-DEPTH REPAIR PROCESS



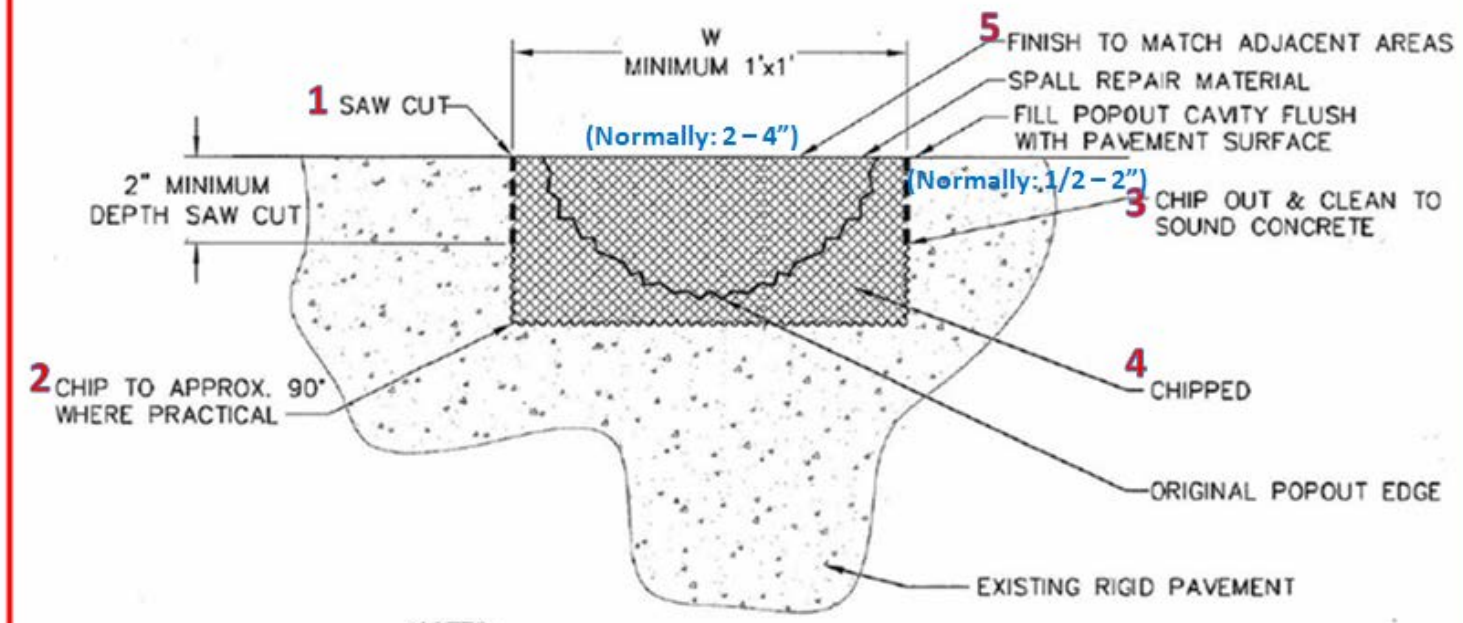
Construction Steps of Partial-depth Repair of PCC Pavement

Partial-depth patch repair of PCC pavements is a maintenance activity that includes:

- select repair area
- saw cut and removal of damaged material from affected areas,
- apply bonding agent
- replacing it with new PCC material or AC material.

PROCEDURES FOR POPOUT

(AC150/5380-6b)



NOTES:

1. "W" INDICATES THE WIDTH OF THE LIMITS OF REPAIR.
2. LOCATION OF REPAIR TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
3. ALL AREAS TO BE CLEAN OF LOOSE DEBRIS AND DUST PRIOR TO APPLICATION OF EPOXY BONDING AGENT, APPLIED PER MANUFACTURER'S RECOMMENDATIONS.

PROCEDURES FOR REPAIRING PUMPING

(SLABJACKING)

PURPOSE:

The purpose of slab-jacking is to raise a slab in place permanently in order to prevent impact loading, correct faulty drainage, and prevent pumping at transverse joints by injection of a grout under the slab.

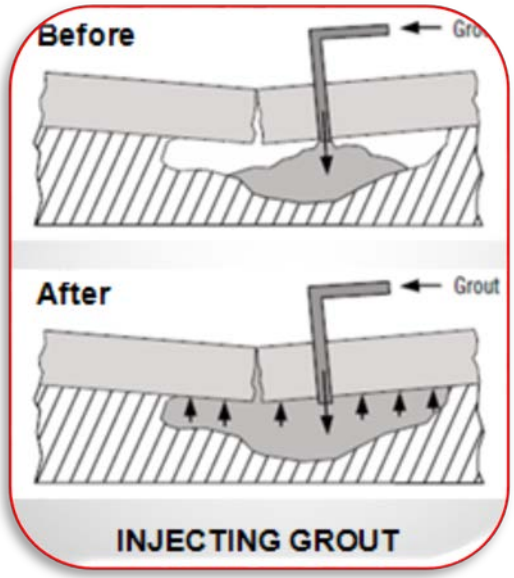
Slab-jacking should be considered for any condition that causes non-uniform slab support

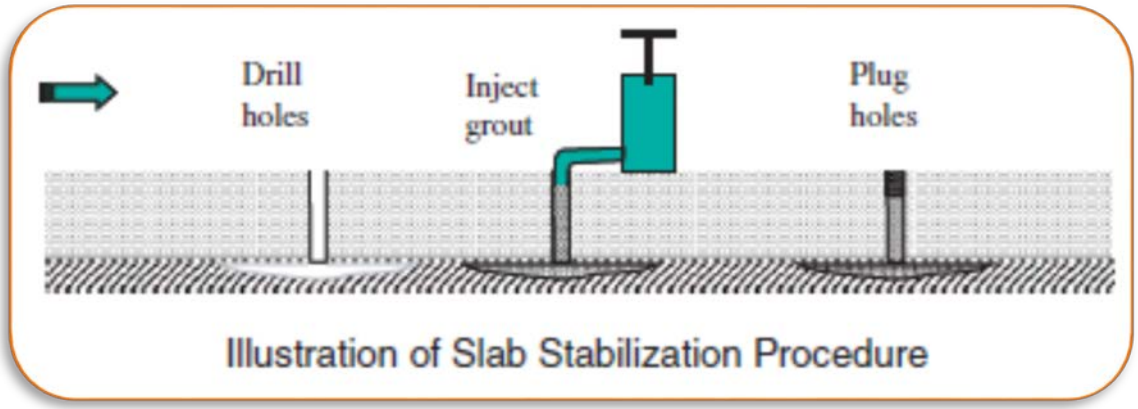
LOCATION OF INJECTION HOLES:

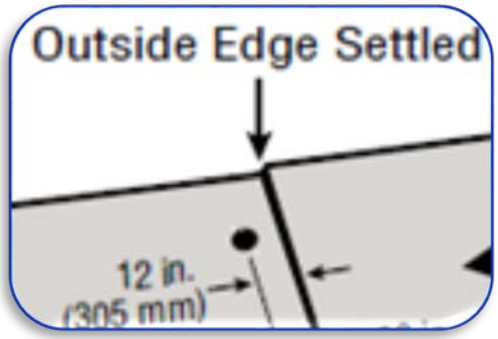
As a general rule, holes should not be placed less than 12” or more than 18” from a transverse joint or slab edge.

DRILLING HOLES:

Holes are 1.25 to 2” in diameter. Drill or core must be capable of injecting grout through the concrete pavement and the base material.



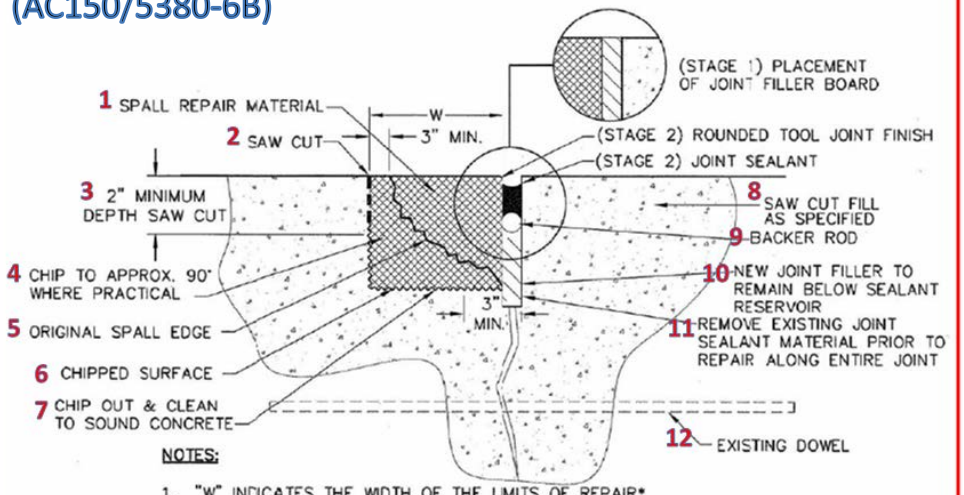




SOURCE: **American Concrete Association**

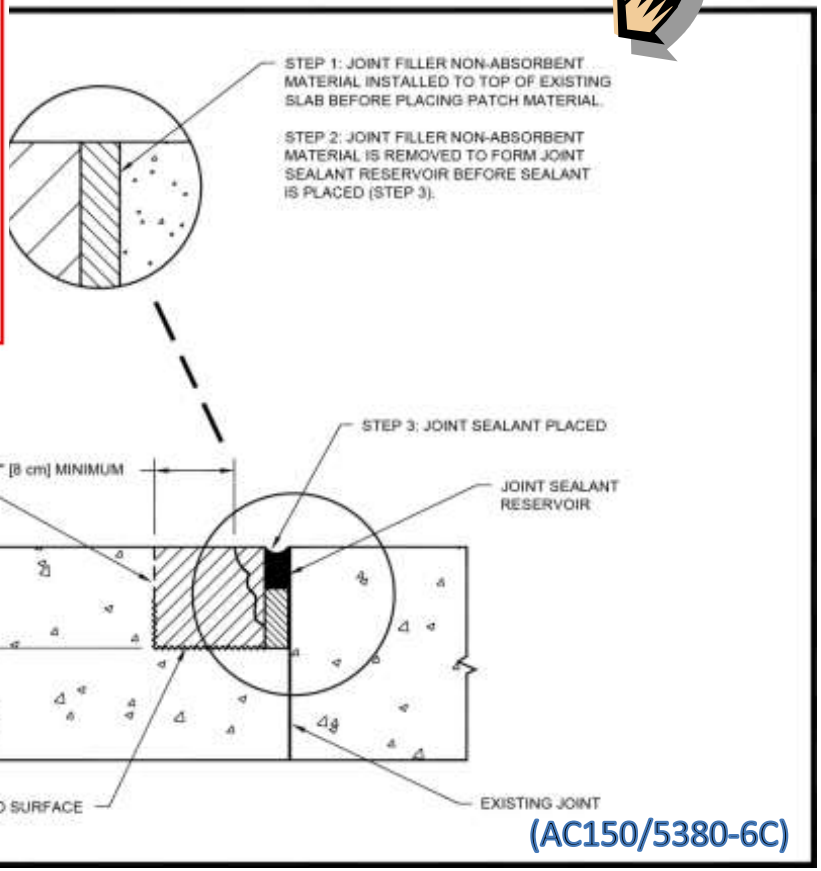
PROCEDURES FOR REPAIRING JOINT SPALLING

(AC150/5380-6B)



NOTES:

1. "W" INDICATES THE WIDTH OF THE LIMITS OF REPAIR*
2. LOCATION OF REPAIR TO BE DETERMINED IN THE FIELD AND CLEARLY MARKED.
3. ALL AREAS TO BE CLEAN OF LOOSE DEBRIS AND DUST PRIOR TO APPLICATION OF EPOXY BONDING AGENT, APPLIED PER MANUFACTURER'S RECOMMENDATIONS.
4. SPALL REPAIR MATERIAL AT THE EXISTING JOINT AREA SHALL NOT BE ALLOWED TO TOUCH OR BOND TO THE EXISTING CONCRETE.



(AC150/5380-6C)

DOWEL & TIEBAR PLACEMENT

The purpose of tiebars and dowel bars are to maintain the alignment of the pavement slabs and to properly transfer the load between the slabs respectively.

In repair of jointed concrete pavement, replacing the dowel bars appears to be the most critical factor affecting the full-depth repair performance.

Dowels provide load transfer across repair joints while at the same time allowing the joint to open and close as the surrounding pavement expands and contracts in response to temperature and moisture changes.

Patch area compaction.

Figure 4.11. Smooth steel dowels and deformed tiebars.

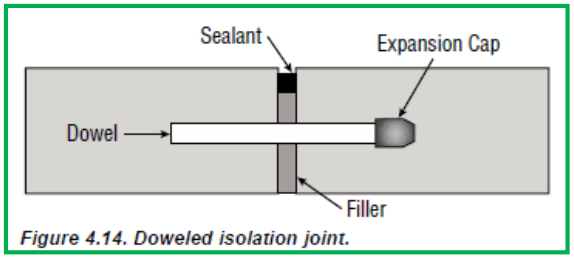
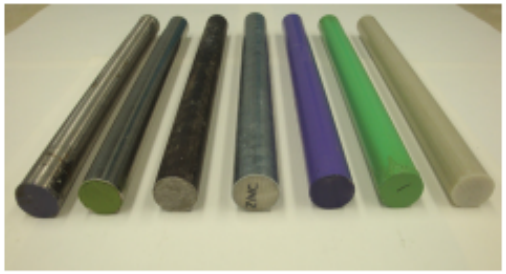


Figure 4.14. Doweled isolation joint.

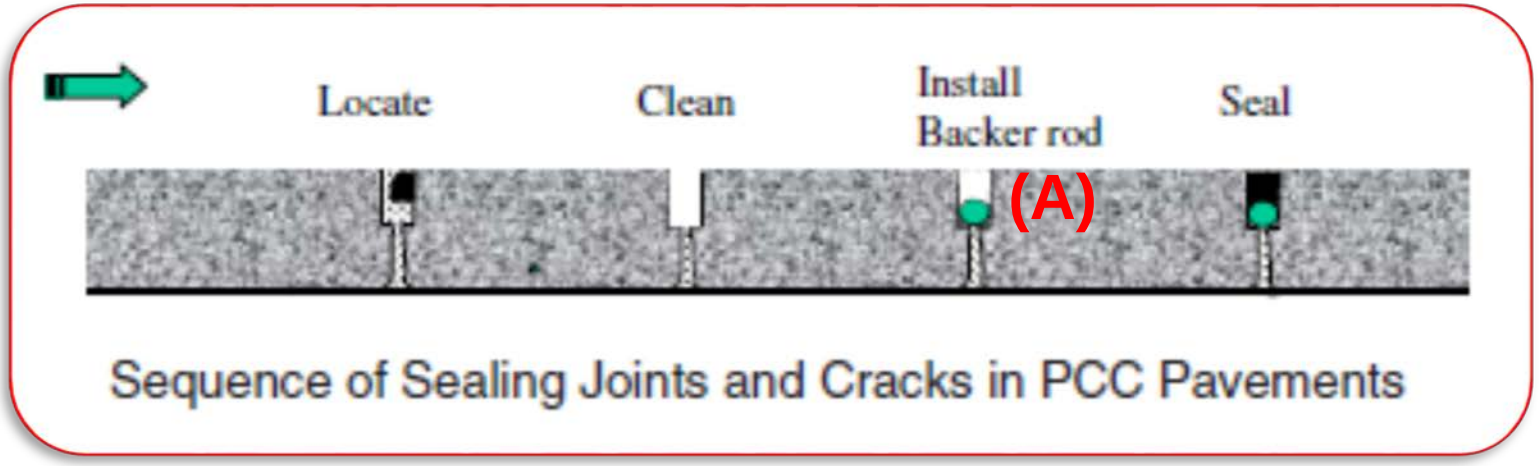


Dowel Bar types from Left to Right: Stainless Steel Clad, Stainless Steel Tube with Epoxy Coated Insert, MMFX$_2$, Zinc Clad, ASTM A934 Epoxy Coated (Purple), ASTM M284 Epoxy Coated (Green), and Fiber Reinforced Polymer.

Dowels used at expansion joints should be capped at one end to prevent further penetration of the dowels into the concrete when the joints close.

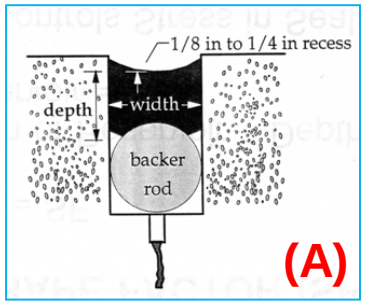
Drilling multiple holes

PROCEDURES FOR SEALING OF JOINT & CRACKS



Sequence of Sealing Joints and Cracks in PCC Pavements

Sealing of joints and cracks in PCC pavements is a maintenance treatment that re-seals joints that have missing or poorly performing sealants, and seals major cracks.



Backer rod

Installation of backer rod

Examples of various sizes of backer rod

REFERENCES

Public Law 103-305, section 107
Amending Title 49, section 47105

Advisory Circular 150/5380-7B
Pavement Management System

Advisory Circular 150/5380-6C
Guidelines and Procedures for Maintenance of Airport Pavements

America Society for Testing and Materials
ASTM D 5340 – 12

The Asphalt Institute
Asphalt in Pavement Maintenance

American Concrete Pavement Association
Concrete Pavement Repair

Airport Cooperative Research Program
Common Airport Pavement Maintenance Practices

FDOT's Airfield Pavement Inspection Reference Manual

Any questions or comments regarding the Airfield Distress Repair Manual, please contact:

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