U.S. Department
of Transportation

Federal Aviation Administration

Advisory Circular

Subject: MEASUREMENT, CONSTRUCTION, AND MAINTENANCE OF SKID-RESISTANT AIRPORT PAVEMENT SURFACES

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Initiated by: AAS-100

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Change: 2

1. PURPOSE. This change updates references to polymer-based runway surface chip seals to account for current materials technology.

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recommends that PFC overlays not be constructed on airport runways that have high aircraft traffic operations (over 91 turbojet arrivals per day per runway end).

2-7. CHIP SEAL. Recent advances in polymer technology have demonstrated the ability for durable, long term improvement of runway surface friction through the use of polymer-based chip seals. Sound engineering judgment should be exercised in the selection of a product when considering the use of polymer-based chip seals for longer term improvements. This technology has not been demonstrated to be compatible with grooved surfaces. A fog seal must be applied on top of the chip seal to minimize loose chips and tire damage. Chips should have a maximum size of 4.75mm (No. 4 sieve) to further minimize aircraft and tire damage.

2-8. AGGREGATE SLURRY SEAL. Temporary improvement of skid-resistance for pavement surfaces can be gained by constructing an aggregate slurry seal, either gradation type II or type III, as given in the specification in AC 150/5370-10. Aggregate slurry seals are recommended only as an interim measure until an overlay is constructed. This type of construction is usually adequate for 2 to 5 years. Figure 2-2 shows a typical type II aggregate slurry seal. Experience has shown that slurry seals do not hold up well in cold climates where snow removal occurs. A life cycle cost analysis should be conducted to determine the long term benefits.

Section 3. Portland Cement Concrete (PCC) Pavement

2-9. CONSTRUCTION TECHNIQUES FOR PCC PAVEMENT. Several methods are available to the paving contractor for constructing skid-resistant PCC pavement surfaces. When PCC pavement is still in the plastic condition, it is strongly recommended that some type of textural finish be constructed in the pavement surface prior to grooving. Such texturing can be accomplished by using either a brush or broom finish or a heavy burlap drag finish. Wire combed or wire tined construction provides an excellent textural finish to the surface. Also, plastic grooves can be constructed in the pavement before it has hardened. For PCC pavements that have hardened, grooves can be saw cut in the pavement. The textural and grooving construction techniques are briefly described in the following paragraphs. The basic construction specifications for PCC pavement are given in AC 150/5370-10. Quality concrete is a prerequisite to the retention of pavement skid-resistance. The physical properties of the fine aggregates and effectiveness of curing are important factors in improving wear resistance.

2-10. TIMING AND CURING. Timing in applying the curing compound is as important as timing the final finishing operations to assure long lasting, nonskid pavement surface texture. The timing of the texturing operation is critical because PCC pavements rarely lose surface moisture evenly or set at a uniform rate, especially during warm weather paving operations. The best time to texture a PCC pavement during construction is when the water spots have dried enough to reasonably hold the texture but before the drier spots have dried too much to texture at all. This is one of the toughest decisions for the paving contractor. After texturing of the pavement surface has been completed, immediate application of the curing compound assures that the pavement surface will not lose water and cure too rapidly. If the pavement cures too quickly, the ridges of mortar left by the finishing technique will not set properly and their durability will be greatly reduced, resulting in a faster rate of diminishing skid-resistance. Therefore, extreme care must be taken in this process to assure an effective cure.

2-11. BRUSH OR BROOM FINISH. If the pavement surface texture is to be a type of brush or broom finish, it should be applied when the water sheen has practically disappeared. The equipment should operate transversely across the pavement surface, providing corrugations that are uniform in appearance and approximately 1/16 inch (1-1/2 mm) deep. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Any imperfections resulting from the texturing operation should be corrected immediately after application before the concrete becomes too stiff to work. Figure 2-3 shows the texture formed by the broom finish.

2-12. BURLAP DRAG FINISH. Burlap used to texture the pavement surface should be at least 15 ounces/square yard (355 gm/square m). To produce a rough textured surface, the transverse threads of the burlap should be removed from approximately 1 foot (0.3 m) of the trailing edge and grout should be allowed to accumulate and harden on the trailing burlap threads. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface. The aggregate particles form the corrugations which should be uniform in appearance and approximately 1/16 inch (1-1/2 mm) deep. A runway pavement constructed with a burlap drag finish is shown in Figure 2-4.

2-13. WIRE COMBING. The wire comb technique uses rigid steel wires to form a deep texture in the plastic concrete pavement. An excellent example of this method is the runway constructed at Patrick Henry Airport in Virginia, where the spacing of the ridges is approximately ½ inch (13 mm) center to center (see Figure 2-5). The spring steel wires which were used had an exposed length of 4 inches (100 mm), thickness of 0.03 inch (0.7 mm), and width of 0.08 inch (2 mm). The wire comb equipment should provide grooves that are approximately 1/8 inch x 1/8 inch (3 mm x 3 mm) spaced ½ inch (13 mm) center to center. It is not necessary to provide preliminary texturing before constructing the wire comb texture. Because of the closeness of the spaced grooves, the preliminary texturing of the remaining land areas would not be effective. The wire comb technique should be constructed over the full pavement width. **The technique is not to be confused with saw cut or plastic grooved runway pavements.** Wire combing is a texturing technique and cannot be substituted for saw cut or plastic grooves because it does not prevent aircraft from hydroplaning.

2-14. WIRE TINING. Flexible steel wires are used to form deep texture in the plastic concrete pavement. The flexible steel bands are 5 inches (125 mm) long, approximately ¼ inch (6 mm) wide, and spaced ½ inch (13 mm) apart. The appearance of this technique is quite similar to the wire comb method. **This technique is not to be confused with saw cut or plastic grooved runway pavements.** Wire tining is a texturing technique and cannot be substituted for saw cut or plastic grooved because it does not prevent aircraft from hydroplaning.

Section 4. Runway Grooving

2-15. GENERAL GROOVING TECHNIQUES. Cutting or forming grooves in existing or new pavement is a proven and effective technique for providing skid-resistance and prevention of hydroplaning during wet weather. In existing pavement (both HMA and PCC), grooves must be saw cut; in new PCC pavement, grooves may be formed while the concrete is still plastic. Grooves in HMA pavement must be saw cut whether new or existing pavement is to be treated.

2-16. DETERMINING NEED FOR GROOVING. Grooving of all runways, serving or expected to serve turbojet aircraft, is considered high priority safety work and should be accomplished during initial construction. Such existing runways without grooving should be programmed as soon as practicable. For other runways, the following factors should be considered:

a. Historical review of aircraft accidents and incidents related to hydroplaning at the airport.

b. Wetness frequency (review of annual rainfall rates and intensity).

c. Transverse and longitudinal grades, flat areas, depressions, mounds, or any other surface abnormalities that may impede water runoff.

d. Surface texture quality as to slipperiness under dry or wet conditions. Polishing of aggregate, improper seat coating, inadequate micro-macrotexture, and contaminant buildup are some examples of conditions that may cause the loss of surface friction.

e. Terrain limitations such as dropoffs at the ends of the runway safety areas.

f. Adequacy of number and length of available runways.

g. Crosswind effects, particularly when low friction factors prevail at the airport.

h. The strength and condition of the runway pavements at the facility.

2-17. SUITABILITY OF EXISTING PAVEMENTS FOR GROOVING. Existing pavements may have surfaces that are not suitable for sawing grooves. A survey should be conducted to determine if an overlay or rehabilitation of the pavement surface is required before grooving.

a. Reconnaissance. A thorough survey should be made of the entire width and length of the runway. Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement should not be grooved until such areas are adequately repaired or replaced. To verify the structural condition of the pavement, tests should be taken in support of the visual observations.