

FAA Recommends Grooved Runways

Diamond grooved surfaces reduce dynamic hydroplaning

THE FEDERAL AVIATION ADMINISTRATION (FAA) realizes the dangers a pilot faces when losing braking effectiveness on a wet runway. Treacherous situations can arise when standing water, slush, or wet snow quickly contaminate a runway surface. Avoiding a dangerous or out-of-control landing situation is the goal of each and every landing.

Hydroplaning, the result of these weather-induced conditions, can have a serious effect on landing control and braking efficiency and can render an airplane partially or totally uncontrollable anytime during the landing. Despite the weather, runways and taxiways must always deliver the best possible overall ground handling and stopping characteristics that today's state-of-the-art technology can provide.

To better ensure that airplanes and their passengers are safe, the FAA has issued a Safety Tip recommending that when confronted with the possibility of hydroplaning, it is best to land on a grooved runway. This is consistent with what pilots have found in the field. Pilots have observed that transverse-grooved surfaces drastically reduce all types of skids on wet or flooded runways and provide positive nose-wheel steering during landing roll-out. Grooved surfaces also prevent the onset of drift and weathervaning. Pilots find overall ground handling and stopping characteristics on grooved surfaces are a dramatic improvement over ungrooved surfaces.

The FAA Safety Team addresses how to plan for hydroplaning in the December 2010 *Approach and Landing Safety Tip*, Notice Number: NOTC2669 (<http://www.faa.gov/safety/spotlights/noticeView>).



asp?nid=2669). In this notification, grooved runways are recommended by the FAA as the preferred surface to avoid weather-induced problems.

Grooved runways are a win-win situation. Not only does grooving make runways safer, but it's also a time- and cost-effective solution for rehabilitating older runways. Because it can be targeted specifically to the areas that need additional traction, grooving does not require massive shut-downs that can elevate costs. It's also easy to perform during off-peak hours, which minimizes logistical issues. Further, grooving does not have an adverse effect on pavement fatigue life.

From the pilot's point of view, the overall airplane ground handling and stopping characteristics on grooved surfaces show remarkable improvement over other surfaces.

▲ Grooved versus ungrooved surfaces when wet

>>> PUTTING IT TO THE TEST

FLIGHT TEST PROGRAMS conducted by NASA have confirmed the effectiveness of grooved pavement. The tests investigated the differences in wet runway braking effectiveness on a grooved pavement surface. In addition, a test on different types of grooving determined that sharp edge grooving — diamond saw cut grooves — was the most effective.

In one of the tests, the landing research runway was divided into separate test sections and bound by 2-inch rubber dams to provide an even water depth. Braking was done for ground speeds ranging from about 50 to 150 knots. The tests involved accelerating to the desired speed from a standstill to the take-off position or landing short of the test section and adjusting speed. This speed, or a slightly higher speed, was held

until about 100 yards before the appropriate test sections. At this point, power was reduced to idle and the spoilers extended. The timing allowed the engines to spin down to idle thrust before entering the test area. Brakes were abruptly applied to the maximum deflection while the wheels were still on the dry reference section and were maintained through two wet or flooded test surfaces, one grooved, and one ungrooved.



Grooved runway surface ↗

ABOUT IGGA

The International Grooving & Grinding Association (IGGA) is a non-profit trade association founded in 1972 by a group of dedicated industry professionals committed to the development of the diamond grinding and grooving process for surfaces constructed with Portland cement concrete and asphalt. In 1995, the IGGA joined in affiliation with the American Concrete Pavement Association (ACPA) and in 2012 formed the IGGA/ACPA Concrete Pavement Preservation Partnership (IGGA/ACPA CP3). Today, this partnership serves as the technical resource and industry leader in the marketing of optimized pavement surfaces, concrete pavement restoration and pavement preservation around the world. The mission of the IGGA is to serve as the leading technical and promotional resource for the acceptance and proper use of diamond grinding and grooving as well as PCC preservation and restoration. For more information, visit www.igga.net.

>>> EFFECTIVE SOLUTION

At the Fort Lauderdale Hollywood International Airport (FLHIA), located in Broward County, Fla. just three miles southwest of Fort Lauderdale, the asphalt paved Runway 9L – 27R was experiencing distress and lost friction. The Broward County Aviation Department decided to form a plan to rehabilitate their airport runway.

According to Gasser Douge, Airport Engineer for the FLHIA, a loss of up to 40 percent of the transverse grooves triggered an investigation of the pavement condition, with concern centering on the pavement's loss of friction. The design engineer recommended grinding and grooving as the solution to the problem.

The scope of work included patching areas of deteriorated pavement, diamond grinding approximately 110,000 square yards of asphalt runway

Consider this ...

- FAA recommendations for runway grooving are used on most major runways in the United States.
- Fort Lauderdale Hollywood International Airport found the cost savings with diamond grinding and grooving were substantial when compared to an alternate repair method such as milling and filling.
- Transverse-grooved landing surfaces increase the pilot's ability to safely land.

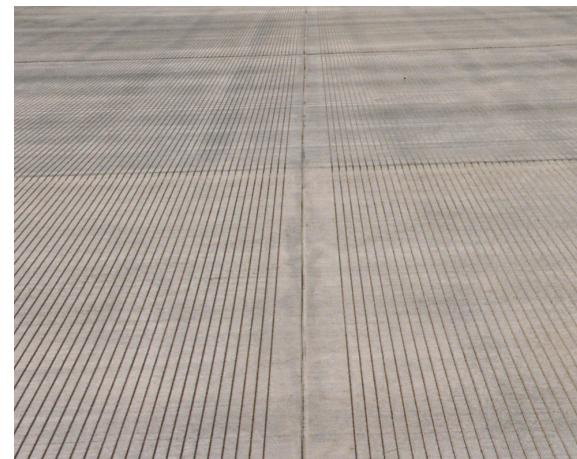
deep enough to remove the existing grooves, then re-grooving the runway in accordance with standard Federal Aviation Administration (FAA) specifications and finally re-striping.

Diamond grinding a major runway is a first for Broward County and possibly for the entire region. The technique is a viable and cost effective method for rehabilitating asphalt paved runways and highways. While the total project cost was \$1.5 million, the diamond grinding and grooving cost was only \$500,000 or \$5 per square-yard. The cost savings were substantial when compared to an alternate repair method such as milling and filling.

Diamond grinding left the facility with a like-new surface and the friction necessary to ensure the continued safety that modern day airports require.

Benefits of a saw-cut grooved surface:

- **MINIMIZED SKIDS:** Overall good ground handling is sustained.
- **MINIMIZED HYDROPLANING:** Positive nose-wheel steering is maintained during landing roll-out.
- **IMPRESSIVE BRAKING:** Reduced stopping distances.
- **SAFER LANDING:** Pilots can maintain control in bad weather landings.



↗ Grooved surface at pavement joint