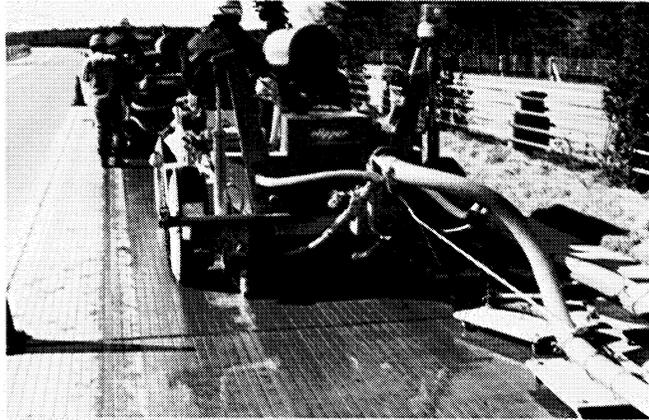


Safety Grooving



At left, a machine equipped with diamond blades is cutting grooves in the concrete holding pen of a California cattle ranch as an animal safety measure. Concrete surfaces are regularly employed for sanitary purposes in pen and feeding areas, but in time the surface finish wears smooth and becomes slippery. This gives rise to the danger that valuable cattle may fall and be seriously injured or killed; it happens often enough to pose a major problem for cattle ranchers and dairy farmers. Operators of such facilities, in the U.S. and abroad, have found safety grooving an effective remedy.

This rather unusual use of safety grooving exemplifies a rapidly expanding list of new applications for a spinoff technique originally



developed more than two decades ago. Most new applications are intended to prevent injury to humans rather than animals. Concerned about traction problems on wet and slippery surfaces, safety engineers are increasingly specifying grooving or texturing—a related process that creates a rough, sandpaper-like surface—in construction plans for new or renovated facilities.

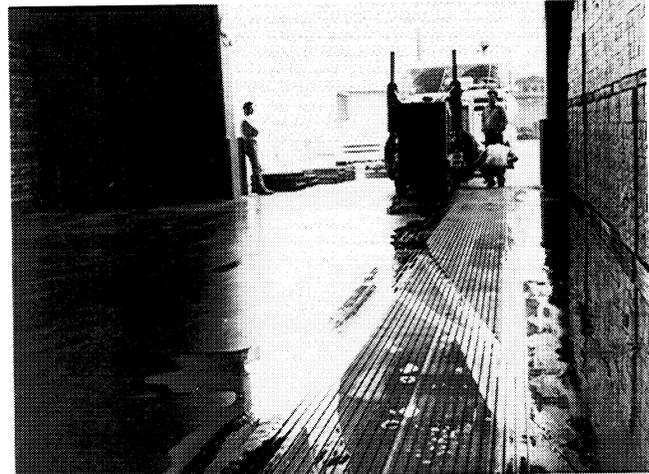
Safety grooving to improve human and animal footing on slick or smooth surfaces represents a “spinoff from a spinoff.” The technique was first developed to reduce aircraft accidents on wet runways and was subsequently widely adopted as a highway safety measure. Grooving commercial airports, which began in the 1960s, helped launch the grooving industry in the U.S. That industry—represented by the International Grooving & Grinding Association (IG&GA), New York City—expanded considerably when safety grooving gained acceptance among highway engineers. Over the past five years, pedestrian safety applications have contributed to further growth of the industry. IG&GA now has a membership, consisting of grooving contractors and manufacturers of grooving equipment, that embraces more than 30 companies in the U.S. and in Europe, Australia and Japan.

In the early 1960s, NASA’s Langley Research Center began an extensive research program that led to the type of remedial grooving currently employed on airport runways around the world. The technique was designed to curb skid-causing “tire hydroplaning,” a condition that occurs during rainstorms when tires rolling or sliding along a water-covered pavement are lifted away from the surface by the action of water pressure. In other words, the tire is riding on a film of water that separates the tire tread from the surface. The grooves, cut transversely across the runway, create channels through which excess water is forced, thereby reducing the skid hazard and increasing an airplane’s braking effectiveness.

Langley Research Center demonstrated its corrective technique and assisted the Federal Aviation Administration in testing the efficacy of various groove configurations. This led to the first runway grooving at a U.S. commercial airport—Washington (D.C.) National Airport—in 1967. Since then hundreds of military and civil airports have been safety-grooved

in the U.S., Canada, Europe and Asia. The process is typified in the bottom photo, opposite page which shows a runway being grooved at Daytona (Florida) Airport. In a survey of U.S. airport managers conducted by IG&GA, 91 percent of the respondents said they would recommend runway grooving as a valuable maintenance/safety improvement.

Langley scientists were also instrumental in bringing the problem and its solution to the attention of highway safety engineers and highway grooving began in the U.S. at about the same time as runway grooving. Generally, highways are grooved longitudinally—along the line of vehicle movement—rather than transversely, because transverse grooving takes longer and necessitates closing highways for longer periods. The result, however, is about the same: it reduces skidding, decreases stopping distances and increases a vehicle’s cornering ability on curves. A report by the California Division of Highways, which made before-and-after grooving studies at 14 locations, showed an after-grooving wet weather accident reduction of approximately 85 percent. Highways have been grooved in many U.S. states and in a number



of countries in Europe and Asia; the middle photo, opposite page shows a grooving machine cutting longitudinal channels in a section of Japan’s Tohoku Expressway.

In the last five years, the success of runway/highway safety grooving has inspired a wide range of new applications and caused the members of the IG&GA to develop new types of diamond-bladed grooving machines, smaller and lighter because they must be operated on narrower surfaces and maneuvered in tight quarters. An example is the machine being used at left, where the granite steps of a Philadelphia school are being grooved to keep students from slipping and falling in wet weather. Among other examples of grooving outdoor surfaces for pedestrian safety are sidewalks, playgrounds, parking lots, service stations, car washes, railroad station platforms and swimming pool decks. Indoor grooving examples include the slippery-when-wet entrance to a West Coast bottling plant (above) and occasionally slick working areas in refineries, factories, warehouses, meat packing facilities and food processing plants.

