



[Standard spec 415.3.8](#) provides that pavements with a design speed of less than 40 MPH receive an artificial turf drag texture. Pavements with a design speed of 40 MPH or greater receive the turf drag texture, followed by a machine-applied transverse tining.

The finish imparted to the pavement by the turf drag and/or tining machine is critical for safety. High skid resistance is necessary for motorists to maintain control of their vehicles under slippery conditions. Properly textured and tined pavements can help save lives.

4-18.1 Texturing

Artificial turf is dragged longitudinally over the pavement behind the finishing machine. The drag should produce a good longitudinal micro-texture, but should not tear the surface. If it is not producing a good micro-texture due to slumping fresh concrete, the contractor should move the drag away from the finisher. If the surface is tearing, the contractor should move the drag closer to the finisher.

Pressure on the concrete can be increased by lengthening the drag in contact with the pavement or decreased by shortening the drag. Usually 3 feet to 5 feet are in contact with the surface. Check the drag material before paving and from time to time during finishing for tears, worn surface, or hardened concrete. The contractor should clean or replace the drag as often as necessary to maintain a well-defined micro-texture.

The turf drag should not be applied when the surface is so wet or plastic that the ridges formed flow back into the valleys when the drag has passed, nor should dragging be delayed until the concrete is so hard that sharp ridges cannot be formed by the drag. Surface conditions may not be fully uniform, however, and dragging should be timed to maximize skid resistance. The contractor should not pull the drag ahead with the finishing equipment.

The inner and outer 6 inches to 12 inches of the slab should be hand dragged to prevent edge slumping or tearing. An acceptable broom finish can be applied to small areas of pavement or driveways where a turf drag cannot be operated.

4-18.2 Tining

The turf drag, followed by a tining machine, drags a steel rake across the slab, producing macro-texture. This macro-texture improves wet pavement friction by providing escape channels for water trapped under vehicle tires. All tining will be longitudinal to the direction of traffic unless the project leader directs or allows otherwise.

4-18.2.1 Longitudinal Tining

A Marquette University study showed that longitudinal tining gave the quietest riding pavement and that longitudinal tining does not diminish the friction factor to a degree that it could be considered a safety risk. There was also no significant difference in the performance of a longitudinally tined surface and a transversely tined surface in wet or rainy environmental conditions. The research concluded that longitudinally tined surfaces performed as well as transversely tined surfaces in all conditions tested and that they had the advantage of being quieter in most cases.

4-18.2.2 Transverse Tining

The contractor should only use transverse tining in locations where the project leader directs or allows. This flexibility is provided under the specification to help address project-specific difficulties, such as equipment breakdown or malfunction that may come up, or in areas where matching the adjacent tining is necessary. Transversely tined pavements, particularly those with uniform tine spacing, may however produce an objectionable tire/pavement whine.

4-18.2.3 Hand Tining

The specification also allows hand tining of areas such as ramps, gaps, intersections, etc. where machine tining is not practical. In these areas it may be difficult or impossible to maneuver the tining machine, or the machine may be in use elsewhere on the project when these areas are poured.

The specifications require longitudinal tining for all handwork unless the project leader directs or allows otherwise.

4-18.2.4 Quality Control

The rake should be checked for missing, bent, or broken tines before tining. Also check the tine spacing and make sure the tines are clean. The specification is based on the dimensions of the rake, not the spacing of the grooves created in the pavement. The flexible tines cause variability in the spacing of the grooves created in the

pavement and thus make it impractical to measure the groove spacing. If the rake is constructed as specified and well maintained, the pavement grooves should have the desirable uniform spacing of 3/4 of an inch for longitudinal tining and 5/8 of an inch for transverse tining. If the pavement consistently shows spacing outside these limits, examine the rake for problems.

During the tining, check the concrete grooves for uniform depth within the limits specified in [standard spec 415.3.8.3.1](#). If the surface is tearing, the contractor should decrease the transverse speed of tining or move the tining machine closer to the paver. If the groove is slumping, the concrete is not stiff enough; the contractor should move the tining machine away from the paver. If the grooves are not deep enough, the contractor should adjust the machine or move it closer to the paver.

The timing of the tining operation must be coordinated with the dragging operation and adjusted for conditions to produce a uniform depth of sharp, well-defined grooves. The finished surface should be free from rough or porous areas, irregularities, and depressions resulting from improper handling of the tining machine.