

Texture of Concrete Pavements

Observations from the FHWA Mobile Concrete Trailer (MCT)

Surface texture is an important pavement characteristic, from both a safety and noise perspective. The use of a tined surface on concrete pavements began in the late 1960s and has evolved over the many decades. Most states moved from transverse tining and have adopted longitudinal tining as their standard practice.

Microtexture and Macrotexture

Microtexture is intended to roughen the surface to provide skid resistance in all weather conditions. Turf drag and broom finish are types of microtexture. Macrotexture is intended to provide drainage channels for water along with additional skid resistance. Macrotexture is provided by tining.

Transverse Tining: Transverse tining was used extensively in the early days of the focus on surface characteristics. Unfortunately, many of these pavements created objectionable noise within the car and along the side of the roadway. Much research has been conducted utilizing different spacing of the tines and depth of the tine indentations. An extensive study found that pavements constructed with transverse tining often exhibited significant noise variability, even within a project.

Other surface treatments: In urban areas, tining is normally not done since these are usually lower speed roadways. In noise sensitive areas, some states will only apply microtexture to the surface. Diamond grinding is also a surface treatment method that is effective in both safety and noise reduction but adds cost and involves another operation into the construction process.

Things to consider: A spacing of 20 mm ($\frac{3}{4}$ " in) is used by most agencies for both transverse and longitudinal tining. The groove depth should be minimized and the grooves need to be as uniform as possible to minimize noise. Care is needed to minimize positive texture. This is a situation where the material removed from the groove ends up on top of the original surface. Positive texture is a primary source of pavement noise.

Longitudinal Tining: Longitudinal tining is currently the standard practice in most states. The noise levels normally are much less and the variability is also reduced. Friction testing has shown very little difference between transverse and longitudinal tining.

Advantages

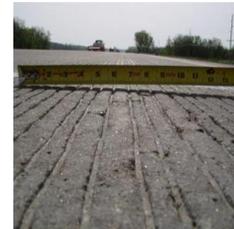
- Reduced tire pavement noise
- Enable application of curing compound sooner
- Less variability in noise generation
- Some report less ice control pretreatment required

Challenges

- Care is needed to ensure grooves are straight because they are very visible to drivers.
- Insuring shallow, uniform grooves is critical to reducing pavement noise.

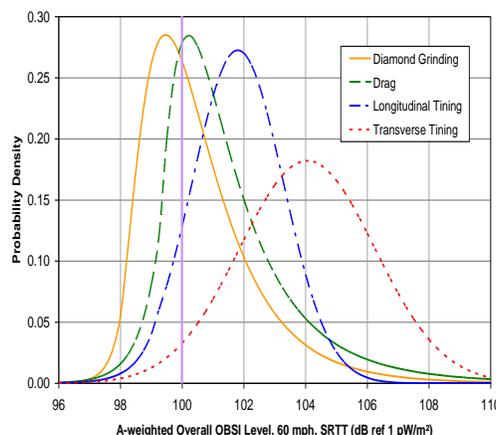


Uniform Texture



Noisy, Positive Texture

FHWA
Images



Extensive testing revealed that transverse tining has more variability and is generally noisier than longitudinal texture, as shown in the graph.*

Summary: Longitudinal tining is an effective method to reduce noise and provide the added safety of hydroplaning reduction. FHWA Technical Advisory T 5040.36 Surface Texture for Asphalt and Concrete Pavements gives guidance: <https://www.fhwa.dot.gov/pavement/t504036.cfm>. Extensive research was conducted evaluating noise on pavements worldwide with research results and guidance given in:

*http://www.cptechcenter.org/technical-library/documents/How_to_Reduce_Tire-Pavement_Noise_final.pdf.