

Resilient Asphalt Roads:

MODIFIED ASPHALT MIX REDUCES THERMAL CRACKING

Alaska DOT and contractors are taking adaptive measures to deal with the state's extreme temperatures and permafrost. Alaska's rapidly changing climate is causing problems with permafrost — ground that stays colder than 32°F continuously for at least two years. Permafrost that stays frozen doesn't cause issues. But ice-rich, thaw-unstable permafrost is susceptible to thawing.



In some places, up to 12 feet of old patched asphalt had to be removed.

When roads are built through permafrost-rich areas, the surface layer of the ground is stripped away of permafrost-insulating vegetation. Organic soil is replaced with gravel, exposing the ground to solar radiation and warmer temperatures. When the active layer of permafrost thaws in the summer, dips in the road develop as ice in the underlying subbase melts and settles. This settlement increases as the active layer gets deeper with warmer weather, causing larger dips in the road. "Permafrost makes it hard to do the job of keeping Alaska moving," said Jeff Currey, Materials Engineer with Alaska DOT.

This was the case with Chena Hot Springs Road in Fairbanks. ADOT contracted Exclusive Paving to rehabilitate 6 miles of the road that had not been reconstructed since 1998. Martin Gray, Project Engineer with Exclusive Paving, said the biggest challenge Exclusive encountered was deep asphalt. At bid time, ADOT thought the asphalt thickness might be 2-3 feet deep. However, annual patching by ADOT Maintenance due to permafrost thaw revealed the thickest section of asphalt to be 12 feet.

ADOT has adapted, changing the binder grade specified in its asphalt mixtures to significantly reduce thermal cracking issues caused by extreme low temperatures due to asphalt's flexibility and ability to stretch and recover. Currey said that PG52E-40, in accordance with AASHTO M 332, modified with approximately 3% SBS polymer, was used on the Chena Hot Springs Road project. Exclusive placed 3 in. of asphalt, on top of a 4-in. asphalt base course. To reduce road settlement due to permafrost thawing, Exclusive placed geogrid layers in six locations. Currey said the polymer-modified mixes are performing well.

The vast majority of pavements in Alaska are built with asphalt. Richard Giessel, Statewide Quality Assurance Engineer with ADOT, explained, "A rigid pavement leads to faulting. A flexible pavement is very important in areas where you have differential surface movement from deep frost penetration, which you have just about everywhere in Alaska." Asphalt's attributes are the appropriate resilient solution to Alaska's extreme climate.

[Learn more: AsphaltPavement.org/Resilience](https://AsphaltPavement.org/Resilience)