

CPR: REBUILT TO LAST

Low Noise Diamond Grinding (LNDG) tested in New South Wales, Australia

>>> A MODIFIED NEXT GENERATION CONCRETE SURFACE (NGCS)

AUSTRALIAN HIGHWAYS can now be quieter thanks to a new diamond grinding technique developed to help minimize tire-pavement road noise.

Australia's Roads and Maritime Services (RMS) constructed several test sections using diamond saw-cut textures on concrete pavement, and this research resulted in the development of a low-noise-diamond-grinding (LNDG) surface texture. The LNDG method, a term coined by the RMS for a modified technique of the U.S.-developed next-generation concrete surface (NGCS), is now able to be used on the most traveled concrete pavements in New South Wales (NSW), a state on the eastern coast of Australia.

NGCS is the quietest non-porous concrete pavement surface texture available, according to U.S. test results. This method consists of diamond grooving a surface using .125 in (3.2-mm) wide longitudinal grooves saw-cut to a depth of $\frac{1}{8}$ in to $\frac{3}{16}$ in (3 mm to 5 mm) at $\frac{1}{2}$ in to $\frac{5}{8}$ in (12.5- to 16-mm) centers. Before the diamond grinding is completed, the surface is flush ground with $\frac{1}{8}$ in (3.2-mm) wide blades with .035 in (0.9-mm) spacers. This results in a very fine, corduroy-like surface finish. The textures are created using conventional equipment.

The development and implementation of the modified NGCS came at a good time for NSW, with increasing urbanization taking place along road corridors and new environmental noise legislation in place. These combined factors led to a demand for more expensive asphalt pavements in noise-sensitive areas within NSW.

However LNDG on concrete pavements can now serve as an alternative to noise reducing asphalt overlays with a lower initial cost and without the need to maintain and replace the overlay throughout the life of the structure. Conventional diamond grinding (CDG) has been successful-



ly used on existing concrete pavement in NSW since 2009 to reduce pavement roughness and increase skid resistance, but the noise attenuation provided by conventional diamond grinding was similar to that of dense-graded asphalt.

The RMS wanted to reduce noise even further and began trials of NCGS sections on a highway with jointed plain concrete pavement (JPCP). In a cost-saving effort during these trials, the agency experimented along a section using a modified NCGS surface. The road noise tests indicated a potential noise outcome up to 3 dB(A) quieter than densely graded asphalt. The noise test results attained for the LNDG sites in NSW are compatible with those that were reported for the same pavement surface treatment in the United States. LNDG's texture depth is about 1.1 to 1.6 mm with the groove depth varying from $\frac{1}{8}$ in to $\frac{5}{8}$ in (3 to 5 mm), which provides an appropriate margin of safety against hydroplaning. The high consistency of the grooving depth and alignment also indicates repeatable results with a narrower band of deviation than other pavement surfaces.

TEAM MEMBERS

- Australian Roads and Maritime Services (RMS) (Owner)
- Seovic Civil Engineering Pty Ltd. (Diamond grinding contractor)

The LNDG process developed from the trials has now provided a safe, cost-effective solution to reduce pavement noise in Australia and has been embraced by the RMS. In NSW, the average initial costs of jointed plain concrete pavement with LNDG surfacing is \$138 per square meter and \$174 per square meter for CRCP with stone-matrix asphalt surfacing.

Ultimately these numbers meant that the savings gained from using LNDG on plain concrete pavement instead of stone-matrix asphalt (SMA) on continuously reinforced concrete pavement, the current practice for low-noise highways, was \$3.2 million. For future projects, this could mean capital cost savings of about \$720,000 per kilometer of dual carriageway.