



Hunter Expressway Concrete Pavement, showing a Diamond Grooving technique applied.

CONCRETE ROADS

Solutions for Low Noise Pavement Design

A low noise surface can be achieved by including readily available and proven Diamond Grinding & Grooving technologies within heavy traffic Road Design.

The heavy traffic conditions of major roads require road surfaces that are strong and durable and may also call for a low noise pavement solution, to minimise noise for neighbours.

Concrete has always offered the strongest and most durable pavement choice, and now through innovative texturing technology it can also deliver a low noise outcome.

Using conventional Diamond Grinding equipment, Low Noise Diamond Grinding (LNDG) textures can be quickly and efficiently applied to concrete road surfaces without impacting other roadway features such as guard rails, noise barriers, or curbs.

LNDG can provide about a 50% reduction in noise compared to Plain Concrete Pavement (PCP) with Transverse Tining

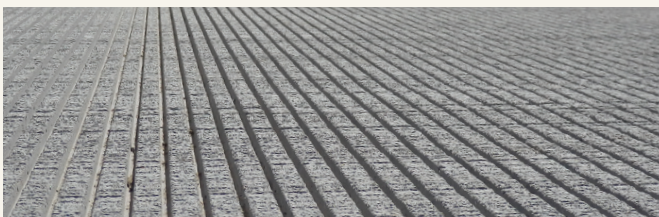
INNOVATIVE AND PROVEN IN AUSTRALIA

Diamond grinding can now be selected for the surfacing of Concrete Roads in Australia to provide a low maintenance, highly durable and quiet riding surface.

The technology is now well established and proven in use on major roads, including on stretches of the Hunter Expressway & Pacific Highway in NSW, and the Northern Connector, Adelaide.

WHAT IS LOW NOISE DIAMOND GRINDING (LNDG)?

LNDG produces surface grooves on concrete pavements to produce a low noise negative texture similar in acoustic performance to the closest Asphalt equivalent.¹



Newly constructed Concrete pavement, shown with Low Noise Diamond Grinding undertaken to provide a grooved texture.

BENEFITS

- **Decreased Noise:** A smoother surface with a grooved texture results in a lower overall noise level.
- **Smoother Ride:** Studies indicate that LNDG provides a smoother, more uniform ride.
- **Increased Safety:** Diamond grooving provides improved traction and allows the road to maintain its texture longer, creating a safer road over the long-term.

Turn over for more detail on Low Noise Diamond Grinding and how it can be specified.

Visit CCAA.COM.AU to learn more

¹ Vorobieff, G and Carson, P (2017). 3year Performance of Low Noise Diamond Grinding. ASCP Conference, Kingscliff, NSW.

LNDG IN APPLICATION

In Australia, LNDG trials were started in 2012 by Transport for NSW (TfNSW) and demonstrated a reduction in noise. This led to the technique being adopted for new and existing major roads within the NSW network where deemed appropriate.

Hunter Expressway & Pacific Highway

LNDG was used on trials at Hunter Expressway 2012-2014 and at Pacific Highway Upgrade at Valla (Nambucca Heads to Urunga) in 2018.

Extensive Acoustic testing was undertaken using a number of methods including the RONDA (Road Noise Data Acquirer) CPx trailer, which demonstrated LNDG surfacing to provide equivalent low noise performance to that of SMA14 asphalt.

Northern Connector

LNDG was also used on the Northern Connector, Adelaide, with the concrete pavement being constructed in two layers. A low-strength, 5MPa sub-base, was first laid on top of the compacted road base, acting as a levelling layer for the subsequent layer. A High-strength 35MPa plain concrete was then laid as the trafficable pavement layer.

Low Noise Diamond Grinding (LNDG), was used to cut grooves into the surface along the entire length of the travel lanes to reduce vehicle noise.

STANDARD SPECIFICATIONS

LNDG is approved under TfNSW Specification R94, whilst CDG is covered by TfNSW Construction Specification R93 and Maintenance Specification M229.

LNDG PERFORMANCE - TYPICAL ROAD SURFACE & FINISH

LNDG Performance

Average tyre-road surface noise emissions measured in 2015 using a RONDA CPx trailer for different pavement surfaces on the Hunter Expressway are shown in the following table.⁽¹⁾

SURFACE TYPE	LOWER BOUND AVERAGE [dB(A)]	UPPER BOUND AVERAGE [dB(A)]	RANGE
PCP Transverse Tining	101.0	105.8	4.8
PCP + LNDG	100.2	102.2	2.0
SMA14	99.5	102.8	3.3
DGA-AC14	98.4	101.8	3.4
SMA10	97.8	100.6	2.8

Table Explanation: Noise is measured using a logarithmic scale and a change in noise of 10 dB is a difference of 10 times. The Concrete Pavement with a LNDG surface texture applied shows a significant reduction of up to 3.6 dB (about 50% reduction) in noise and also a decrease in variability compared to the Plain Concrete Pavement (PCP) with Transverse Tining. The noise measurements of the LNDG are also generally comparable to Stone Mastic Asphalt and Dense Graded Asphalt-Asphaltic Concrete (SMA 14 and DGAAC14) and only slightly higher than the "low noise" SMA10 surface.

Due to the success of these trials LNDG was applied to sections of the Pacific Highway near Valla Beach. This concrete pavement was opened to traffic in 2016 and the LNDG applied in late 2018. Pre and Post Grinding noise measurements were undertaken showing a reduction of about 4 dB after grinding with the noise levels of the LNDG comparable to the "low noise" SMA10.⁽²⁾

BENEFITS

- **Decreased Noise:** A smoother surface with a grooved texture results in a lower overall noise level.
- **Increased Safety:** Diamond grooving provides improved traction and allows the road to maintain its texture longer, creating a safer road over the long-term.
- **Smoother Ride:** Studies indicate that LNDG provides a smoother, more uniform ride.



NORTHERN CONNECTOR, ADELAIDE (2020)

Source: Department for Infrastructure and Transport, Government of South Australia.

LOW NOISE SURFACING

Concrete pavements can provide a service life of forty years or more under extreme conditions due to the inherent strength and durability of concrete. They are used widely in NSW, across major arterials including the recently constructed Hunter Expressway - the main artery to Newcastle's International Port. Concrete's excellent performance and financial benefits are also being realised in other regions of Australia, such as on the Northern Connector, Adelaide. Low Noise Diamond Grinding is now readily available for use on Concrete Pavements as a Low Noise Surface solution.

Visit CCAA.COM.AU to learn more

1 Vorobieff, G and Carson, P [2017]. 3 year Performance of Low Noise Diamond Grinding. ASCP Conference, Kingscliff, NSW.
 2 Nambucca Heads to Urunga. Low Noise Diamond Grinding Pavement Noise Monitoring [2019]. Transport for NSW, North Sydney, NSW.