



THE UNIVERSITY OF
AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

THE EFFECT OF SPECIMEN PREPARATION ON THE MECHANICAL PROPERTIES OF OPEN GRADED POROUS ASPHALT

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Open Graded Porous Asphalt (OGPA)

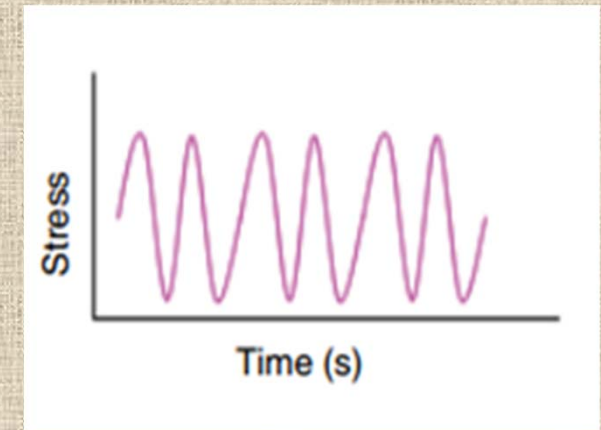
- Open Graded Porous Asphalt (also known as OGPA) – NZ since 1970s
- Up to 4 -5 layers of OGPA on Auckland motorways (each layer 26 mm thick)
- Benefits:
 - Improved skid resistance
 - Reduction in noise pollution
 - Improved storm water quality



100mm OGPA specimen

Dynamic modulus (E^*)

- $E^* = \frac{\text{Stress}}{\text{strain}}$
- Asphalt Standard Tester (AST)
- Deformation controlled using harmonic loading



PReSBOX™ – Compaction equipment



PReSBOX compacted OGPA sample & specimen

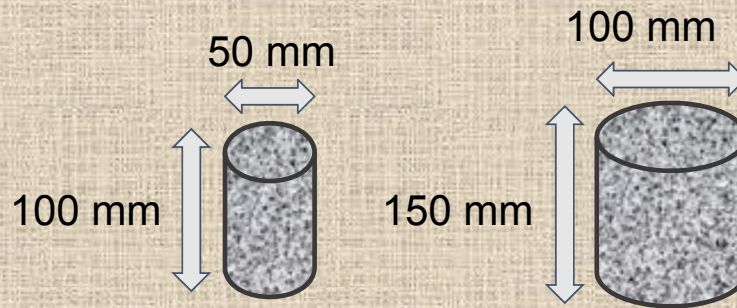


Objectives

- 1 Determine the extent of variability of dynamic modulus within and between PReSBOX compacted slabs
- 2 Determine if a small scale specimen comprising a 50mm diameter can be used as an alternative to the standard 100mm diameter for testing purposes

Sample preparation

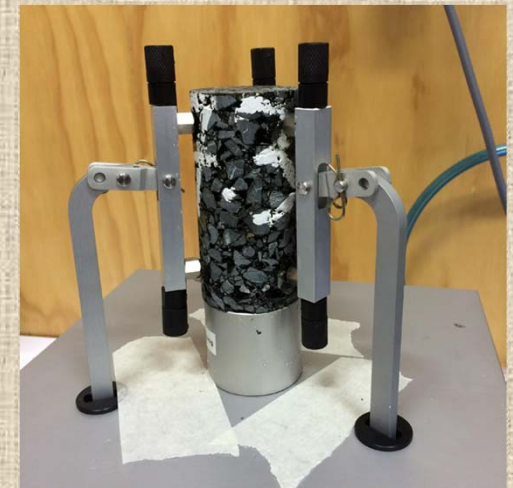
- OGPA mix – 10mm NMAS with polymer modified binder and greywacke aggregate mix



- PReSBOX™: Shear box compactor four OGPA slabs

- Coring/ Sawing

- Level studs attached



Dynamic modulus test

Asphalt Standard Tester (AST): AASHTO TP79 testing method

Temperatures: **4, 20 and 30 °C**

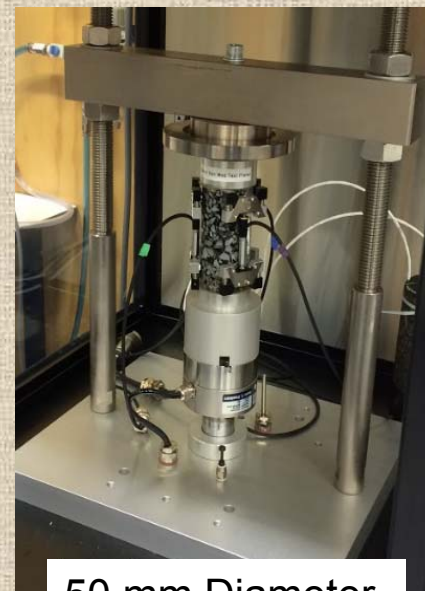
Frequencies: **25Hz, 10Hz, 1Hz, 0.1Hz and 0.01Hz**



EC



AST

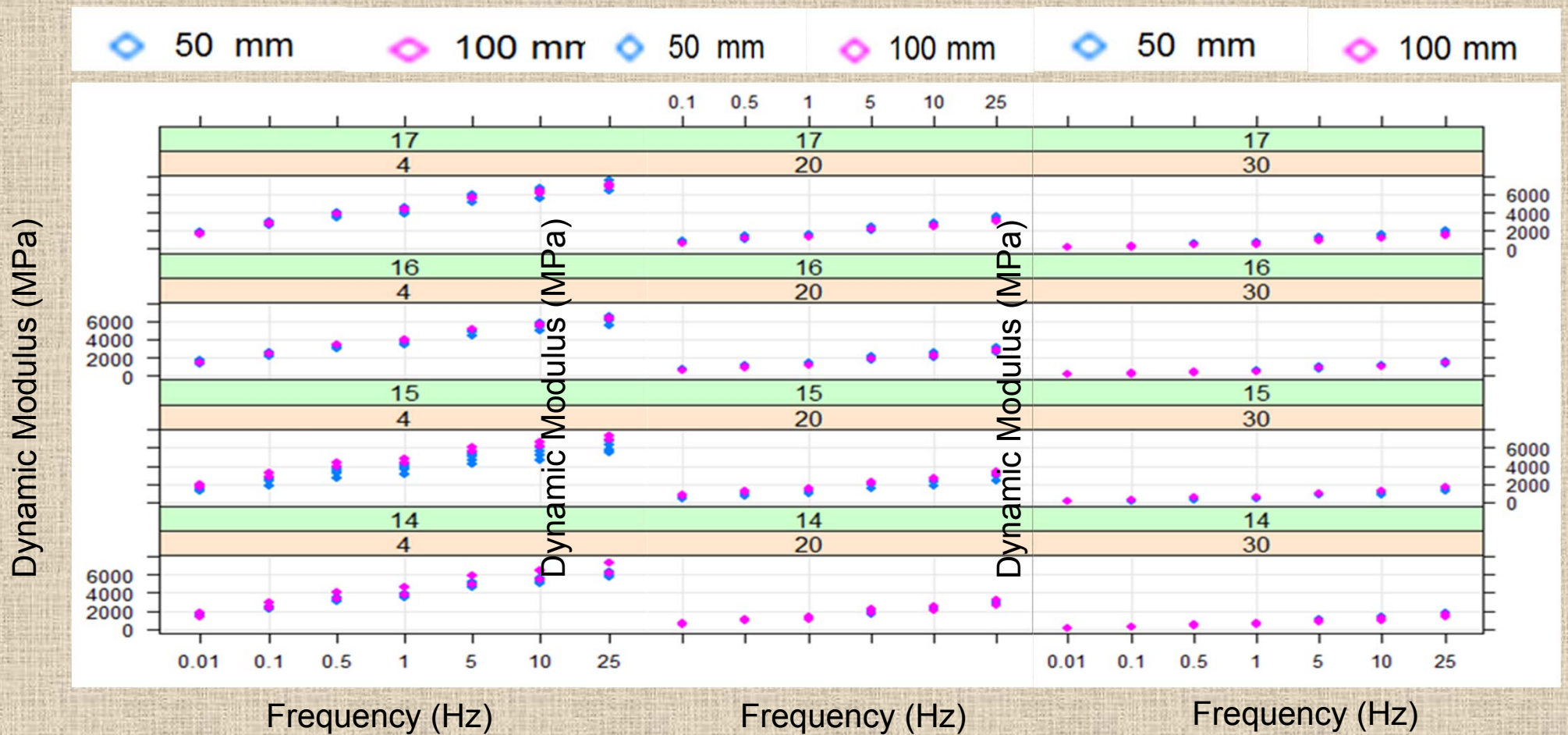


50 mm Diameter



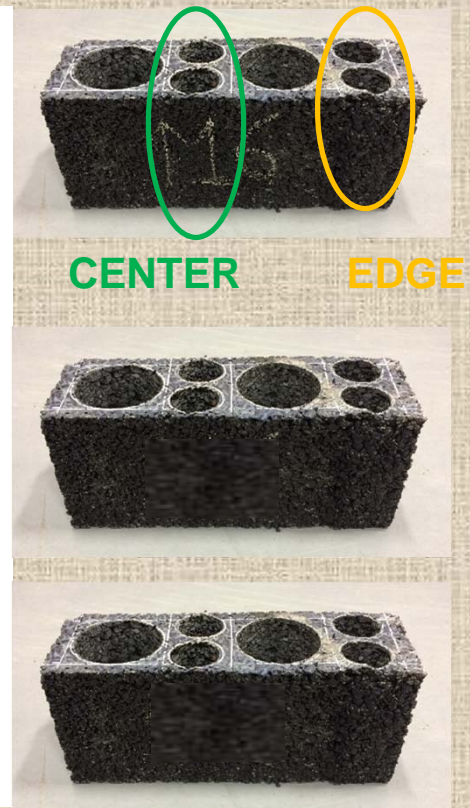
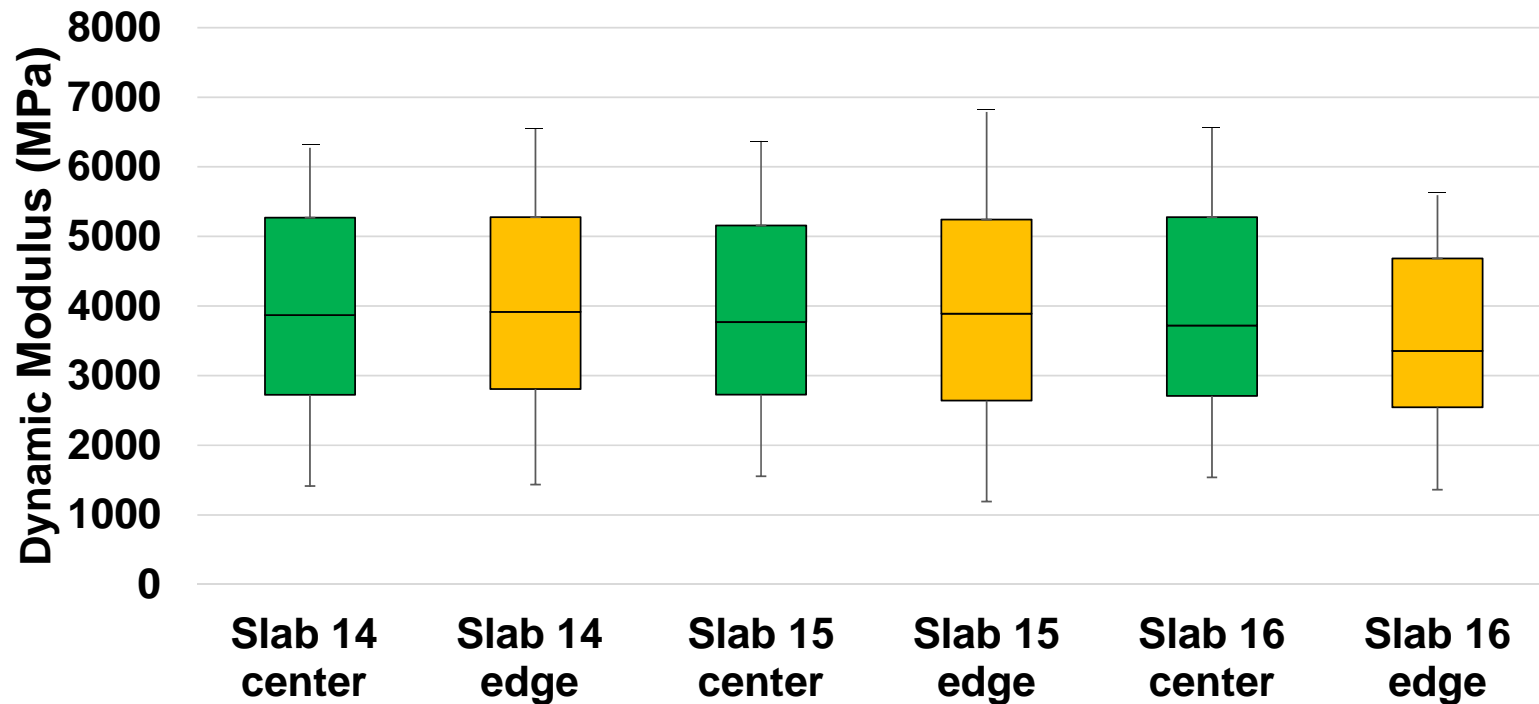
100 mm Diameter

Dynamic modulus results

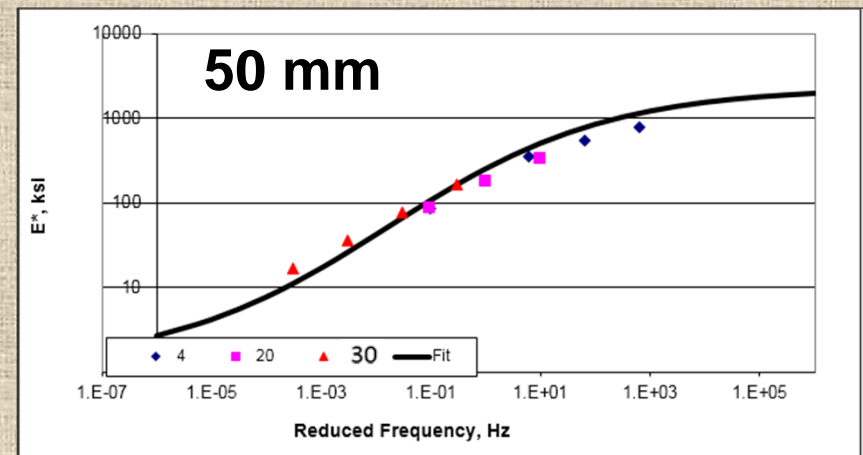
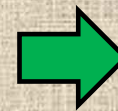
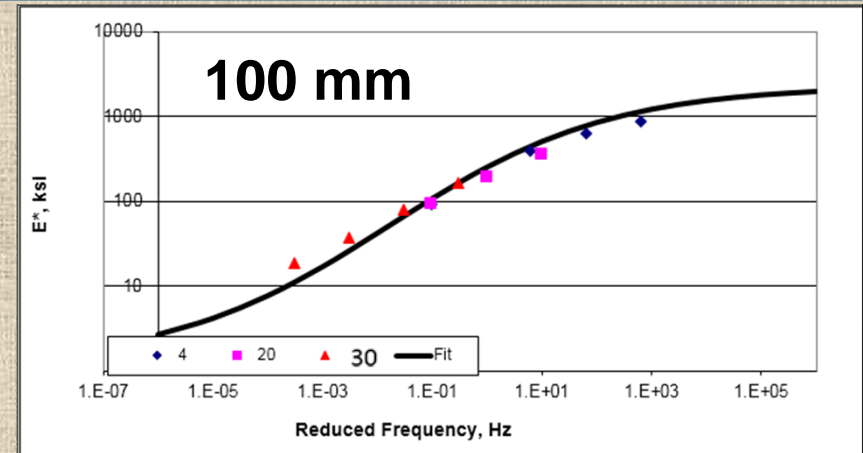


Slab variability

Boxplot of Dynamic Modulus values at 4°C

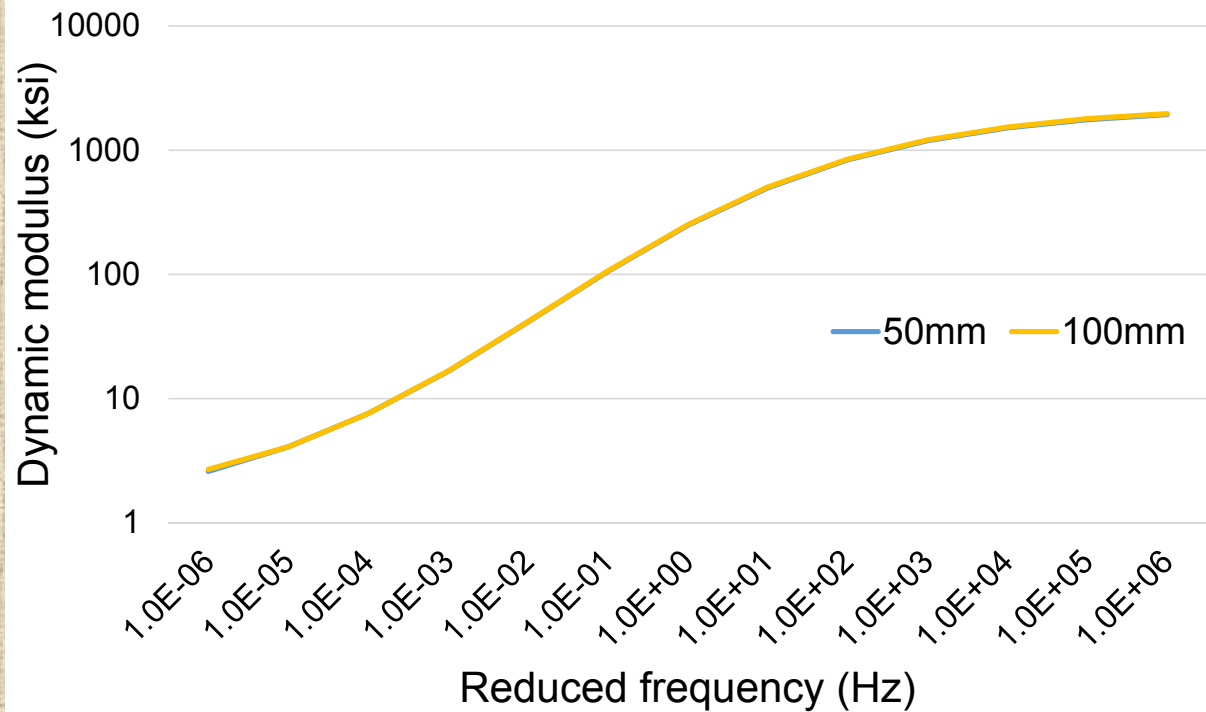


Master curves



100mm vs 50mm test specimens

Master Curve of 100 mm vs 50 mm



Reduced frequency (Hz)	Dynamic modulus (ksi)	
	50mm	100mm
1.0E-06	2.6	2.7
1.0E-05	4.1	4.1
1.0E-04	7.6	7.6
1.0E-03	16.6	16.7
1.0E-02	41.4	41.7
1.0E-01	105.8	106.9
1.0E+00	248.5	251.5
1.0E+01	498.3	505
1.0E+02	835.3	847.6
1.0E+03	1195	1213.7
1.0E+04	1514	1538.5
1.0E+05	1762	1790.5
1.0E+06	1937	1968.9

Conclusions & Recommendations

There is enough evidence to conclude:

- PReSBOX™ can be used as a more effective alternative to conventional compactors as negligible variability exists between the four OGPA slabs that were prepared using PReSBOX™.
- 50mm diameter Open Graded Porous Asphalt (OGPA) test specimens can be used as a suitable alternative to the conventional 100mm diameter test specimen.

Future research to:

- Assess different types of OGPA mixes.
- Investigate different coring directions
- Carry out tests on 38 mm diameter specimens

THANK YOU!

Questions?