



Sanral Field testing: Latest Benchmark data

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- Benchmarking objectives
- Summary of data collection to date
- Selected speed effects
- Selected transverse location effects
- σ_{contact} vs texture depth

Benchmark objectives

- Objective:
 - Benchmark of pavement material parameters**
 - (σ , ϵ , δ)**
 - Not calibration
- Place in Sanral project
 - After materials model developments
- Expected outcome
 - Verification of parameters predicted using materials models

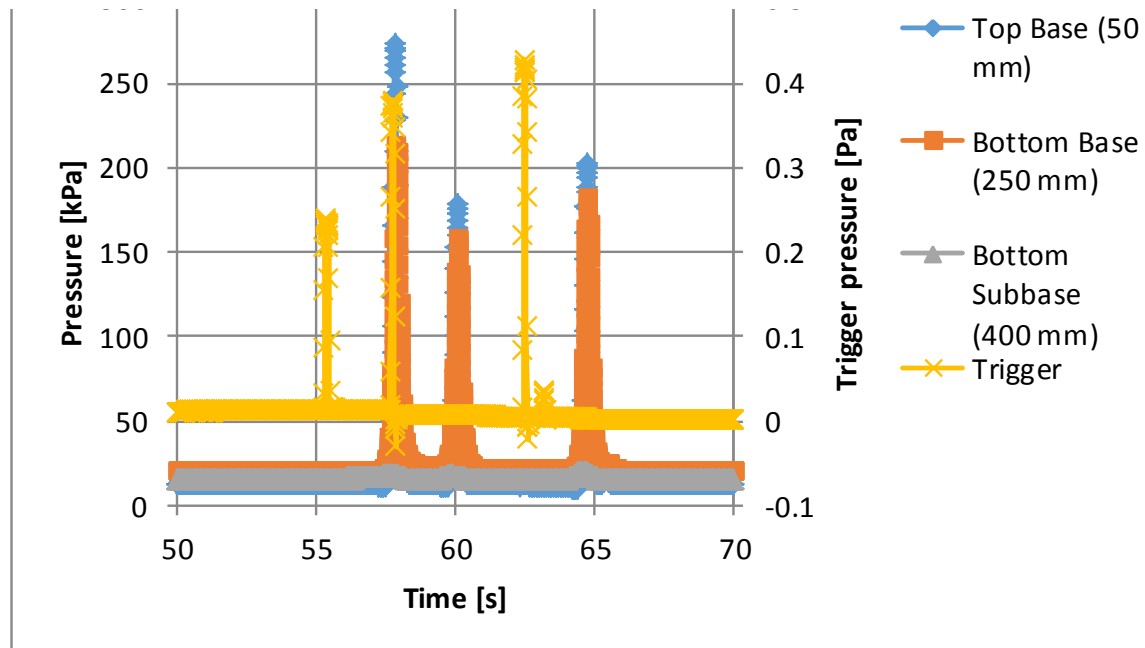
Data collection to date

- Verified all sensors and sections
- Checked functionality and ranges of all sensors
- General set of data

- Finalizing procedures
 - Data collection
 - Linking TSD and DAQ
 - Analyzing data in standard format

Vertical pressure

Location	Axle Load [kN] (Left trail tyres load [kN])	Maximum pressure [kPa]
Top of base (50 mm)	87.7 (42.5)	273
Bottom of base (250 mm)		214
Bottom of subbase (400 mm)		20

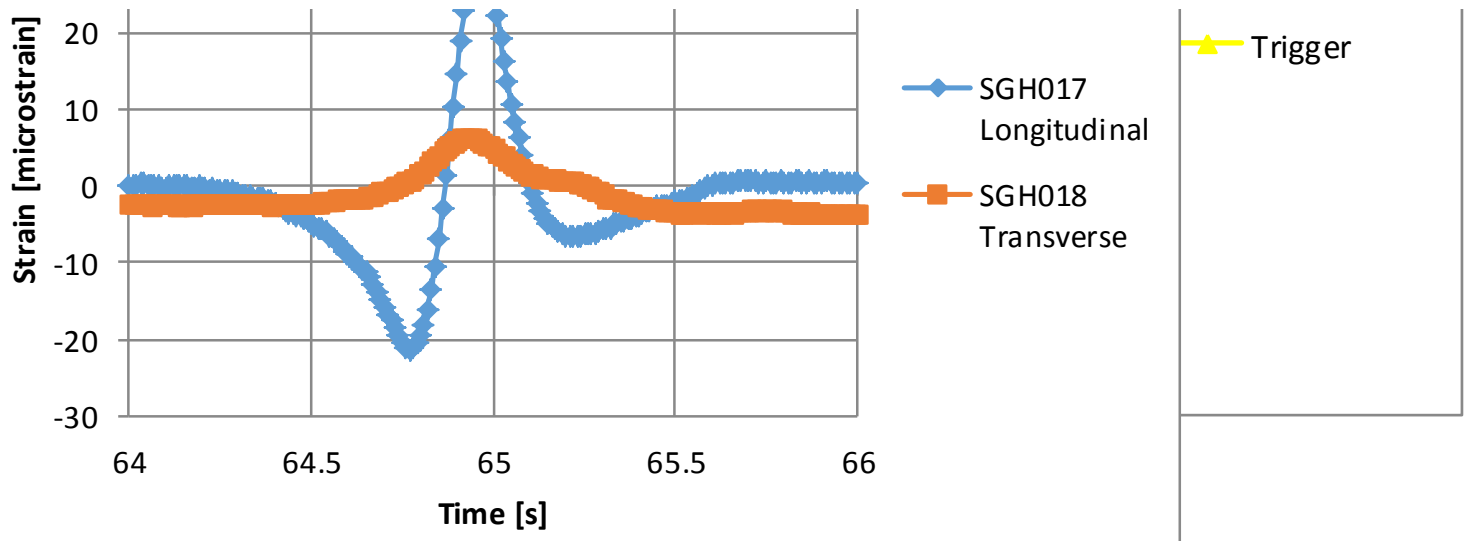


	Section 1	Section 2	Section 3	Section 4	Section 6	Section 7	Section 8
Vertical pressure [kPa]	383	425	263	385	642	395	36

Horizontal strain

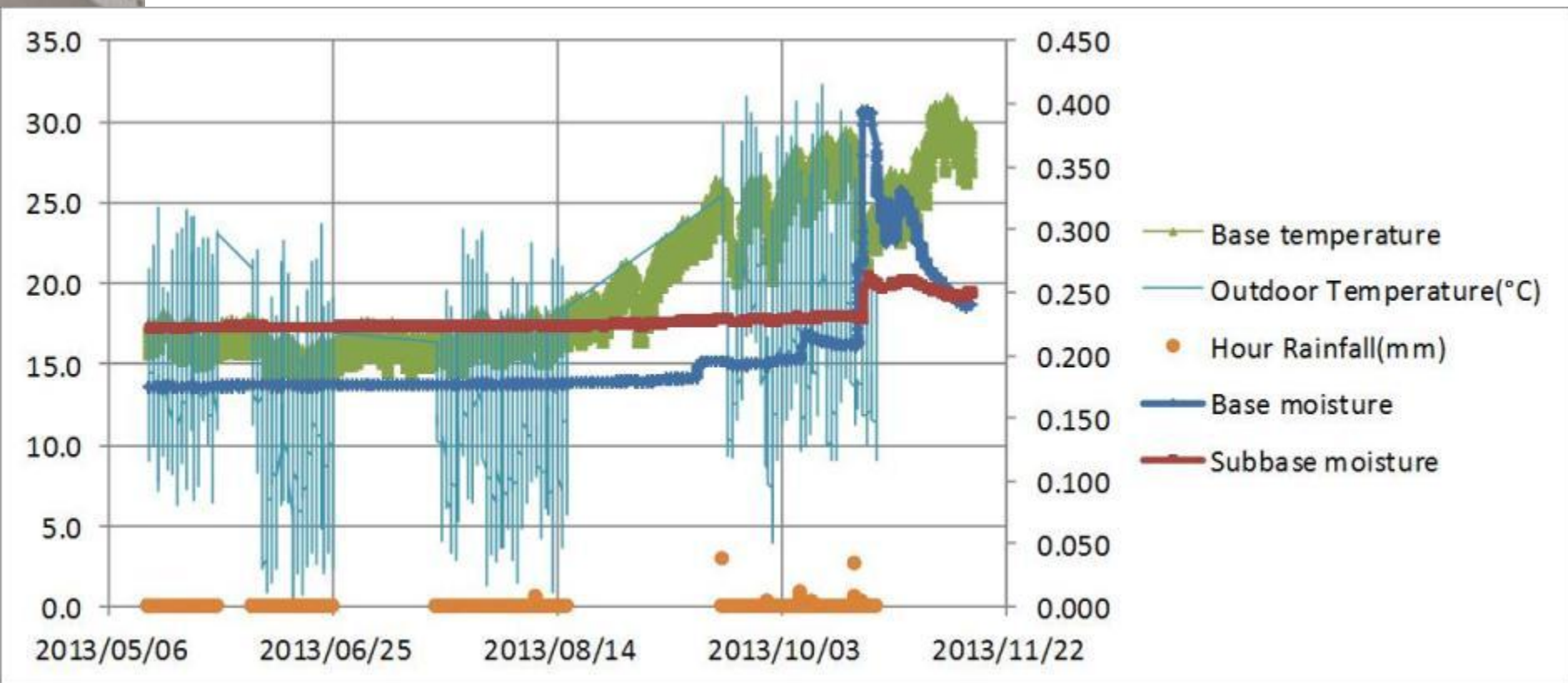


Location	Axle Load [kN]		Longitudinal strain		Transverse strain [$\mu\epsilon$]	
	Section 1	Section 3	Section 4	Section 6	Section 7	Section 8
SGH12	23.79		24.18			
SGH16	33.38		33.38			
SGH17		58.16				
SGH18		32.96				
SGH024				150		
SGH040					88	
SGS003						18



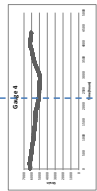
Moisture sensors

Section 3

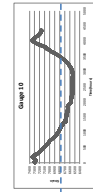
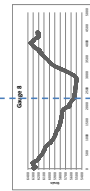
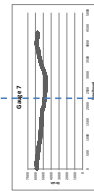
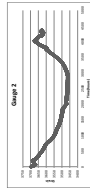
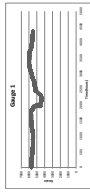
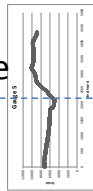


Strain on steel

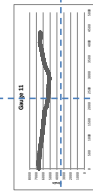
Left part of UTCRCP slab



Centreline

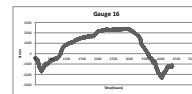
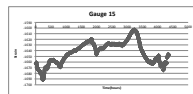
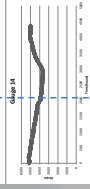
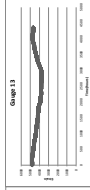
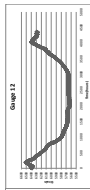


Centreline

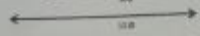
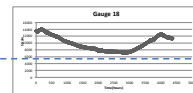
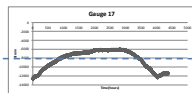


Right part of UTCRCP slab

Centreline

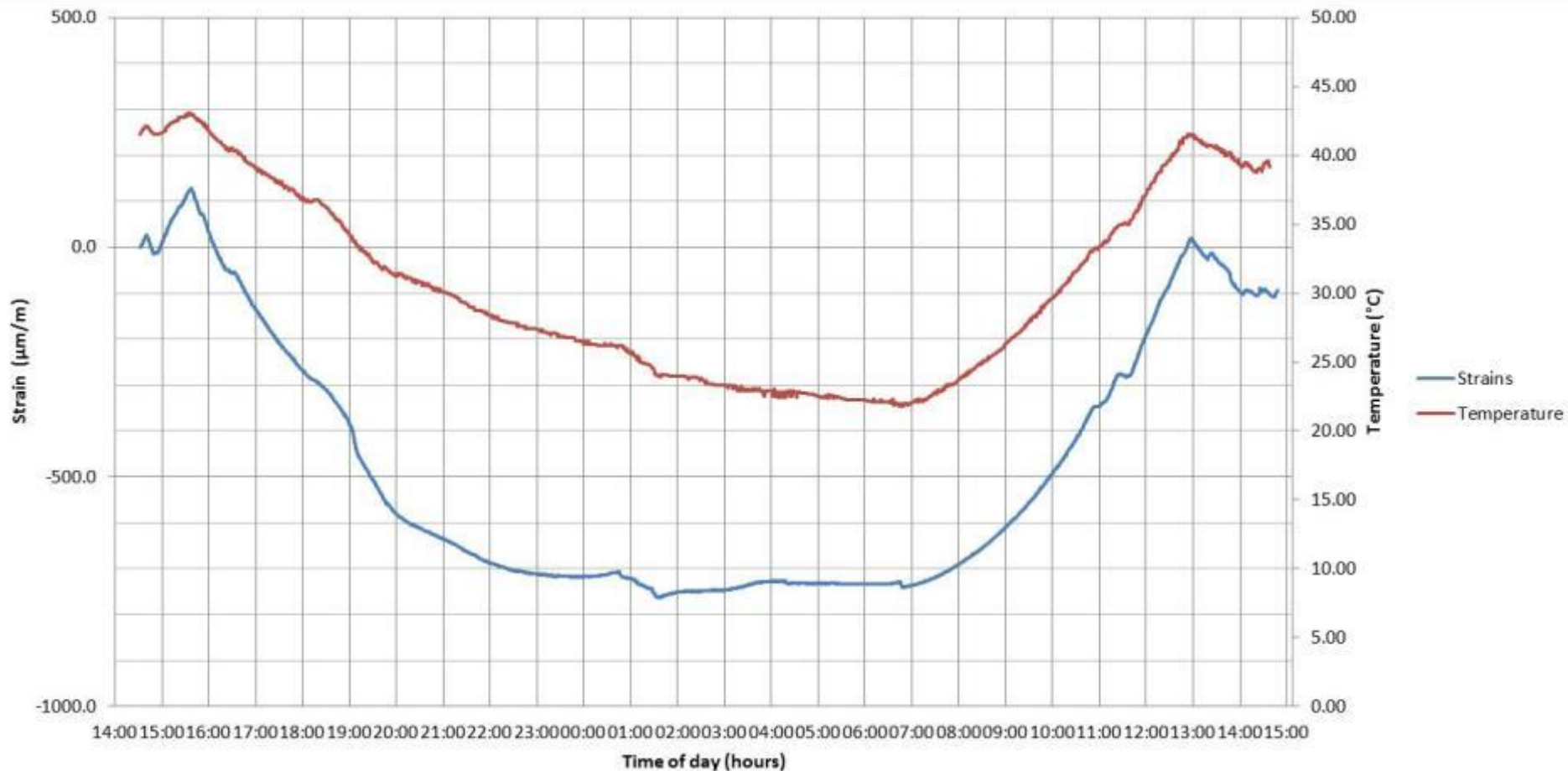


Centreline



Strain on steel

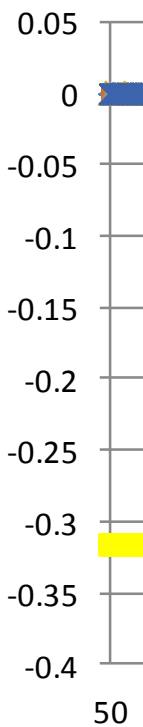
- When do we load and measure with TSD?



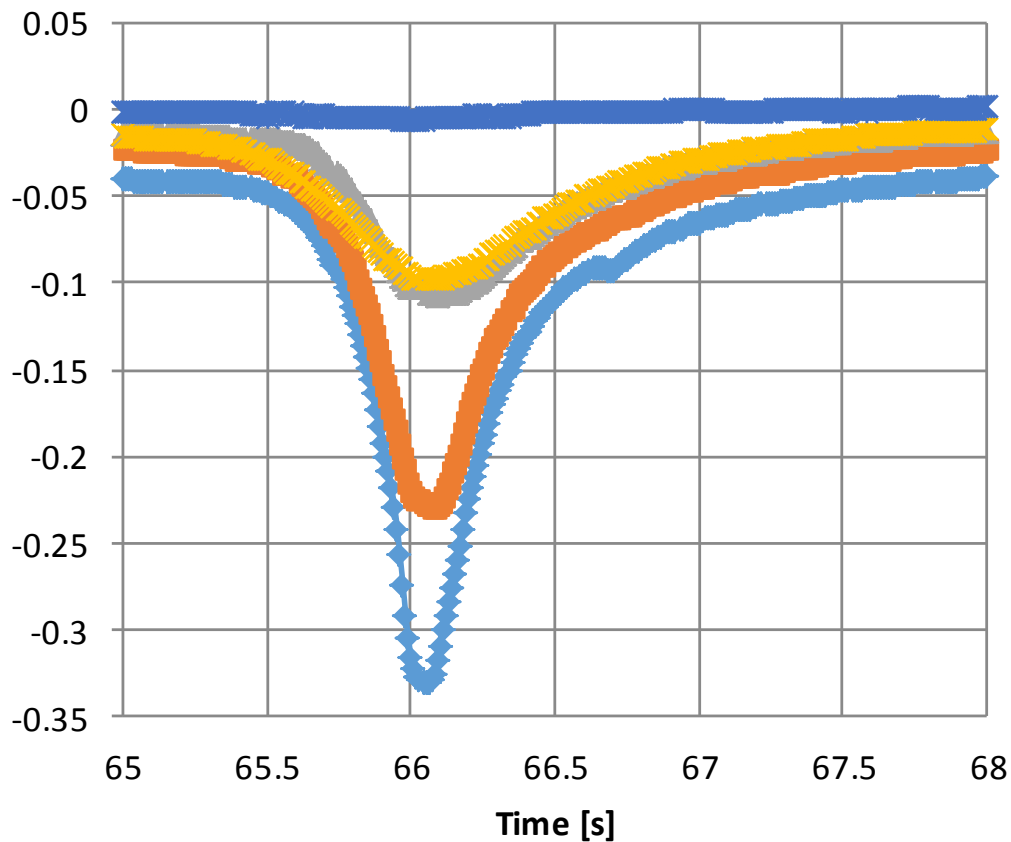
MDD



MDD deflection [mm]

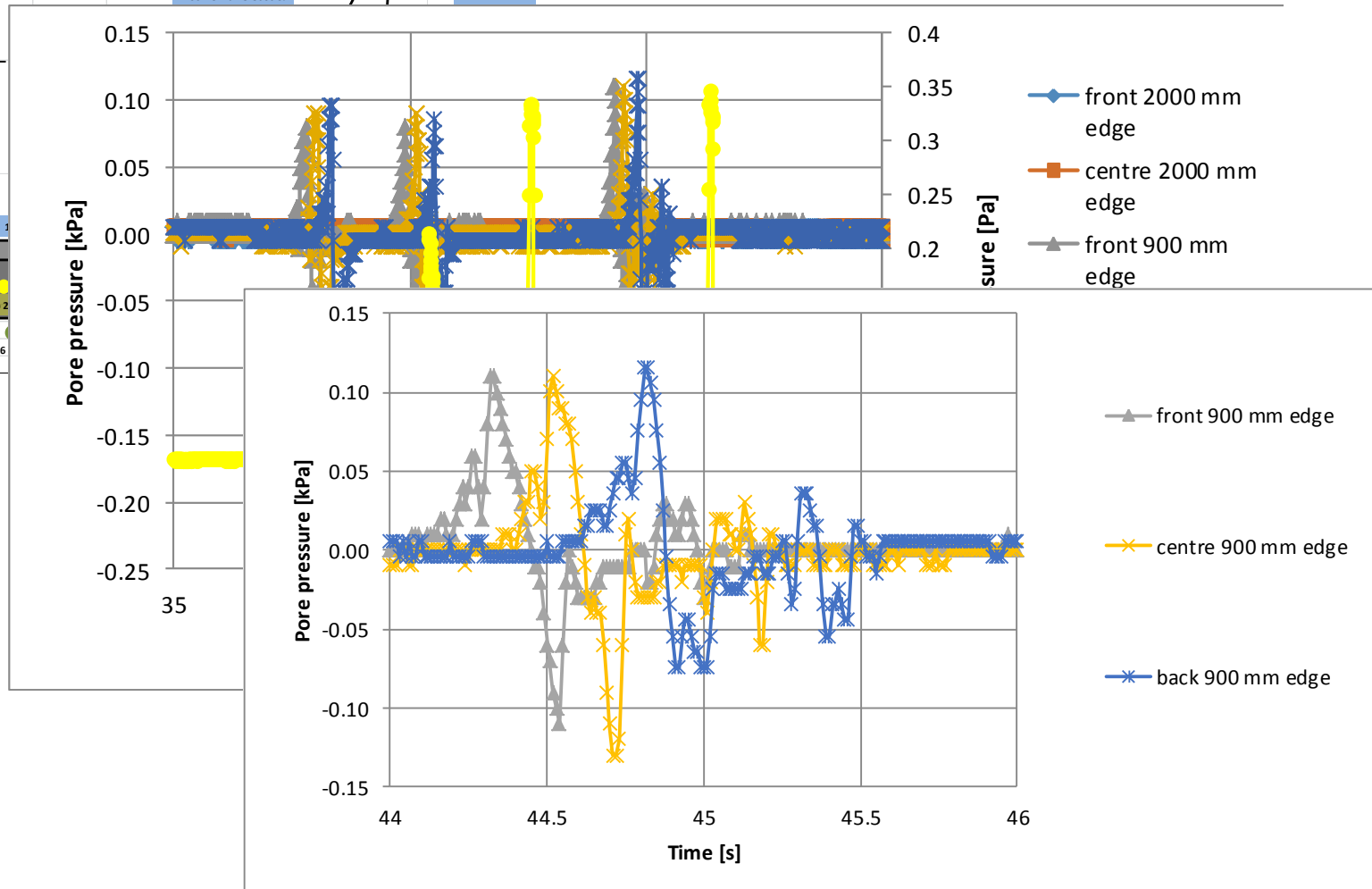
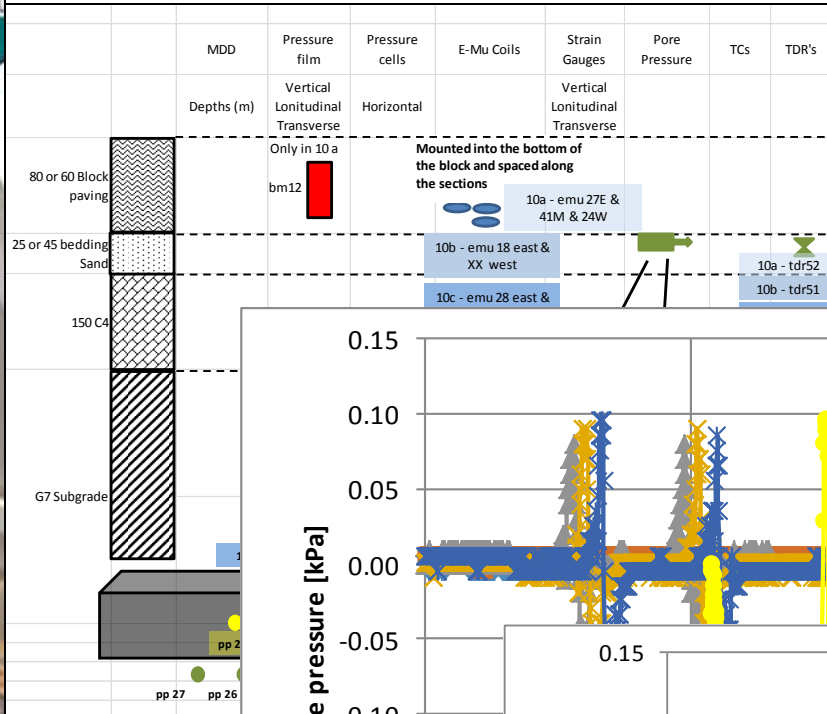


MDD deflection [mm]



- ◆ Top (0 mm)
- Bottom base (190 mm)
- ▲ Bottom subbase (350 mm)
- ✖ Subgrade (510 mm)
- ✖ bottom (900 mm)

Section 10 Block Paving



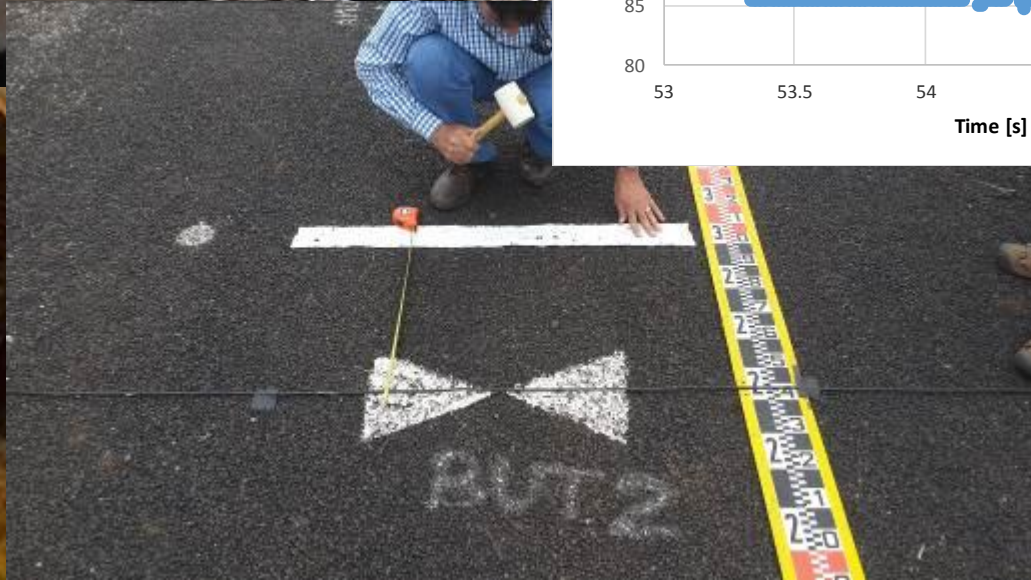
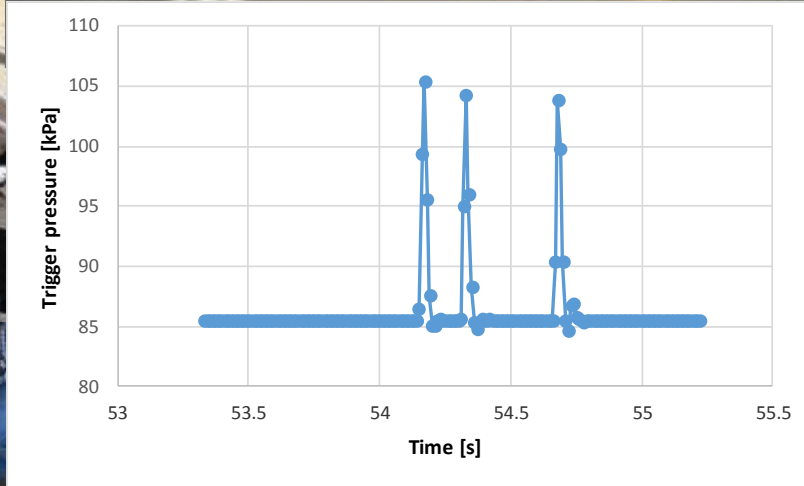
Water table

- Piezometer holes at Sections 2 and 5
- Sections 7 and 9 also
- Dry at 3 m in January 2014

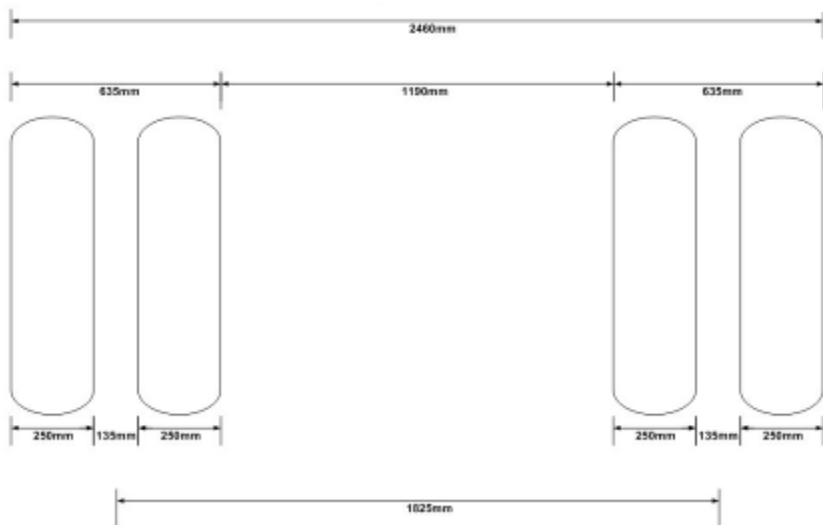
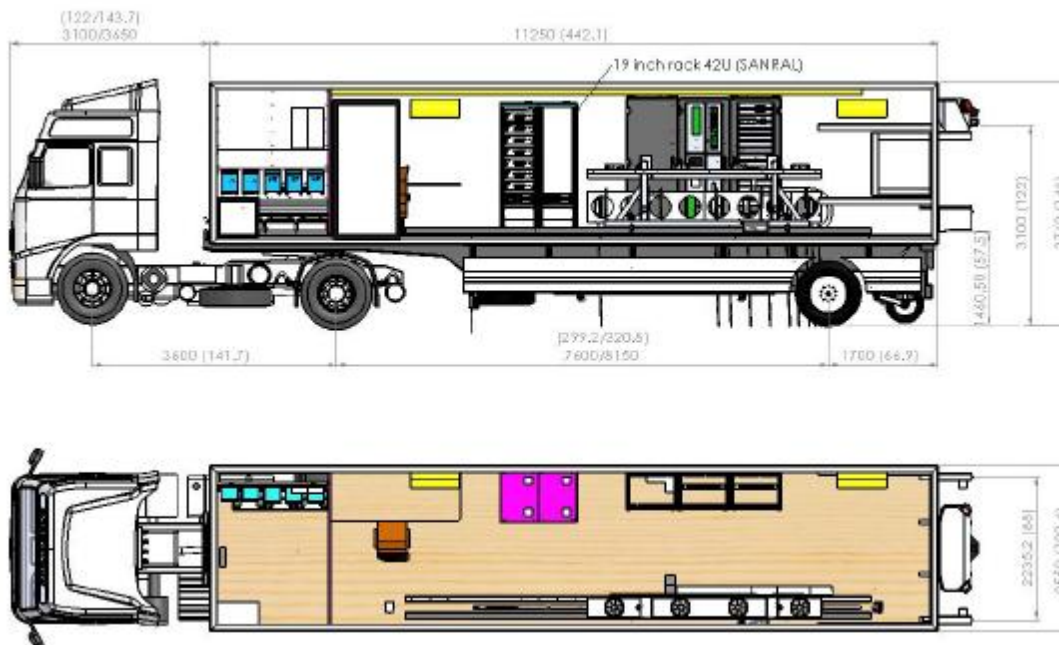


TSD loads

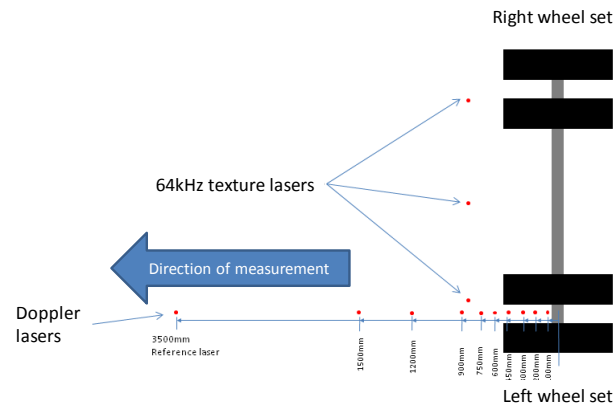
- TSD controlled load and speed
- Monitor load, speed, location
 - Load – trail axle
 - Speed – vehicle
 - Location
 - Longitudinal and transverse
 - Markers on road surface

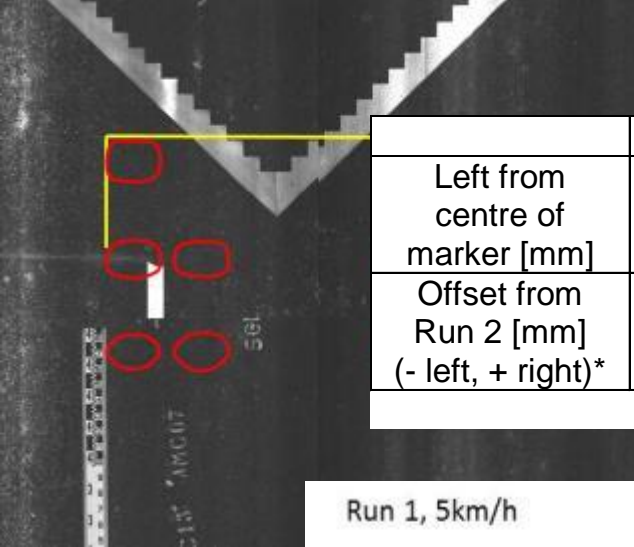


Transverse location



Tyres: 315/80 R22.5





	Run 1	Run 2	Run 3	Run 5	Run 6
Left from centre of marker [mm]	450	750	600	250	400
Offset from Run 2 [mm] (- left, + right)*	300	0	150	500	350



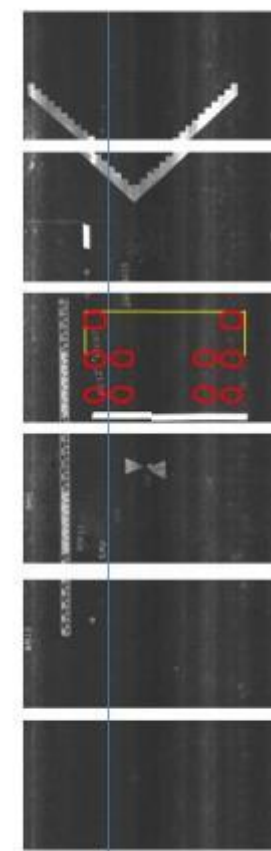
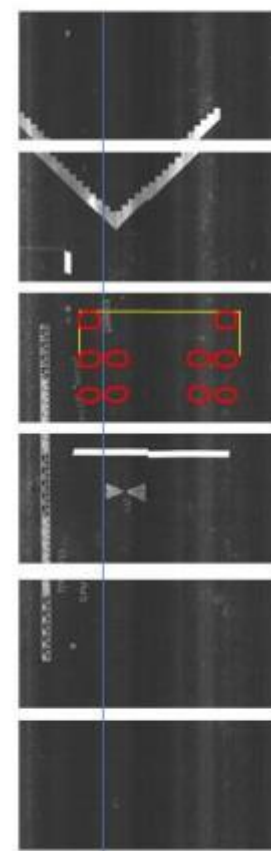
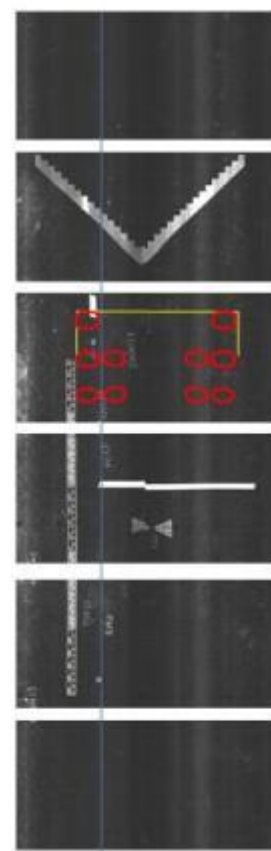
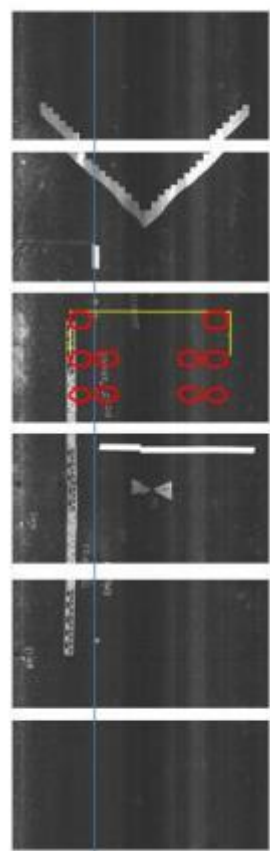
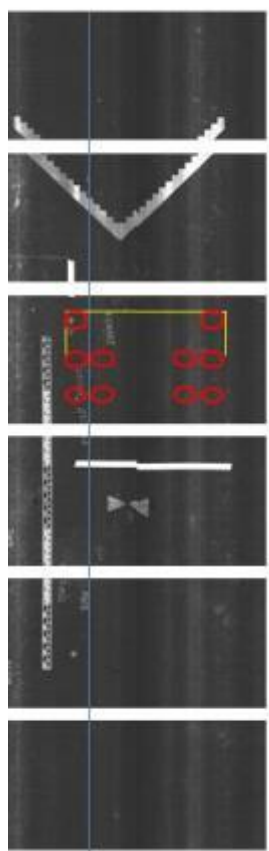
Run 1, 5km/h

Run 2, 20km/h

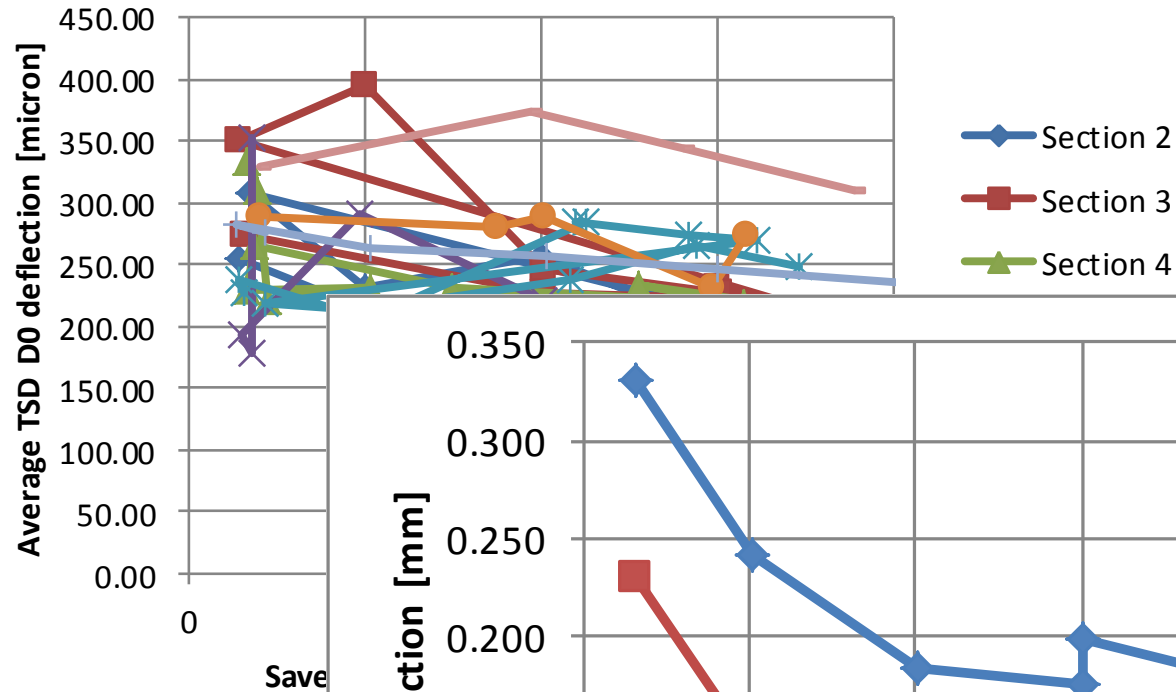
Run 3, 40km/h

Run 5, 60km/h

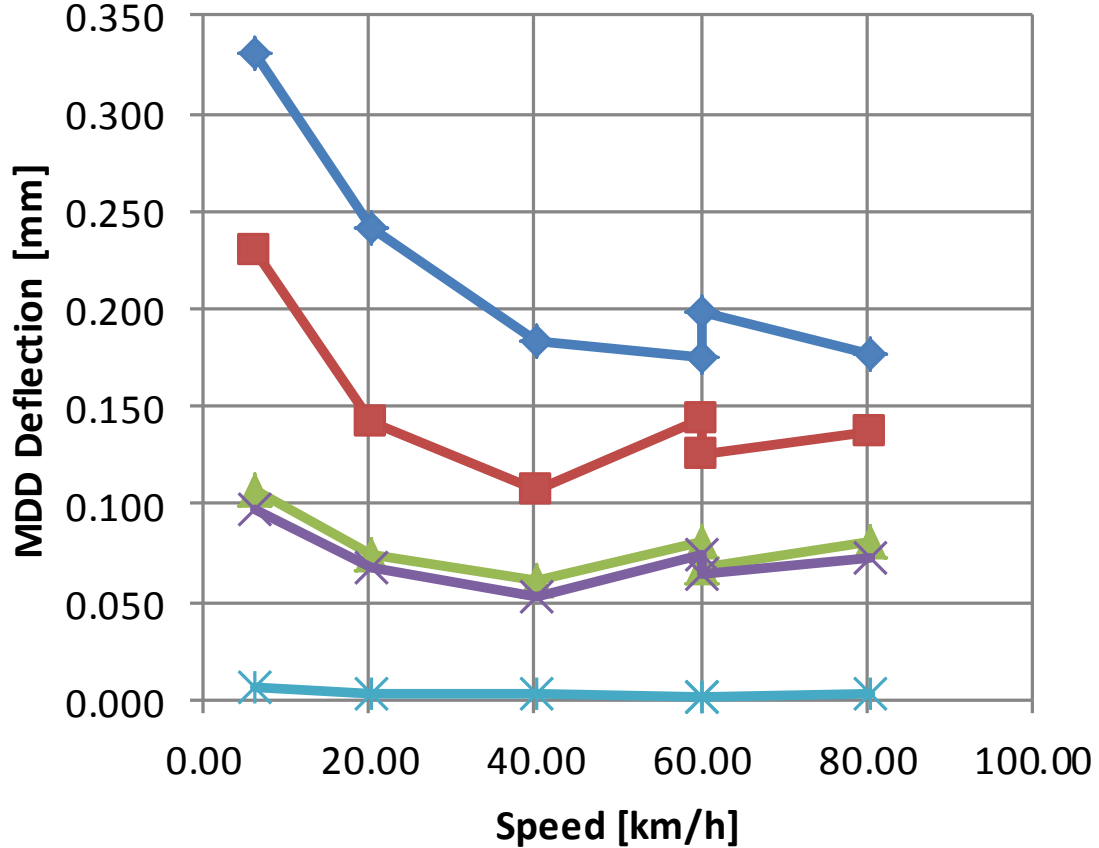
Run 6, 80km/h



Speed analysis

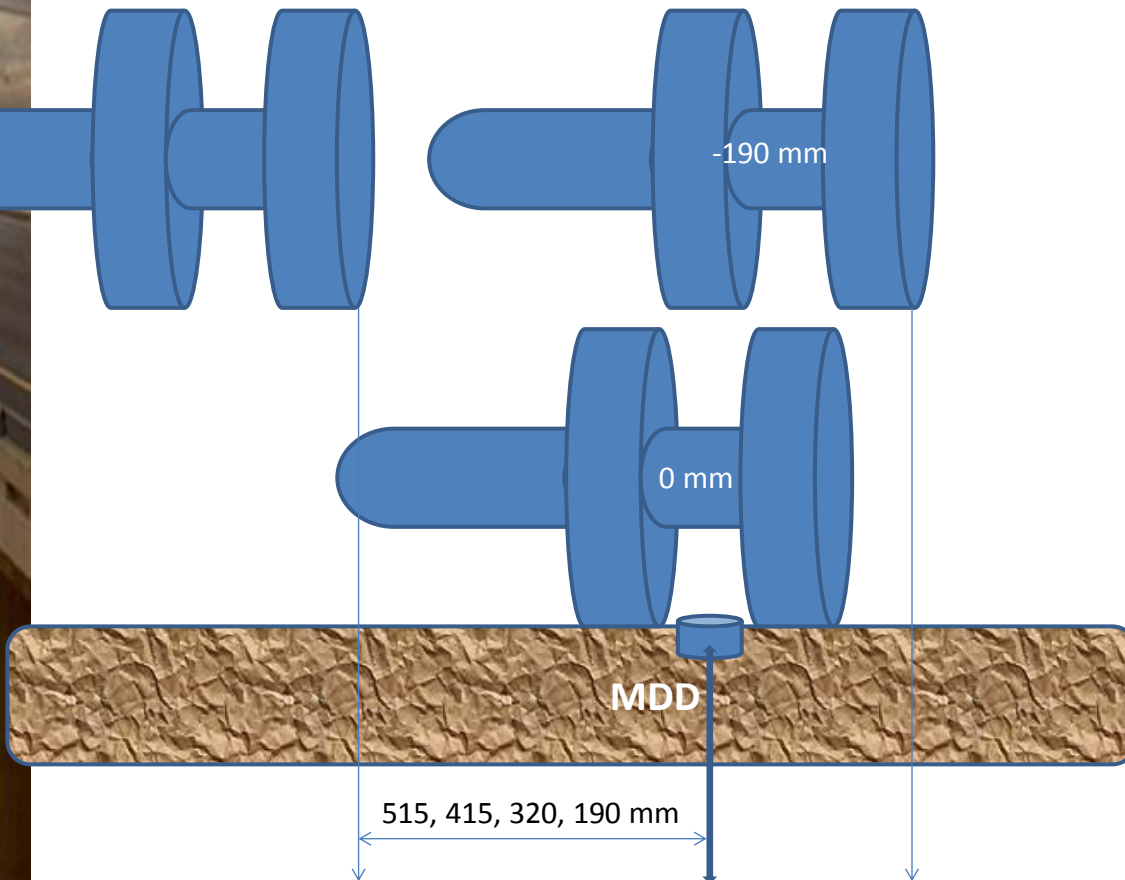


on pavement



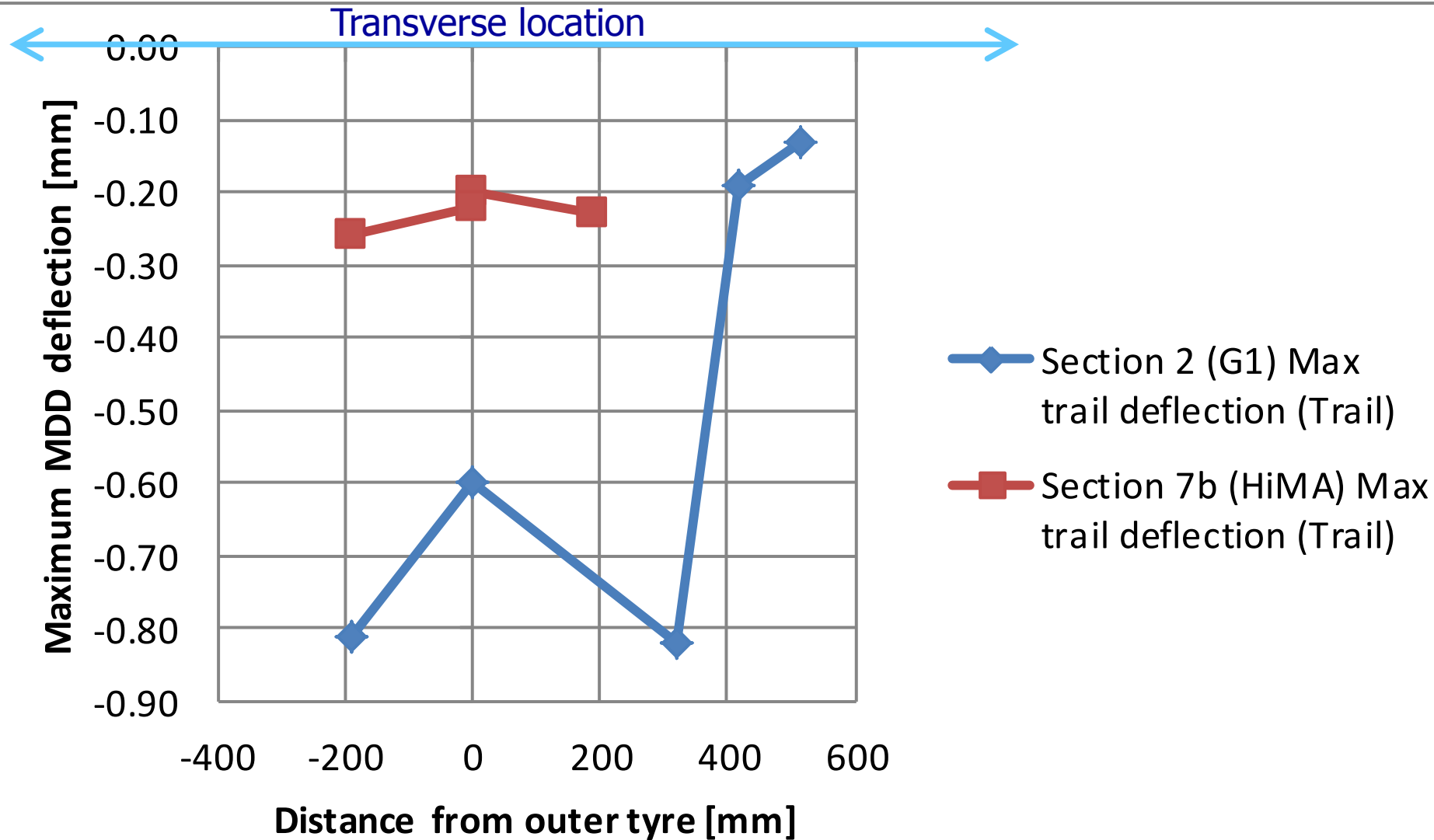
Transverse location analysis

- Deflections due to transverse location of loads



MDD centre to tyre edge [mm]	
Section 2	Section 7b
515	190
415	0
320	0
0	-190
-190	

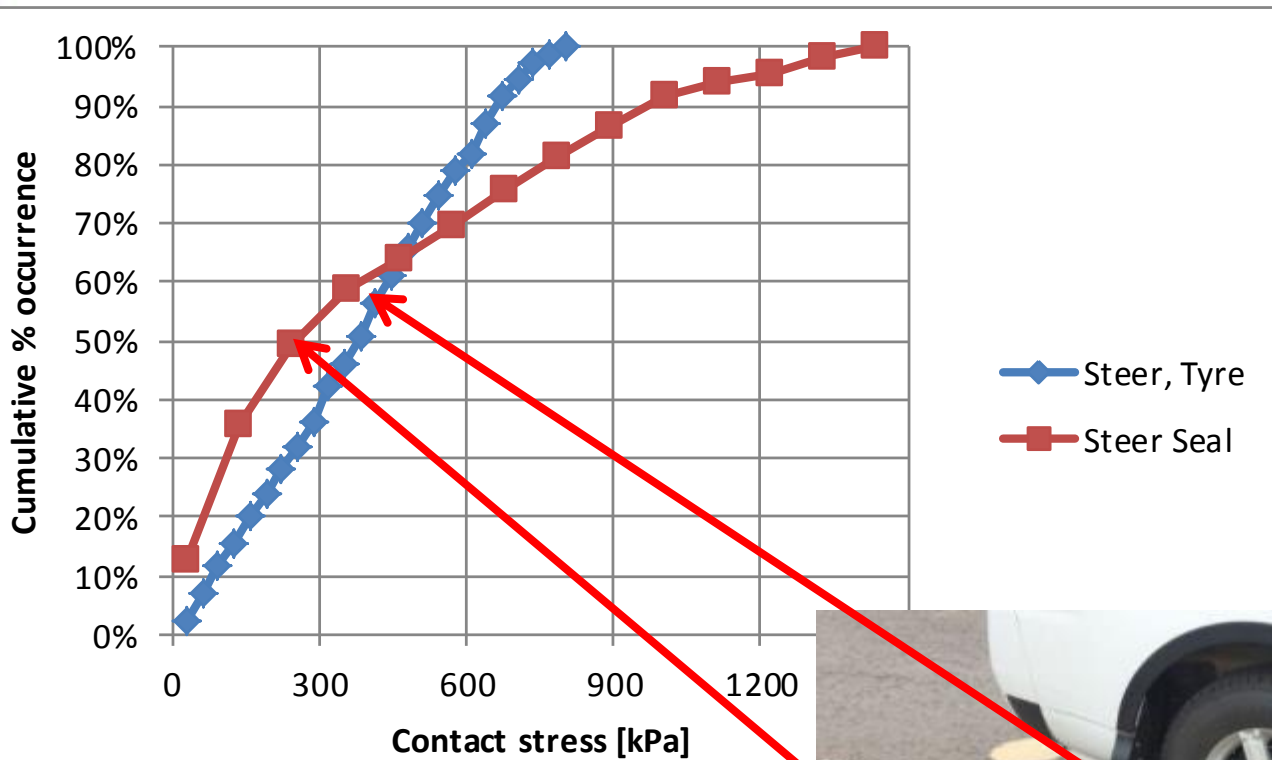
Transverse location analysis



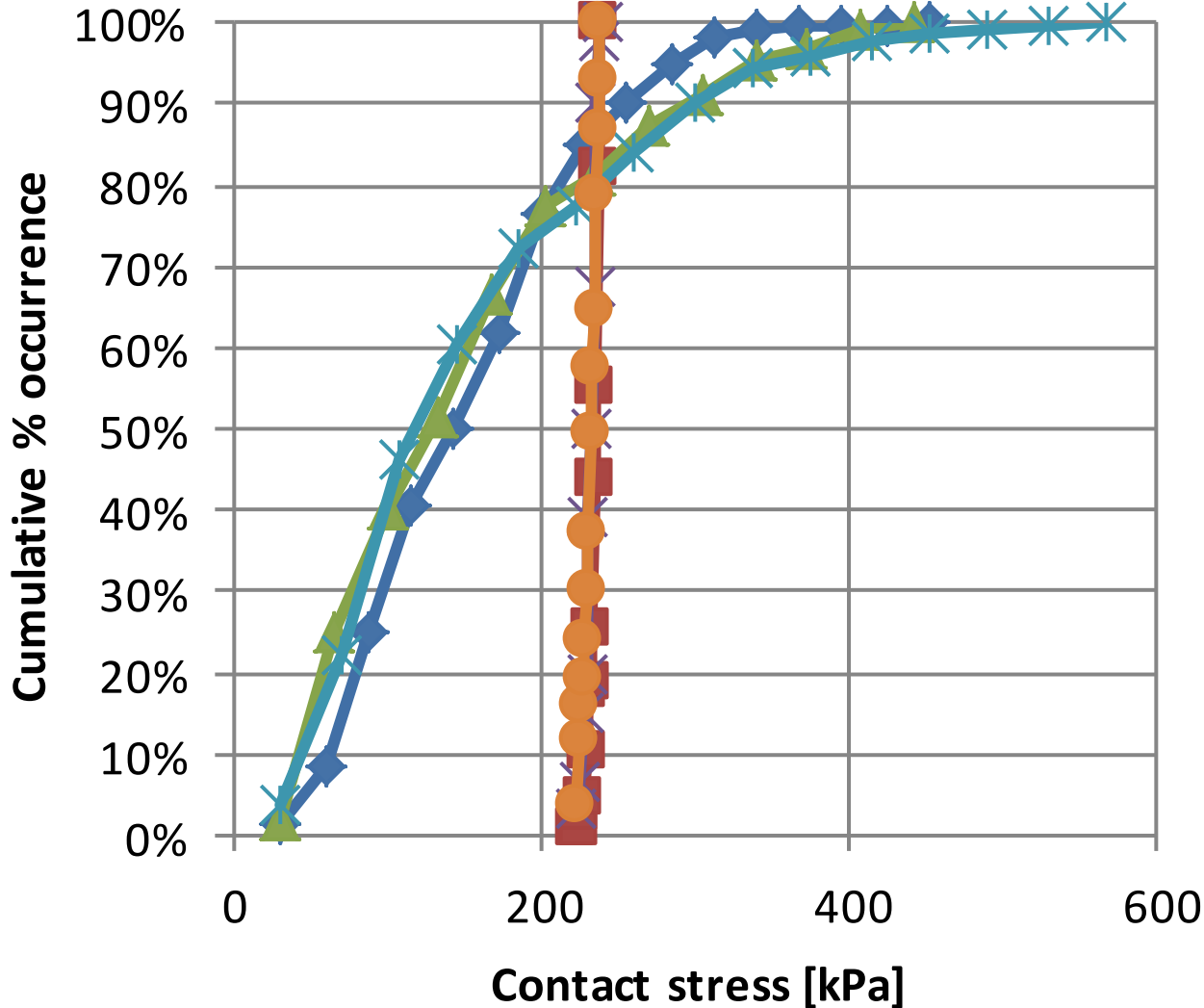
σ_{contact} vs texture depth



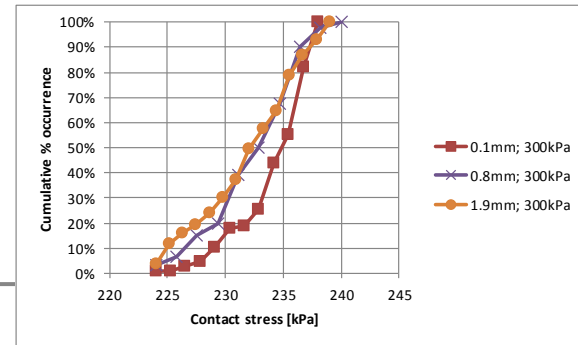
Tyre/seal vs Seal/base σ_{contact}



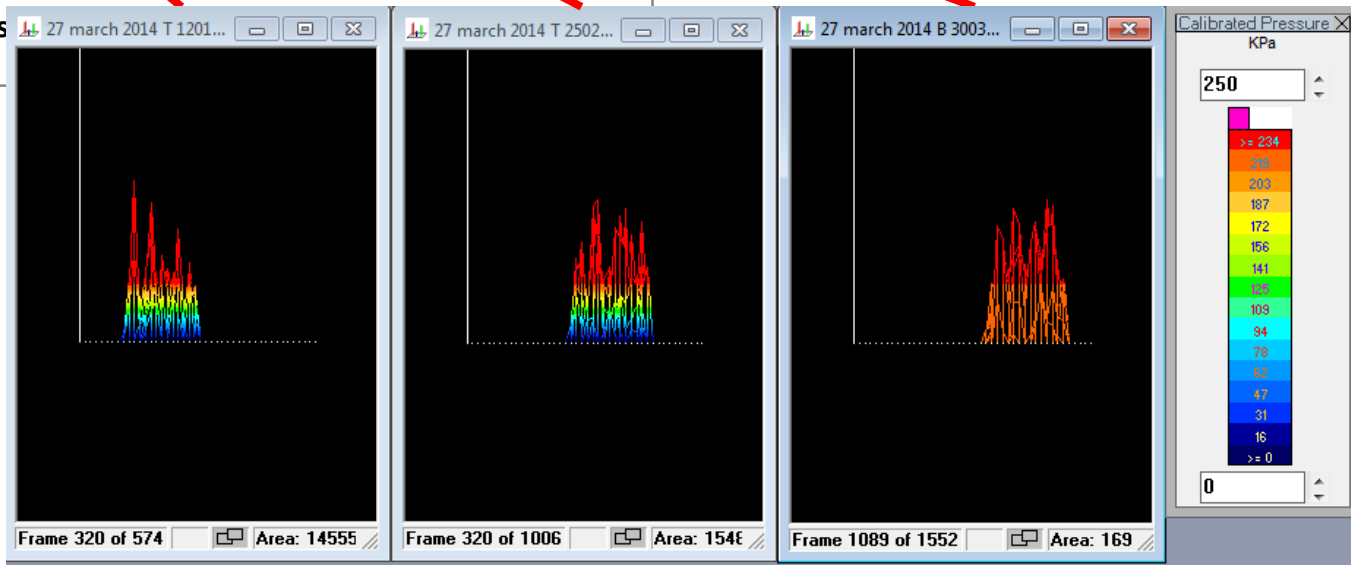
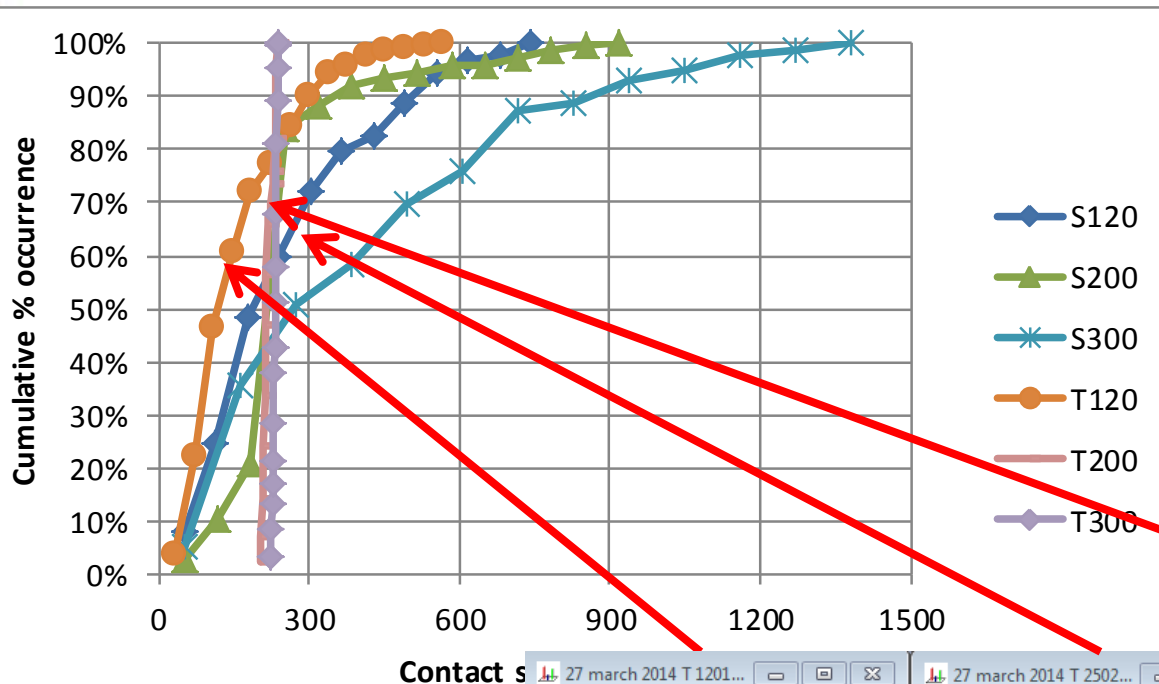
Light vehicle σ_{contact} vs texture



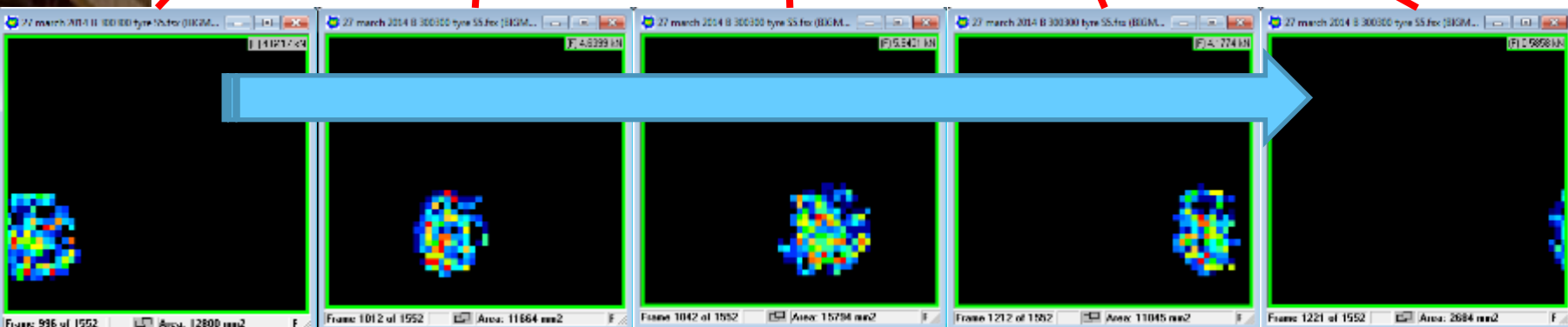
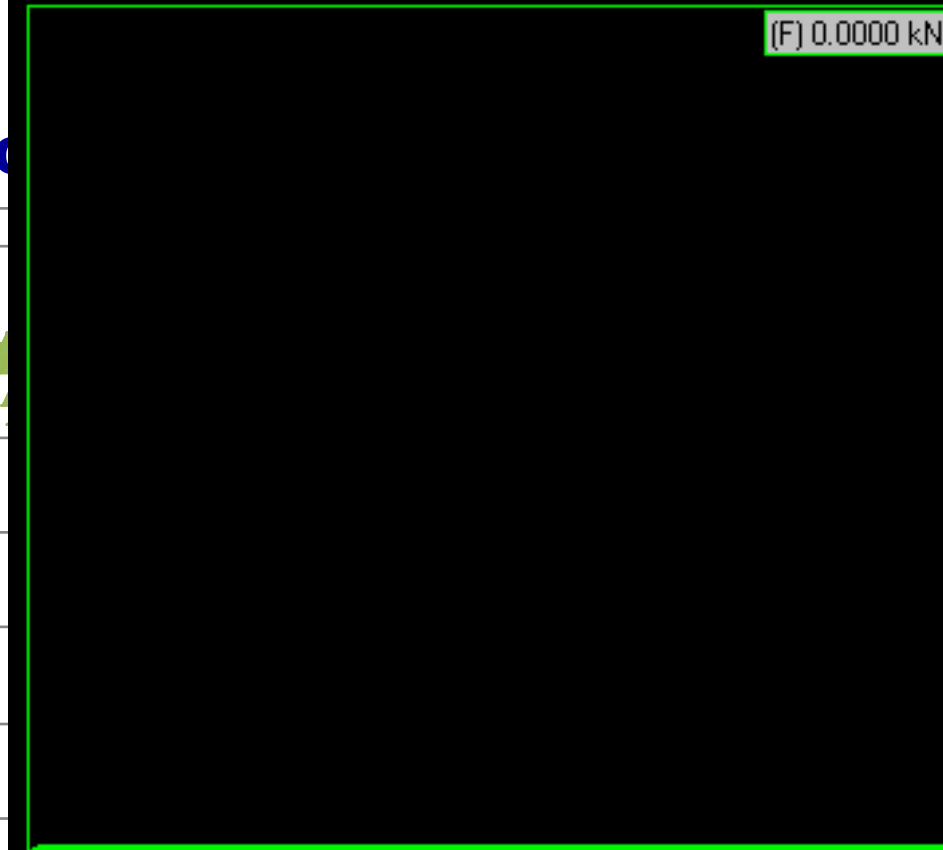
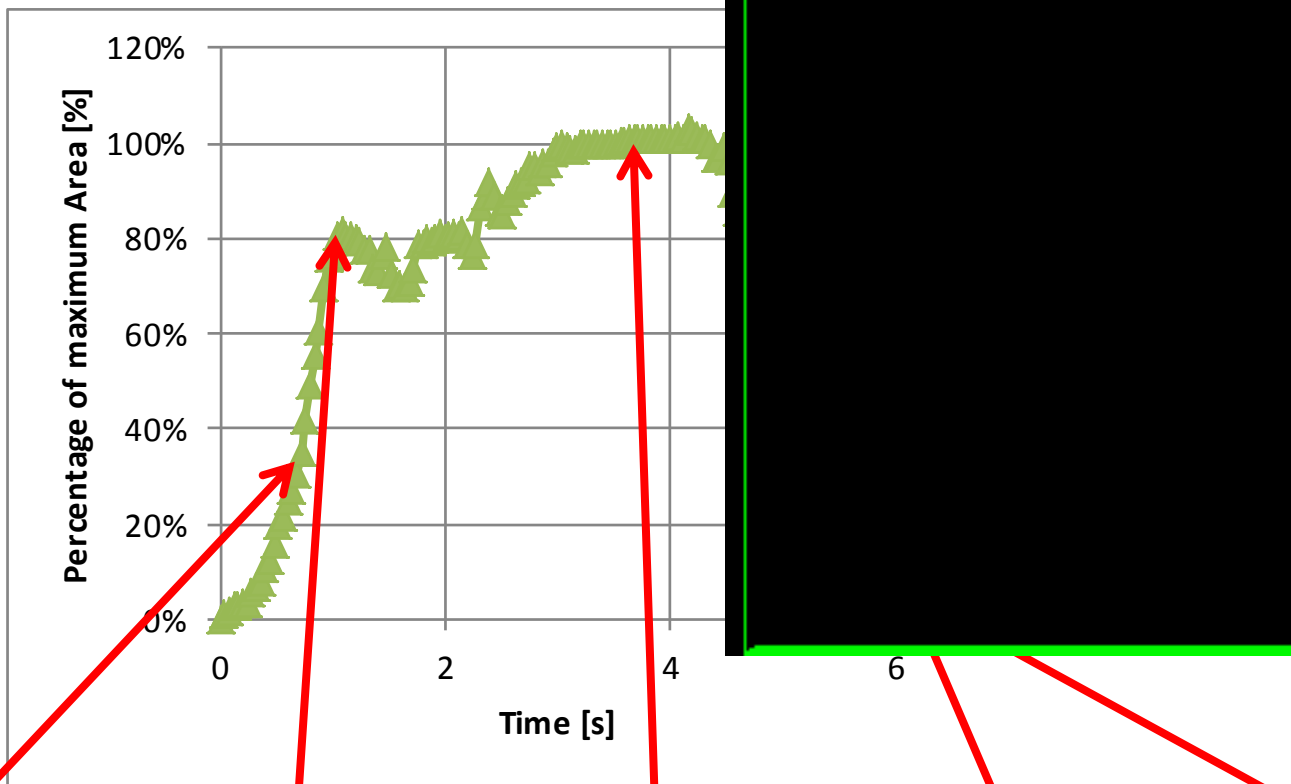
- ◆ 0.1 mm; 120kPa
- 0.1mm; 300kPa
- ▲ 0.8mm; 120kPa
- ✕ 0.8mm; 300kPa
- ✱ 1.9mm; 120kPa
- 1.9mm; 300kPa

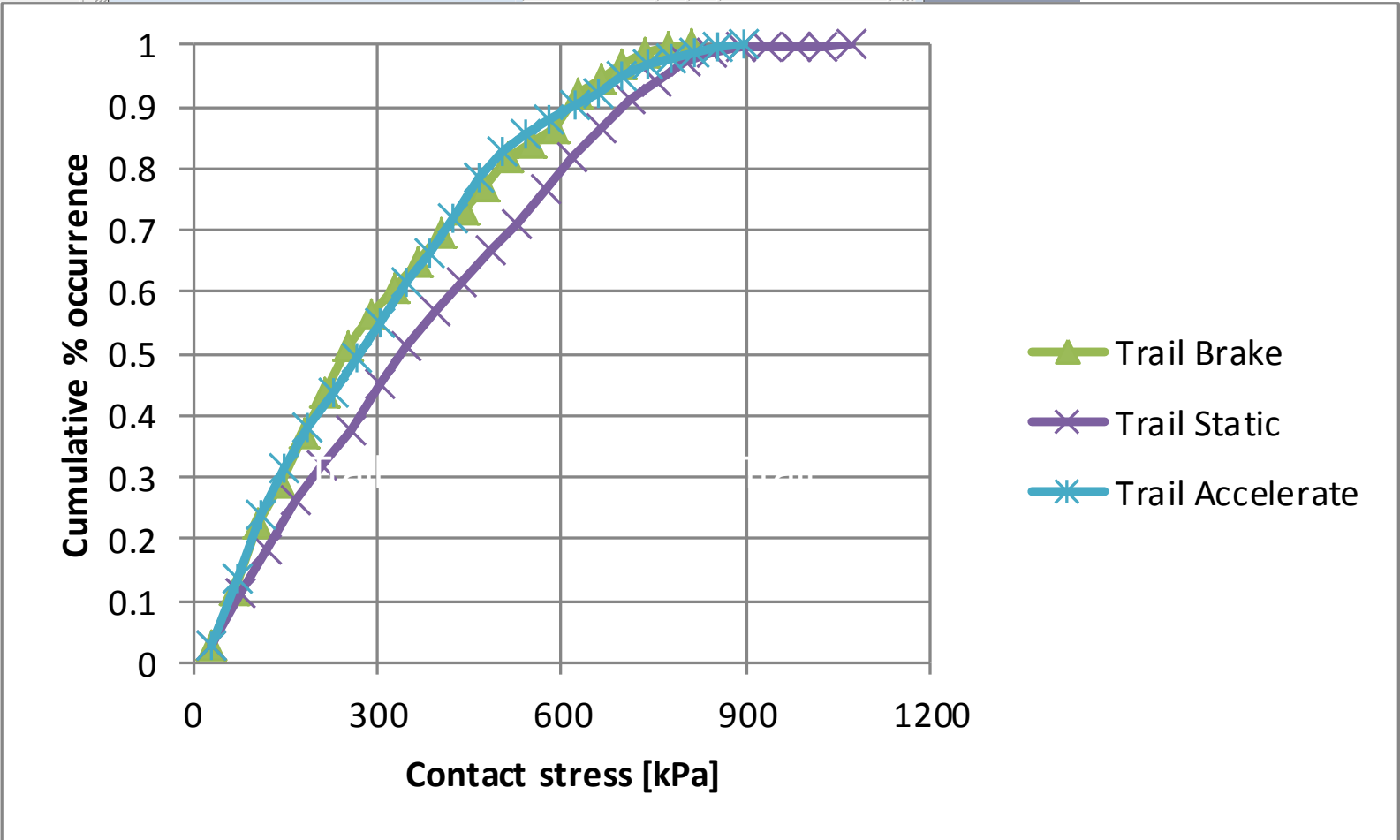
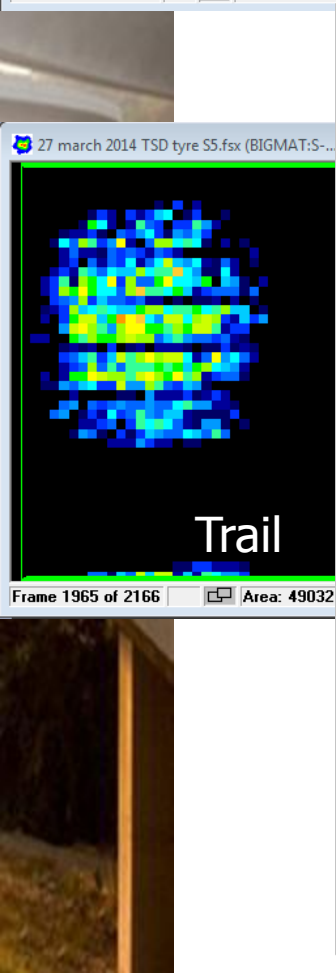
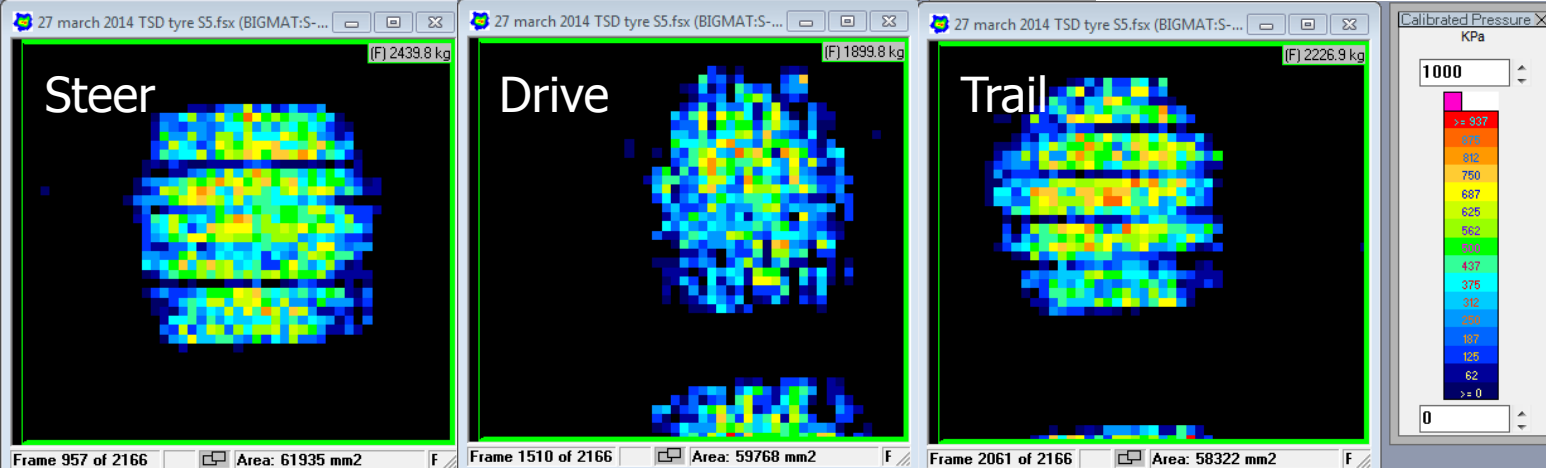


Light vehicle σ_{contact} vs texture

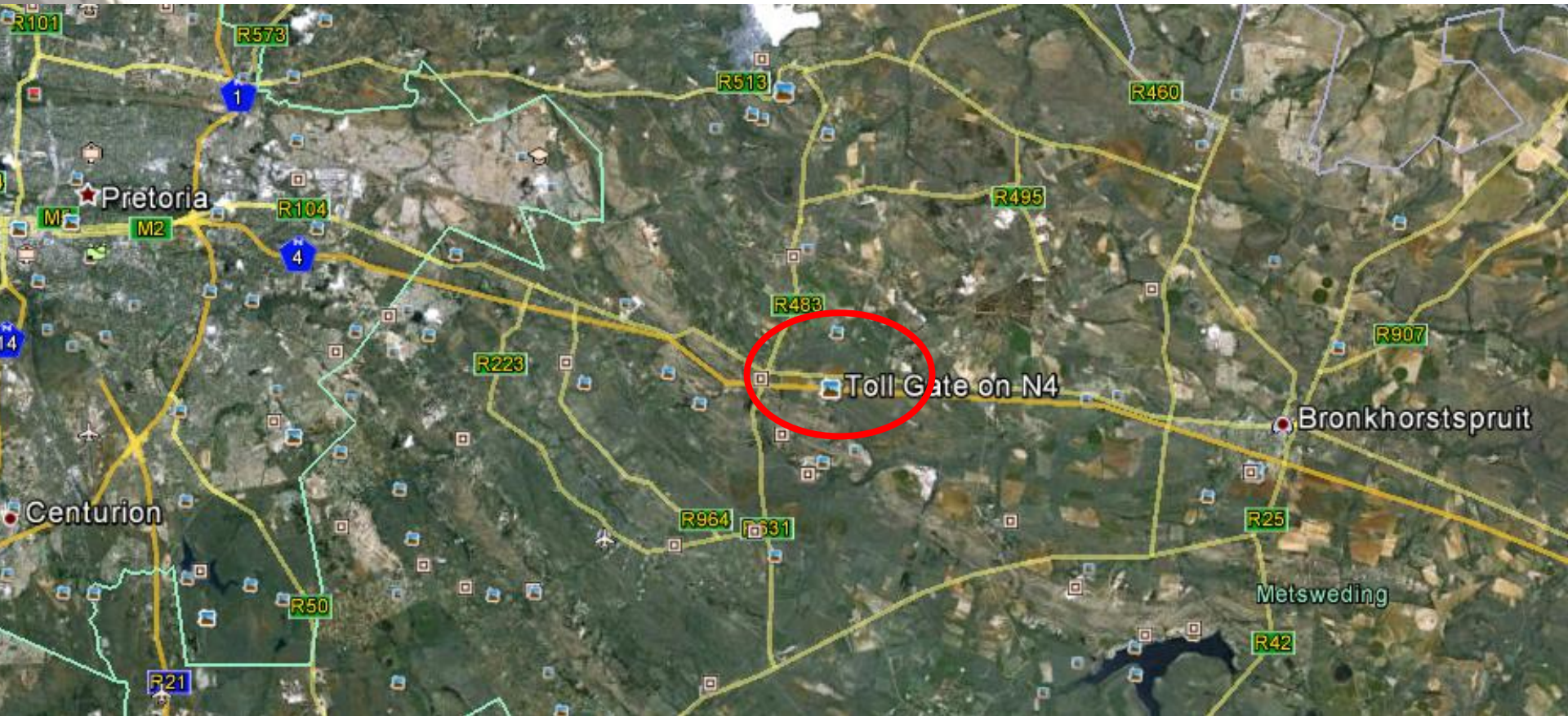


Light vehicle σ_{co}





Location



Location

- R104 Bronkhorstspuit
- 10 pavement types (21 sections)
- Between 16 m and 100 m long
- 2 lanes
 - 1 instrumented (outer)
 - 1 duplicate – normal traffic



Test sections

- Natural gravel base
- Inverted G1
- Foam Treated Base (FTB)
- Emulsion Treated Base (ETB)
- Cement Treated Base (CTB)
- Bitumen-based (HiMA)
- Bitumen-based (BTB)
- Jointed Concrete
- Ultra-Thin Continuously Reinforced Concrete Pavement (UTCRCPP)
- Block paving