Determination of binder content of asphalt using the Ignition Oven

COLAS

WE OPEN THE WAY

Background

- **Past experiences**
  - NZ aggregate varied considerably
  - Binder content and grading results variable
  - Correction factor not easy to achieve
  - Confidence in method lost

- **Benefits**
  - Easy sample preparation
  - Fast results
  - Secondary burner (+800°C)
  - No chemical used

Moving Forward

- **Colas NZ Investigated Ignition Oven Accuracy and Benefits**
  - Duplicate asphalt samples tested with both chemical and ignition oven
  - Results compared and calibration factor determined
  - Aim to obtain confidence in results and then for future compliance and acceptance on projects

- **Reduced ignition temperature**
  - NCHRP 09-56A Identifying Influences on and Minimizing the Variability of Ignition Furnace Correction Factors

  - Reducing the test temperature of AASHTO T 308 method from 538°C to 427°C

- **Colas NZ Investigated Ignition Oven vs Chemical for Asphalt Production at 427°C**

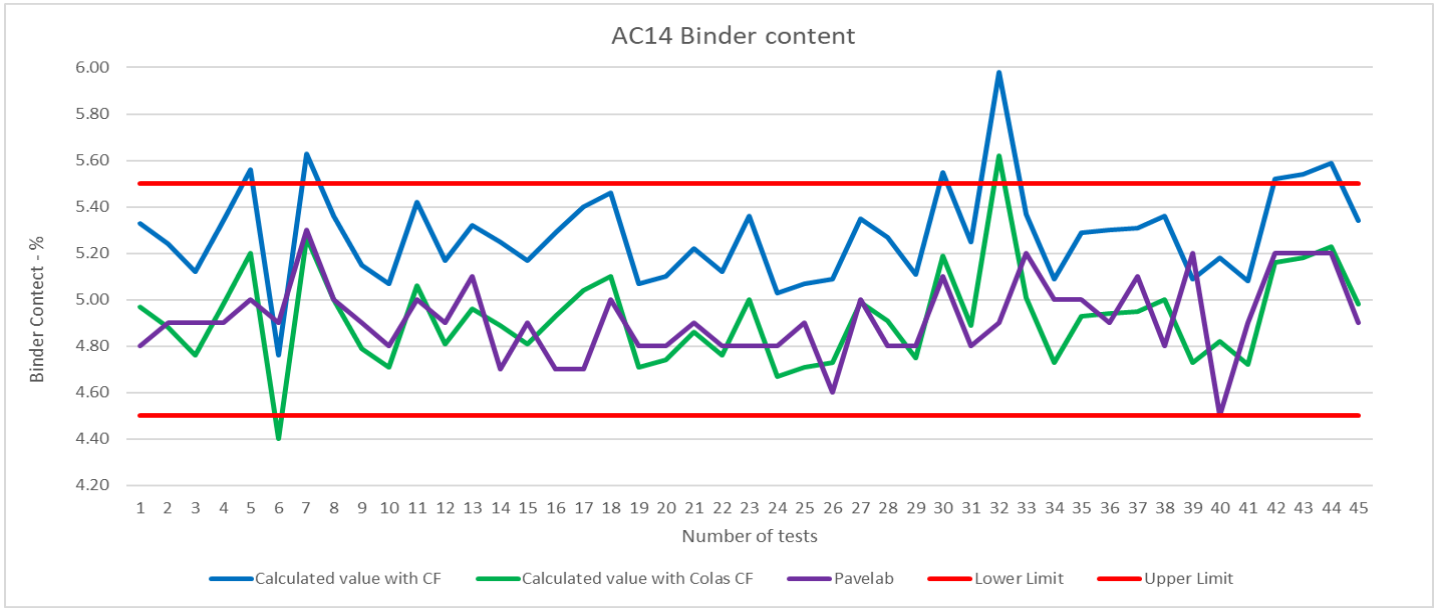
Ignition Oven vs Chemical Asphalt Production

- **Ignition Oven Binder Content at 427 °C**
  - Option 1 – Binder content determined by Ignition Oven internal balance
  - Option 2 – Manual weighing on external balance

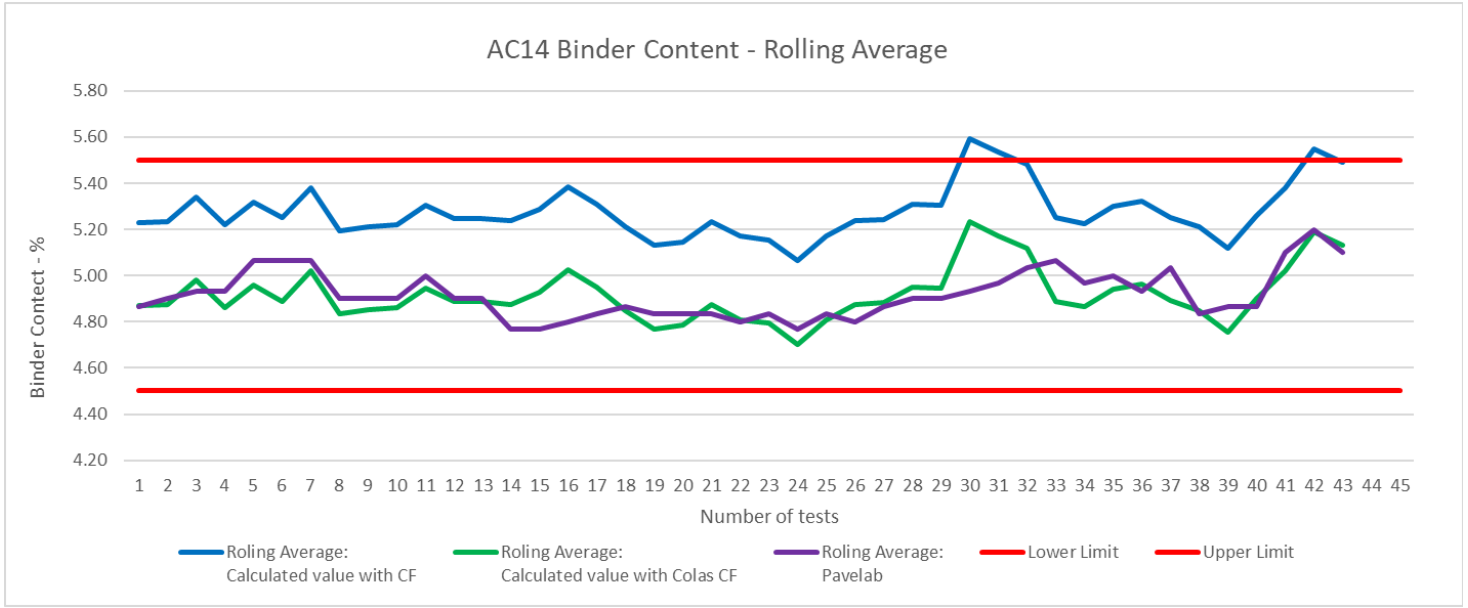
- **Binder Content Correction Factor determination**
  - 1st Method – ASTM D6307 - Average of three laboratory prepared mixes used
  - 2nd Method – Calibration Factor that gave the closest binder content to that measured with the Chemical Method

- **Particle Size Distributions Compared Ignition Oven vs Chemical Method**

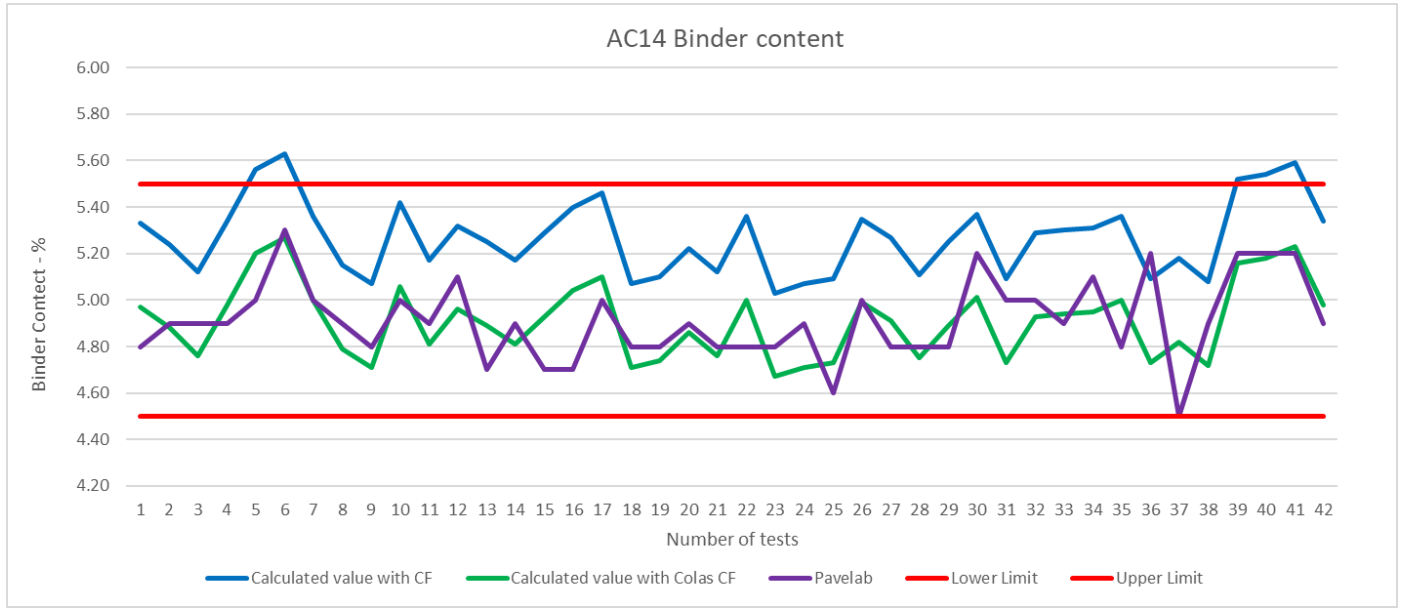
Binder Content Correction Factor

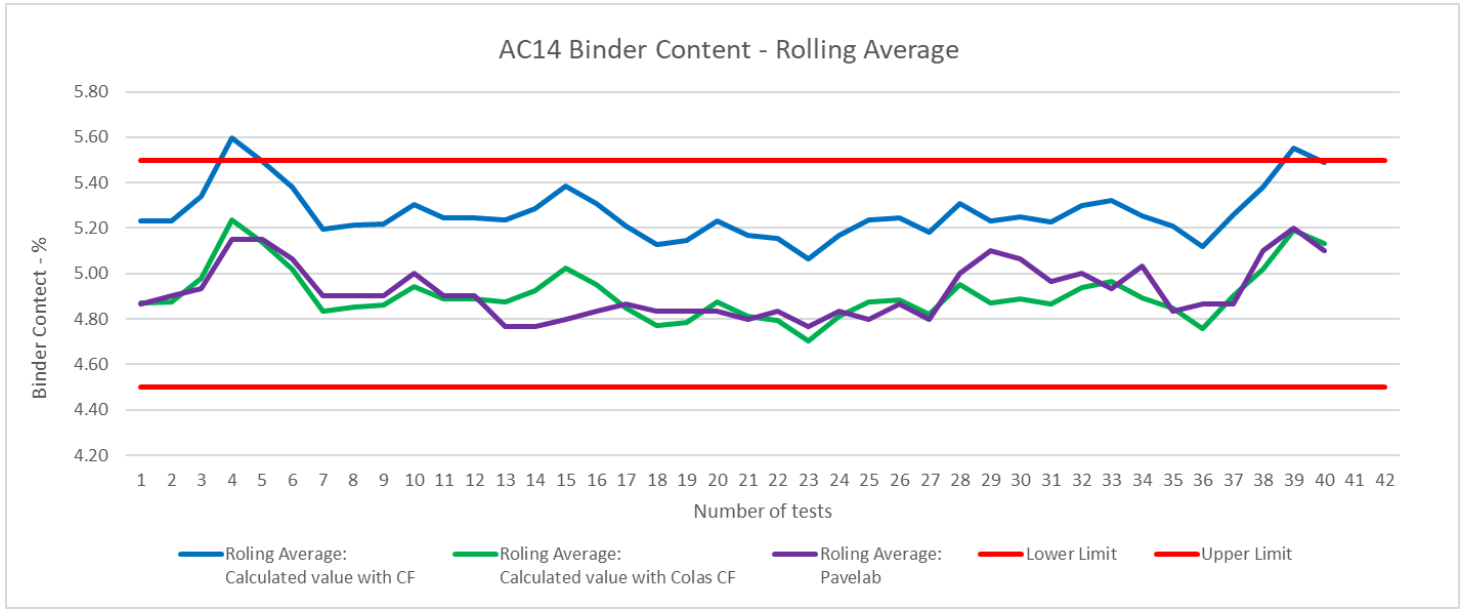


Mix type	Calibration Factor
AC14	0.27
AC10	0.24
AC14 HF	0.41
AC20	0.44
DG7	0.11
DG10	0.25

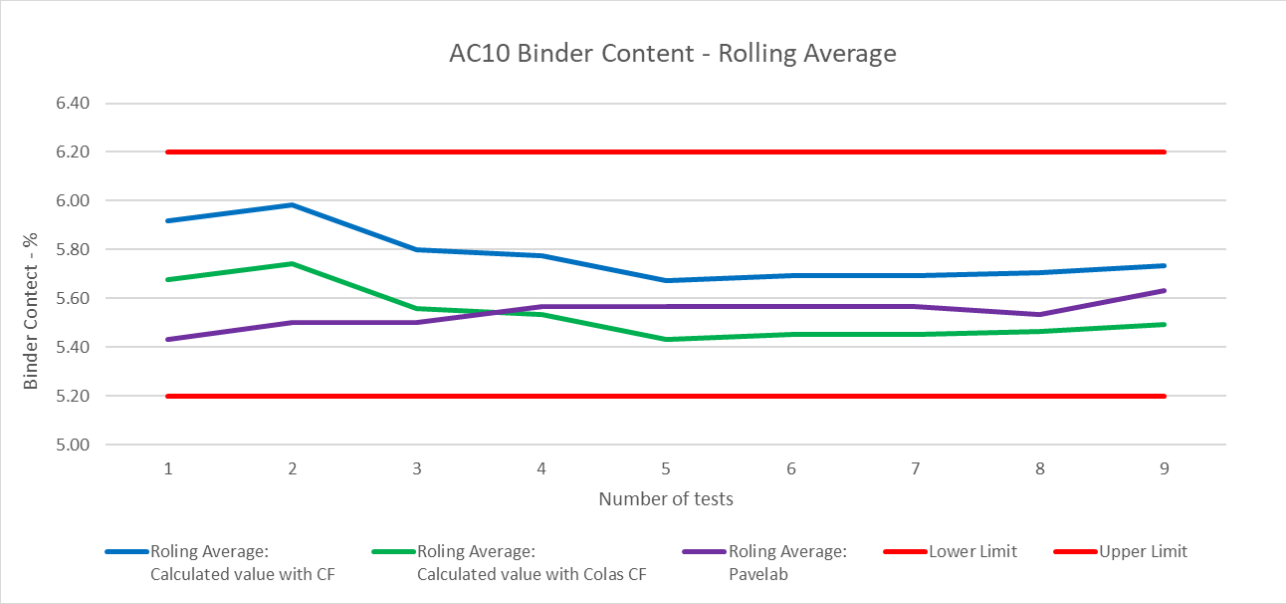


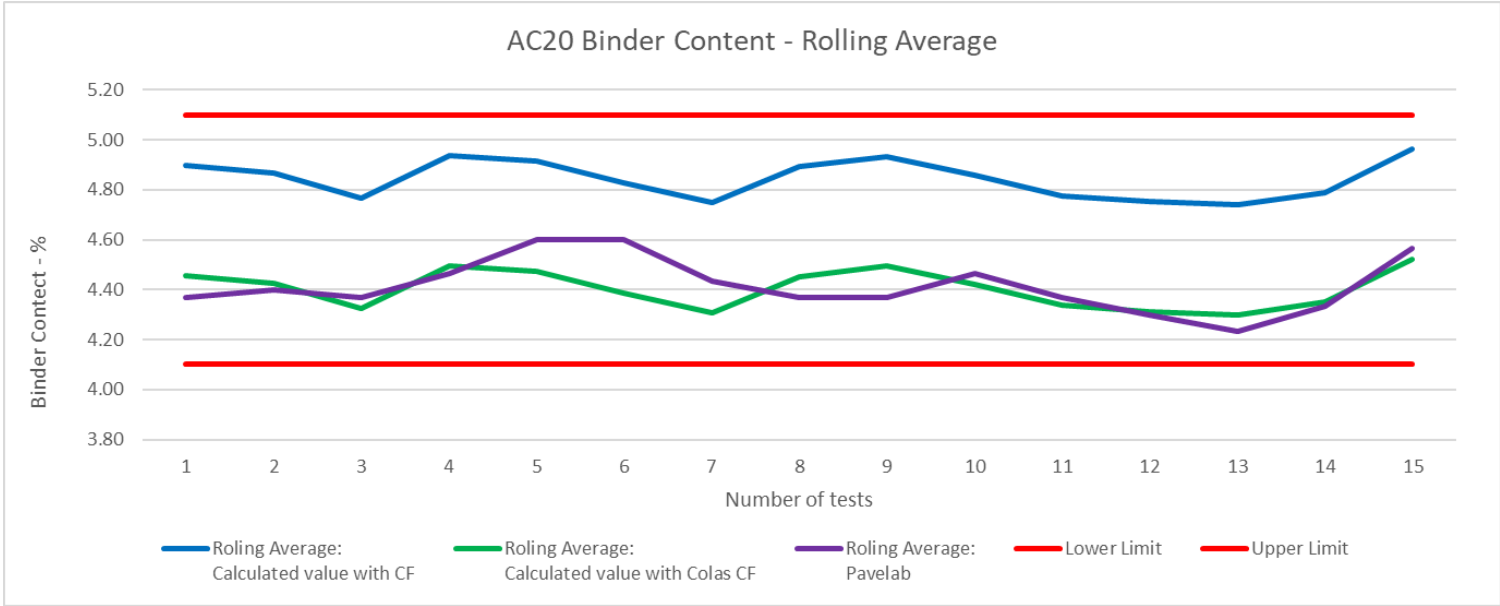
Binder Content Correction Factor



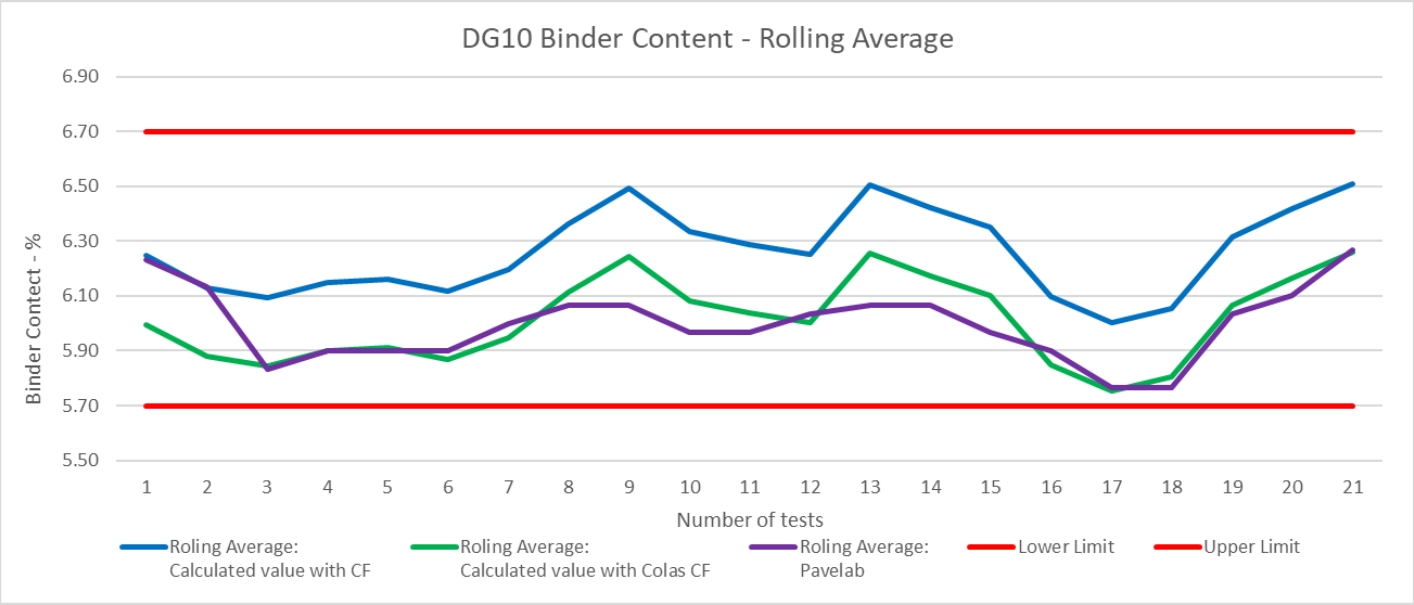


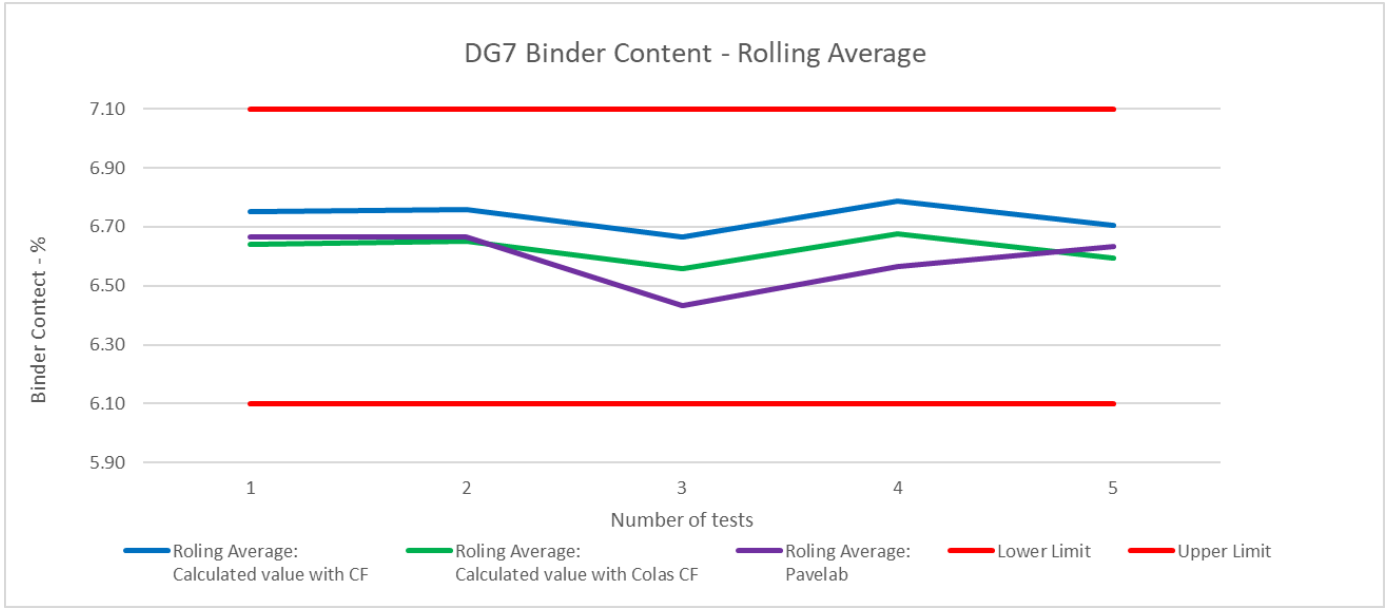
Binder Content Correction Factor



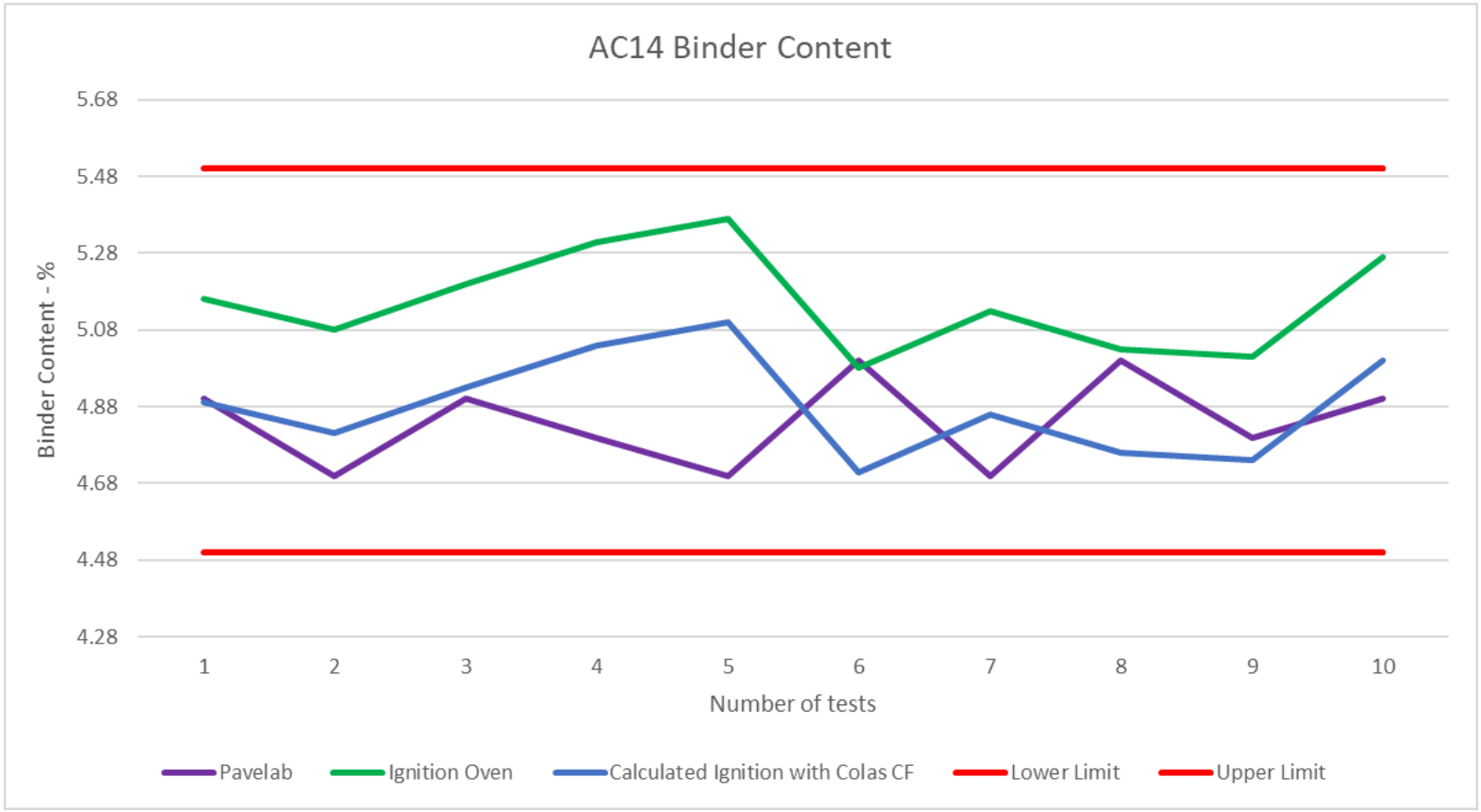


Binder Content Correction Factor





Ignition Oven vs Chemical

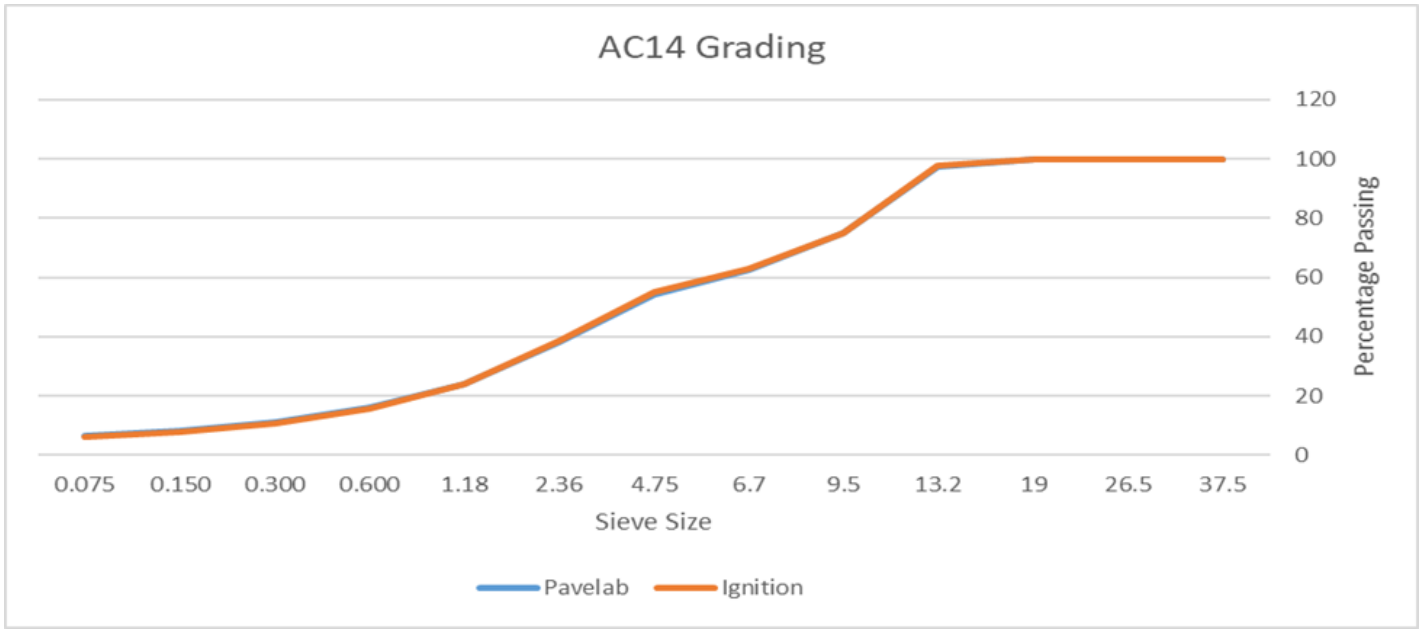


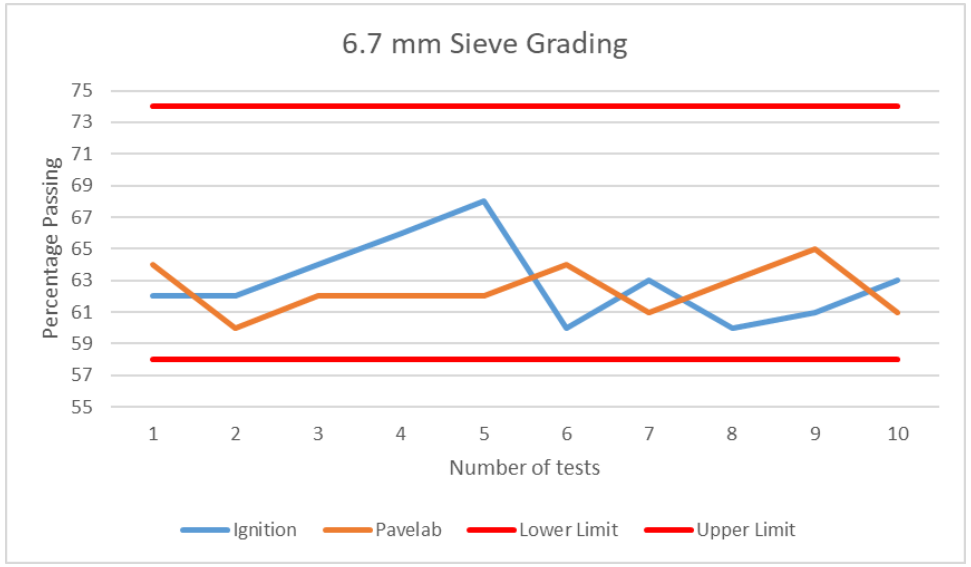
	Standard Deviation
Ignition oven	0.13
Pavelab	0.12
PT with multiple methods	0.17

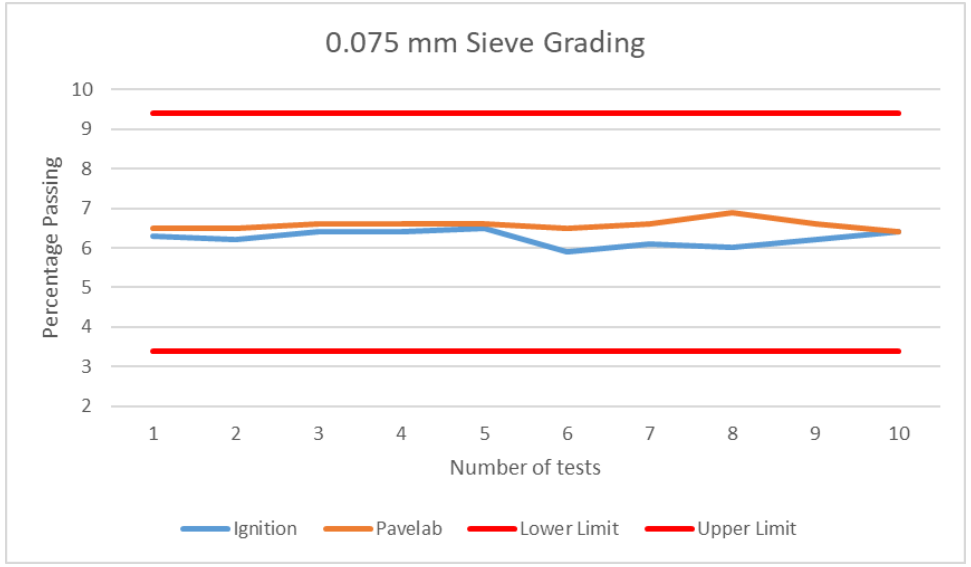
PROFILE NAME: Test
TEST NUMBER: 222
SPECIMEN ID: AC14H
STANDARD: ASTM D6307
FURNACE TEMP.: 427.0 °C
AFTERB. TEMP: 820.0 °C
LOAD CALC.: SAMPLE
BASKET WEIGHT: 3529.6 g
COMB. WEIGHT: 5678.1 g
SAMPLE WEIGHT: 2148.5 g
CORR. FACTOR: 0.000
MOISTURE: 0.00 %
DELAY: 00:00
CONST. MASS LIMIT: 0.01 %
CONST. MASS CHECK: 1 mi

CONTROL CYCLES: 3
RESULTS:
BITUMEN: 5.39 %
TEST TIME: 00:52:40

Particle Size Distribution

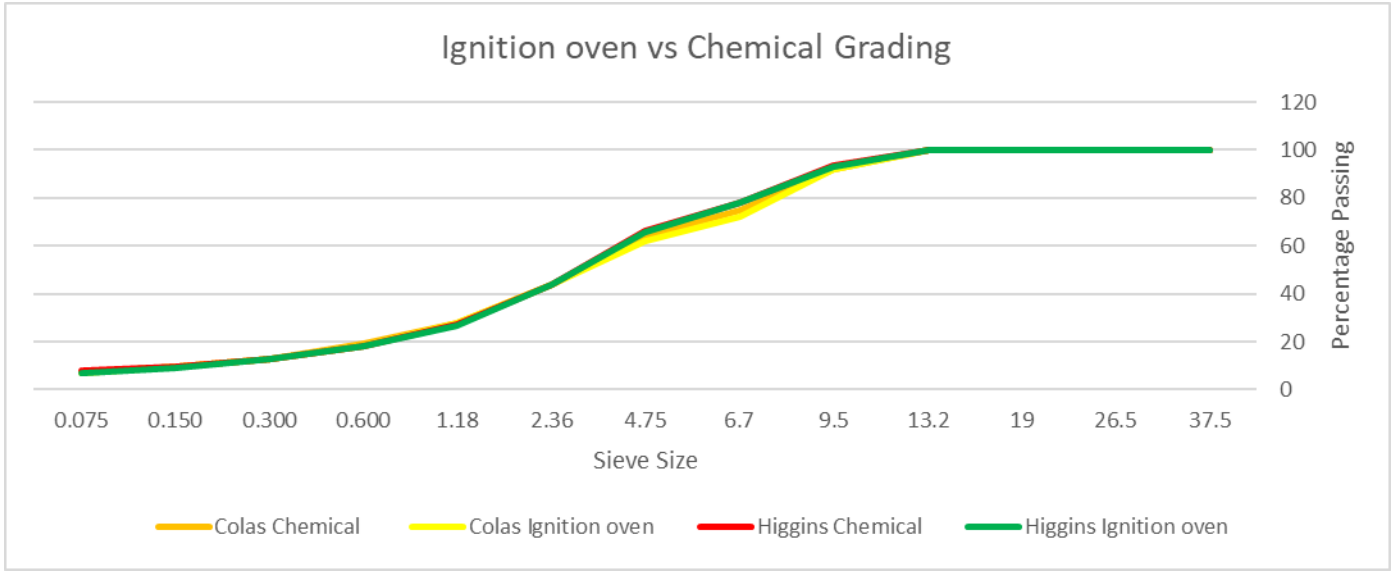






Inter Laboratory Comparison

	Ignition oven	Calculated	Chemical
Colas	6.66	6.01	5.9
	6.80	6.08	
	6.54	6.30	
	6.44	6.04	
	7.02	5.95	
Average	6.69	6.08	5.9
Std	0.23	0.13	
Higgins	6.20	6.35	5.85
	6.02	6.02	5.73
	6.18	5.92	5.89
Average	6.13	6.10	5.82
Std	0.10	0.23	0.08



Conclusions

Ignition Oven Binder Content

- Option 2 – Weighting on external balance optimal
- Calculating manually

Correction Factors

- 2nd Method – Calibration Factor determined by chemical comparison
- Correction Factor following ASTM D6307 to be reviewed

Particle Size Distribution

- Virtually no difference between Ignition Oven vs Chemical

General

- Outliers can be expected
- Results found still compliant to mix requirements
- Rolling average of 3 results compared well to chemical method

Conclusions

Way forward

- Colas confident in Ignition Oven use
- Calibration Factor offset will be used for internal quality control
- ASTM and AUSTROADS methods for correction factor
- Accreditation at reduced temperature
- Acceptance from NZTA for reduced temperature
- Safety high priority


thank you