



PAYNE & DOLAN
INCORPORATED
A WALBEC GROUP COMPANY

Automated Extraction of Asphalt Binder

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Asphalt Binder Expert Task Group
Ames, IA
May 3-4, 2017



Acknowledgements

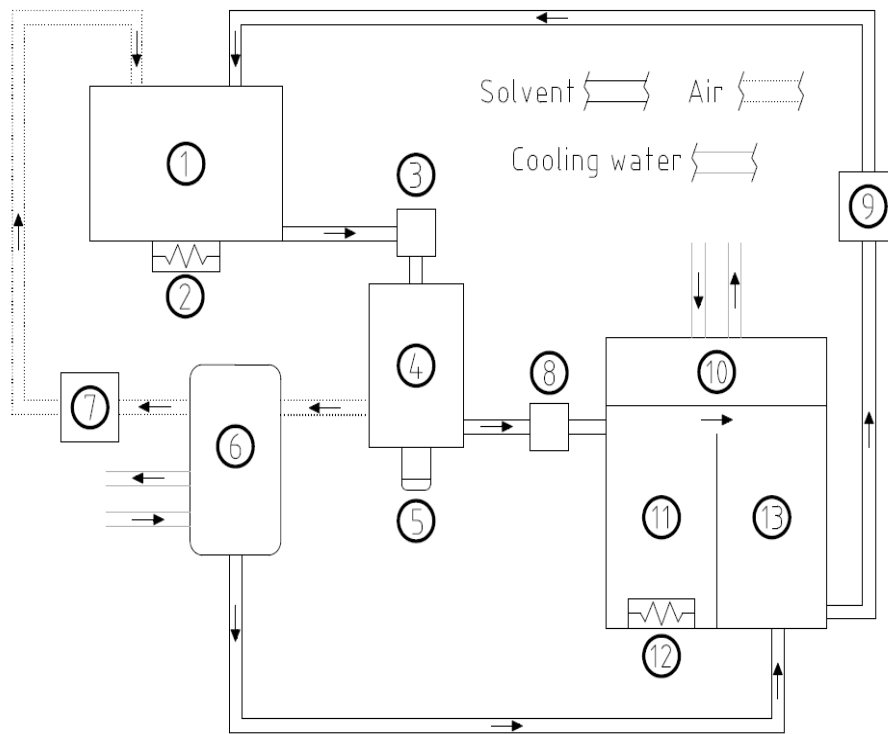
- ASTM Work Group and ILS Team
- Behnke Materials – Signe Reichelt
- Controls – Khaled Hasida
- Infratest – Ann Baranov
- Iowa DOT – Kevin Jones
- Payne & Dolan
- TxDOT – Norman Jones
- WHRP



Outline

- Equipment Overview
- Binder Percent
- Aggregate Gradation
- Instrument Verification
- WHRP Study
- Ruggedness Study
- ASTM ILS
- AASHTO re:source PSP Data

Automated Extraction System



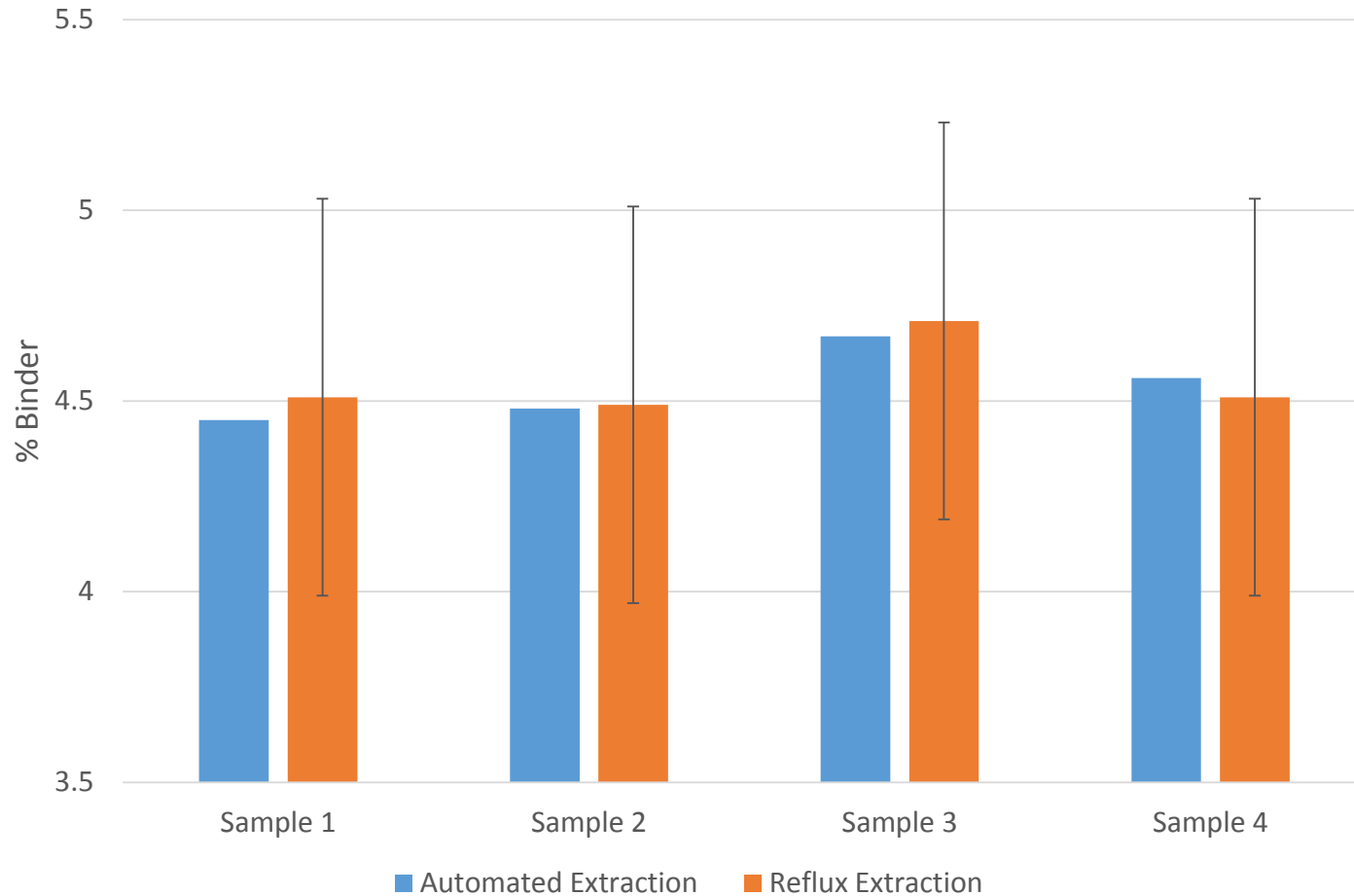
- 1= Washing chamber
- 2= Washing chamber heating system
- 3= Inspection window
- 4= Centrifuge
- 5= Centrifuge motor
- 6= Condenser
- 7= Pump
- 8= Outlet valve
- 9= Solvent pump
- 10= Integrated cooling system
- 11= Dirty solvent tank
- 12= Distillation unit heating system
- 13= Clean solvent tank

Automated Extraction System



Internal Evaluation

Binder Extraction – AASHTO T164



*Reflux Extraction did not include a mineral matter determination.

**Error bars are based on AASHTO T164 d2s

Iowa DOT – Draft Report

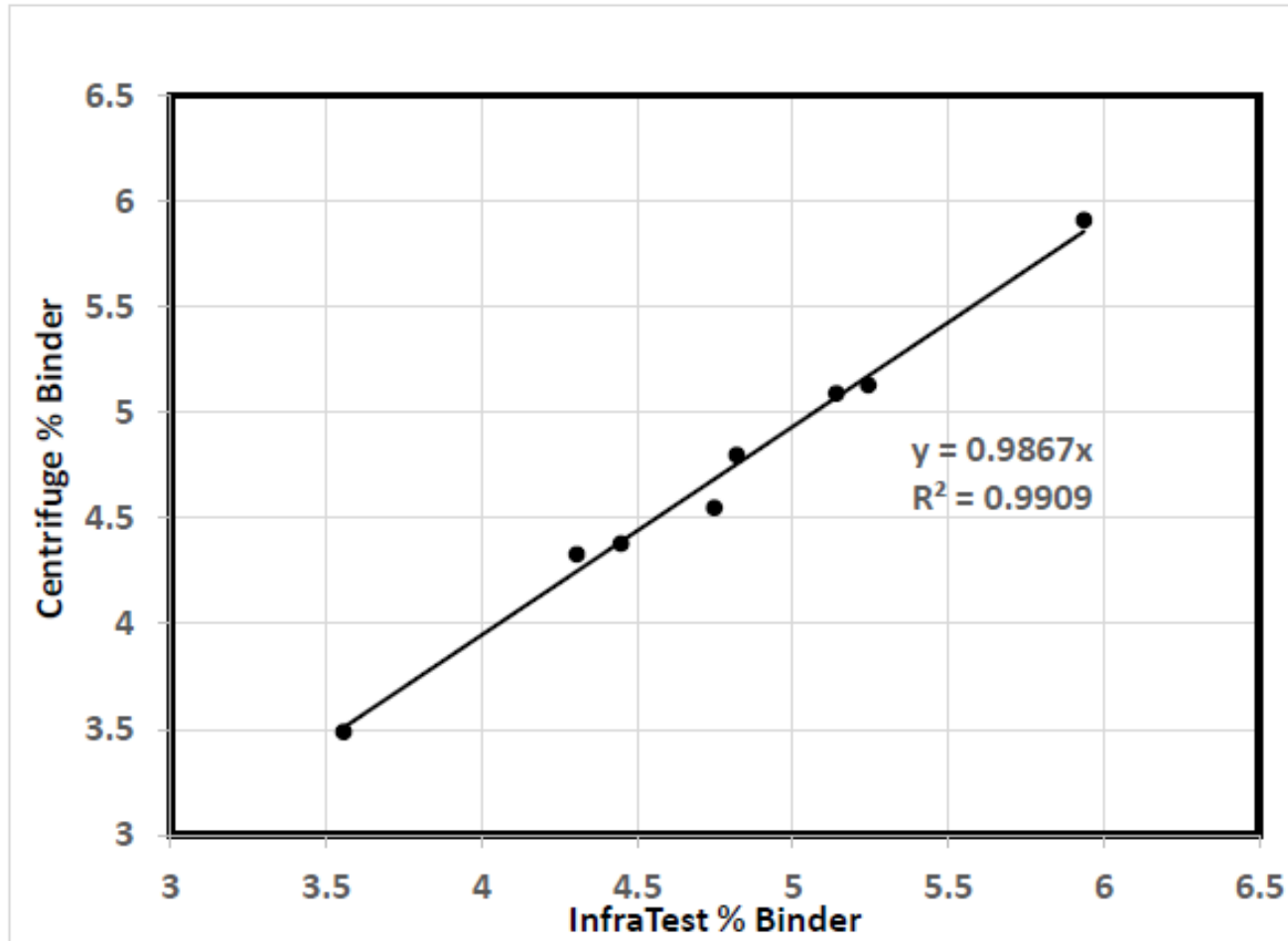
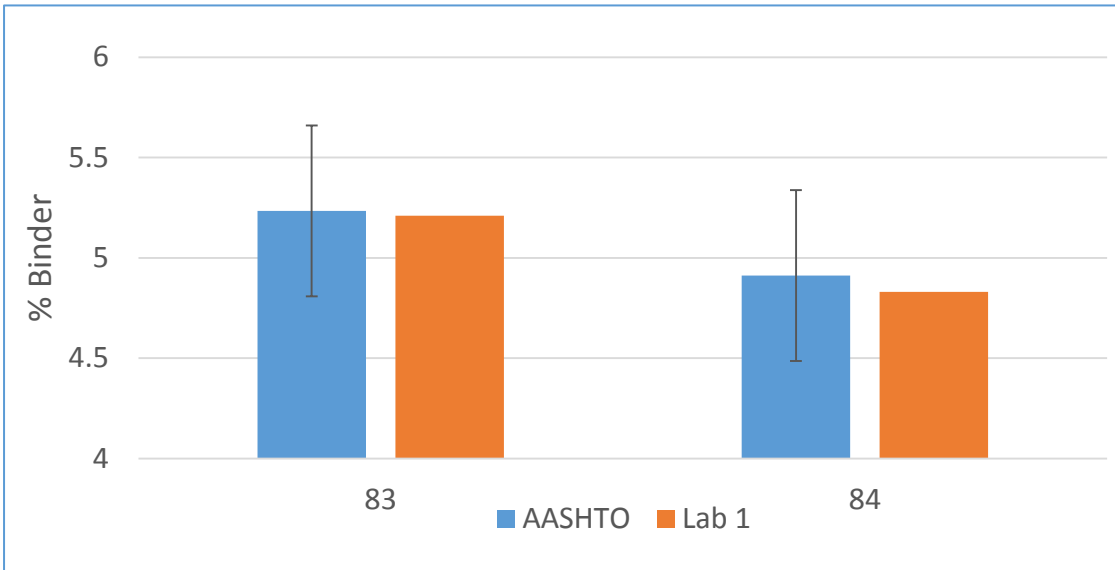
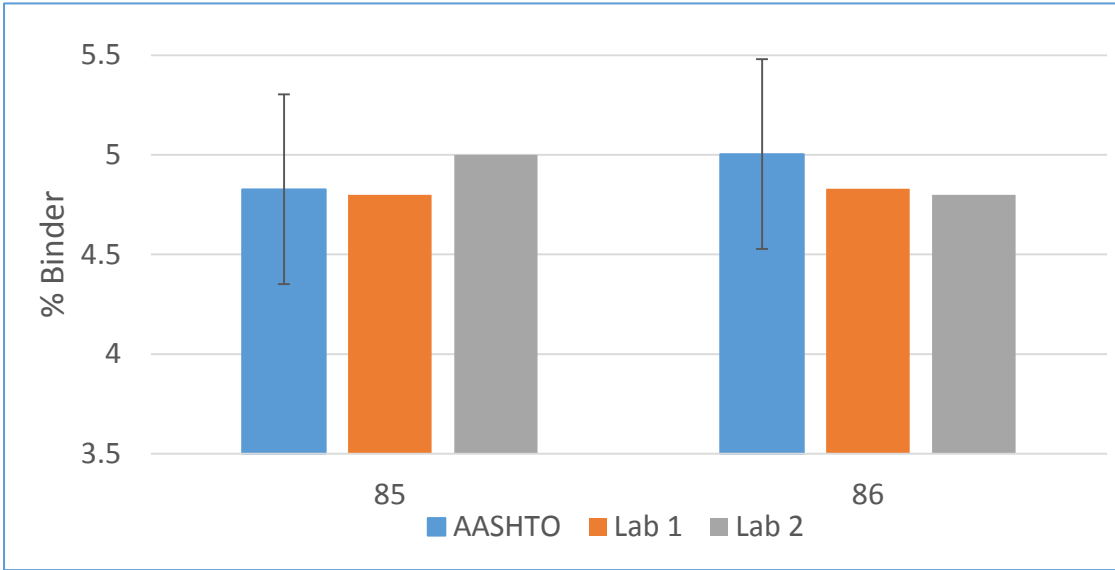


Figure 1. Comparison of Extraction Method Results on Eight RAP Samples

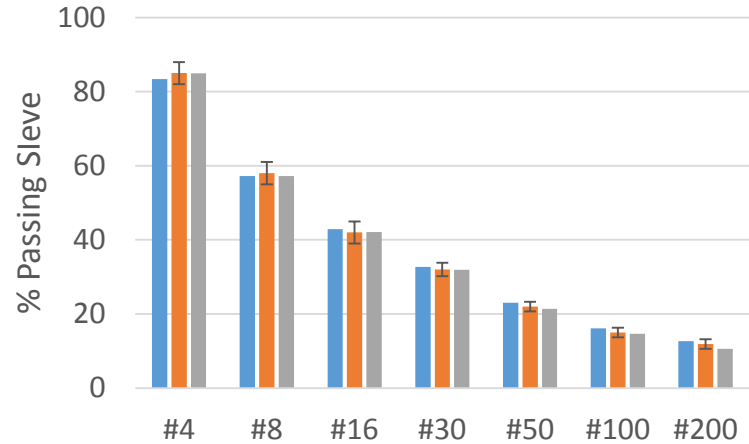
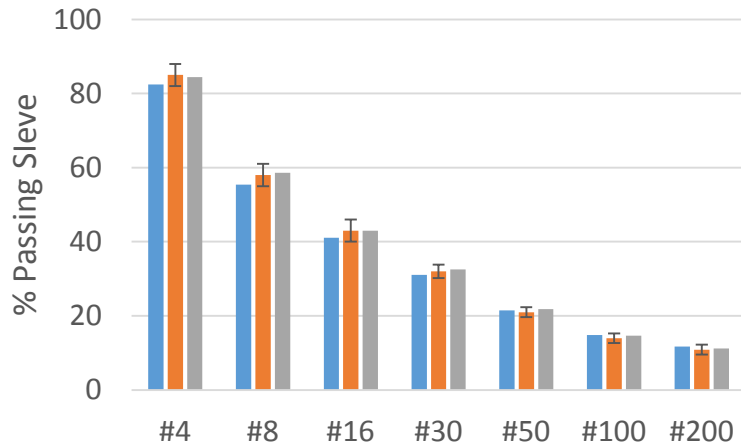
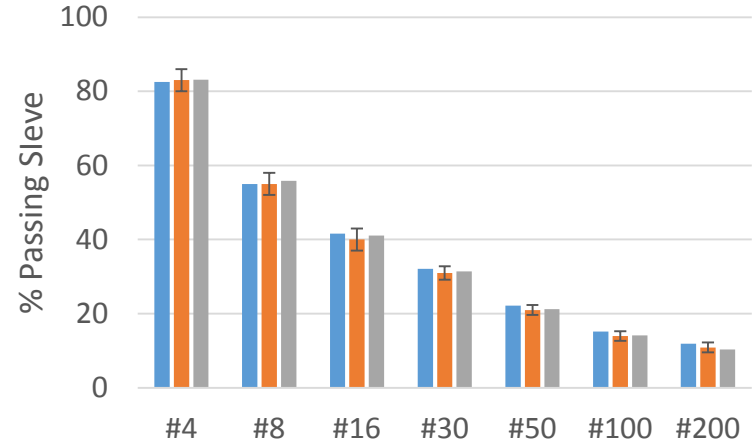
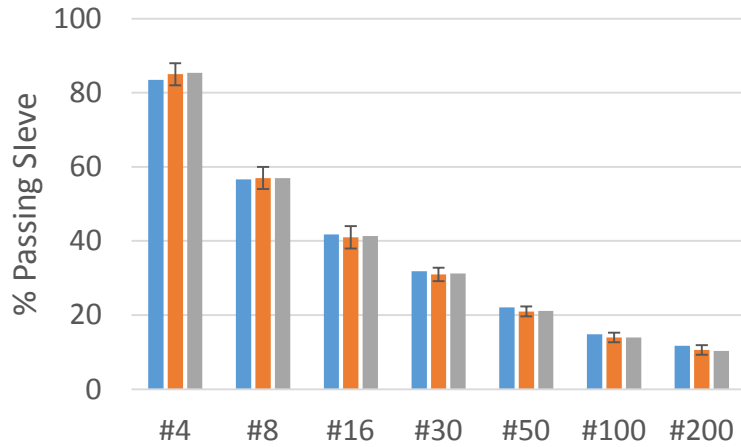
AASHTO re:source PSP Binder Extraction



**Error bars are based on PSP d2s

Internal Evaluation

Gradations – AASHTO R30



■ Automated Extraction

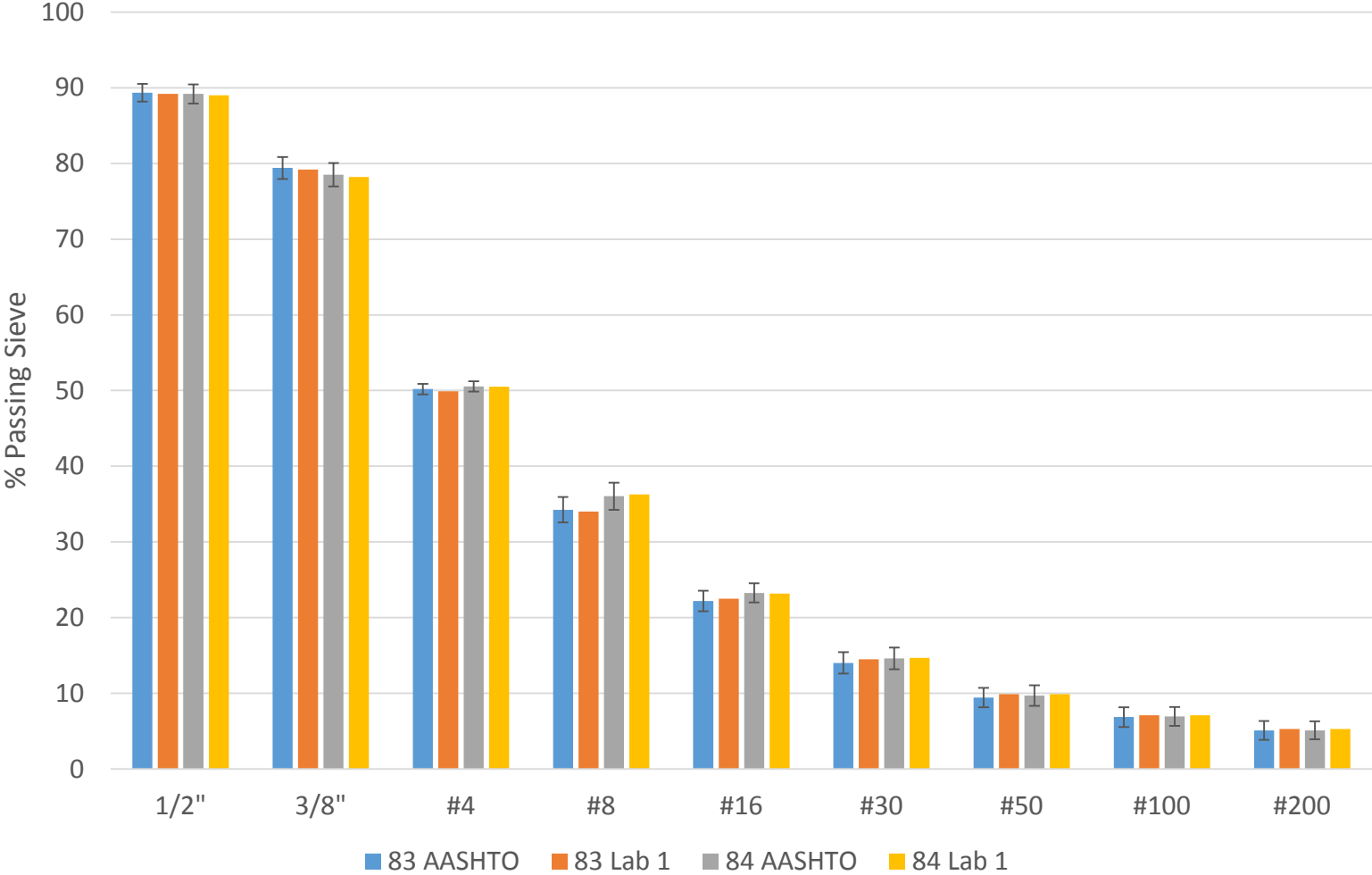
■ Reflux Extraction

■ Ignition Oven

*Reflux Extraction did not include a mineral matter determination.

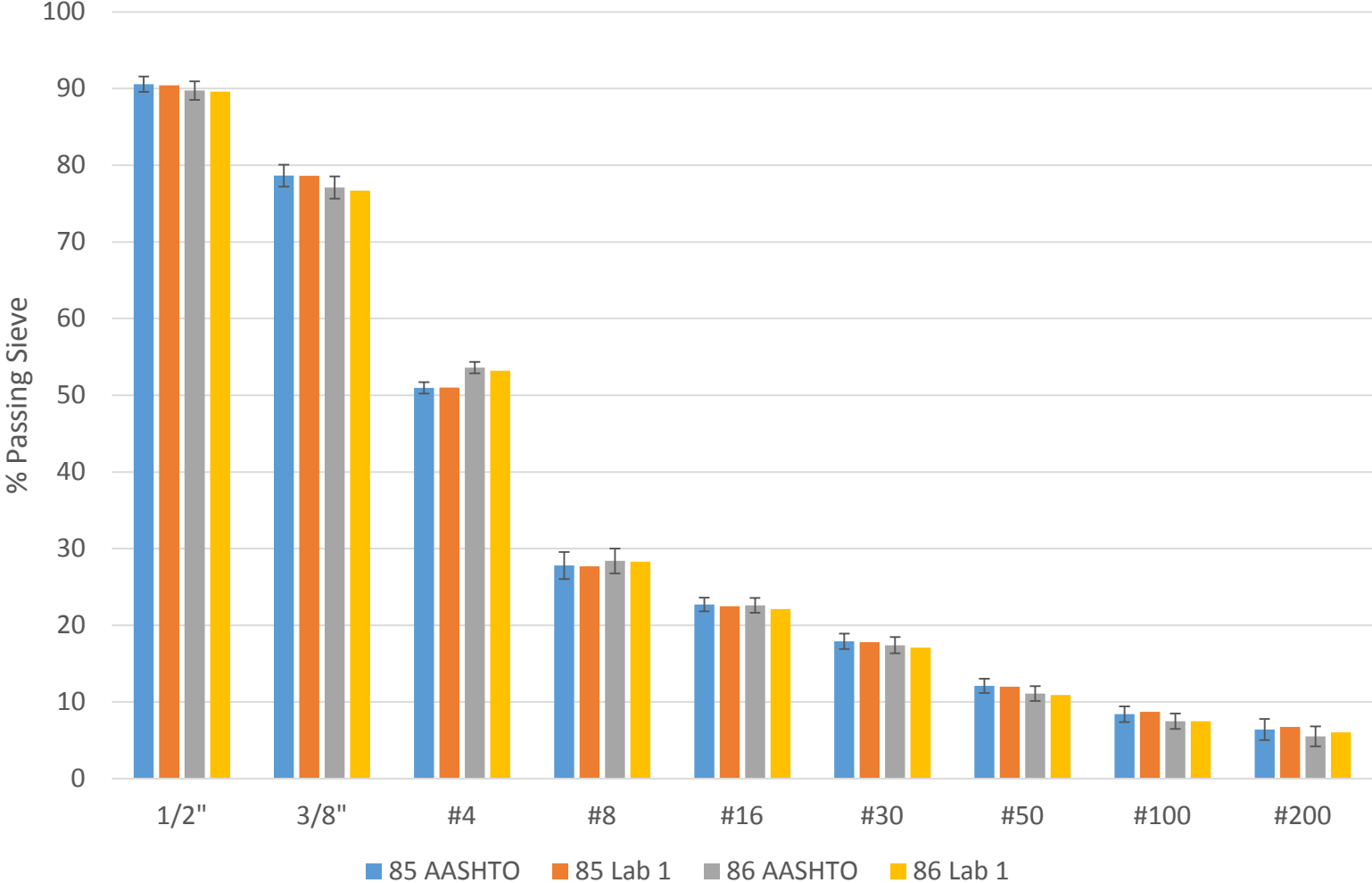
**Error bars are based on AASHTO R30 d2s.

AASHTO re:source PSP Gradation



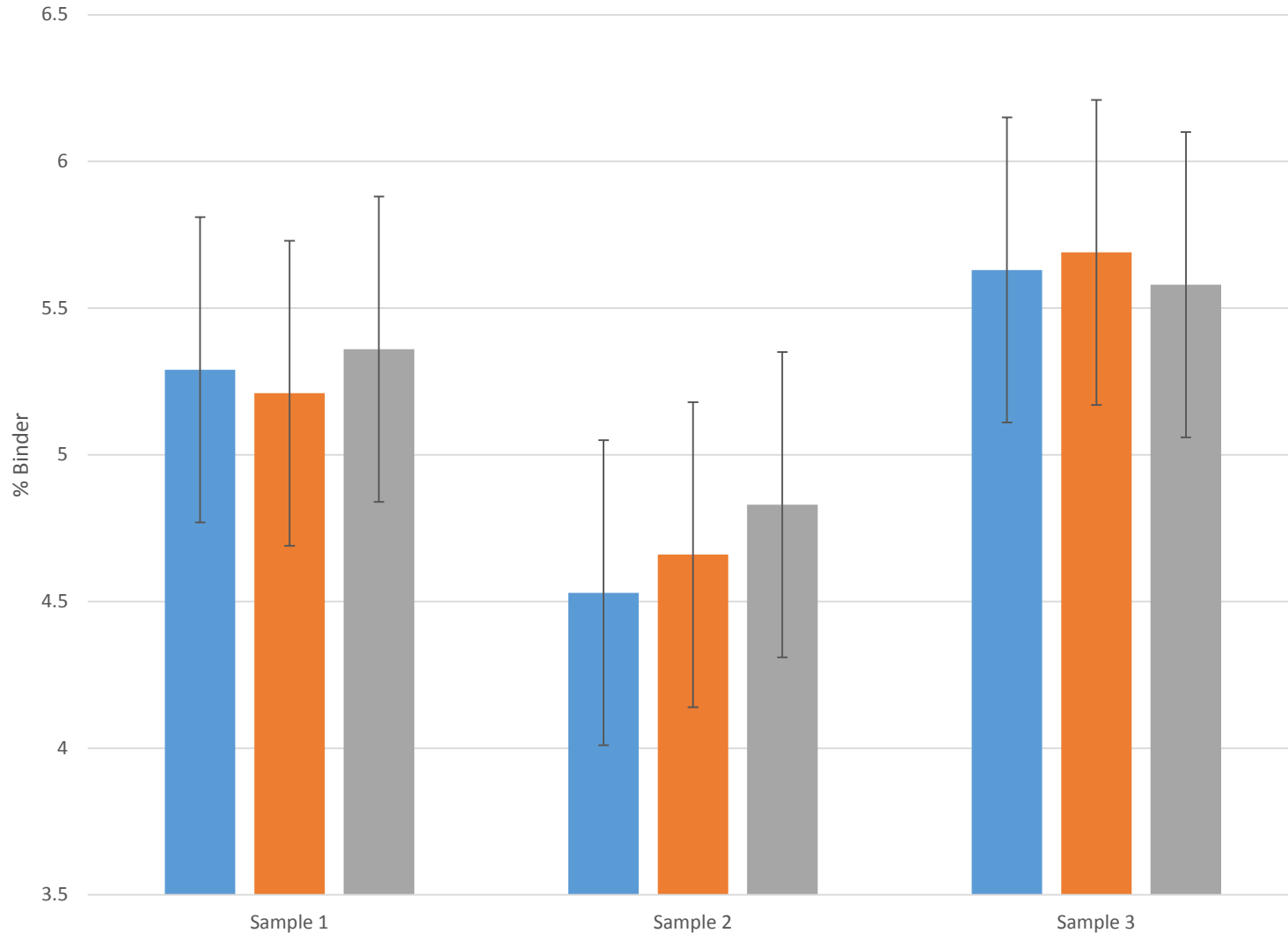
**Error bars are based on PSP d2s

AASHTO re:source PSP Gradation



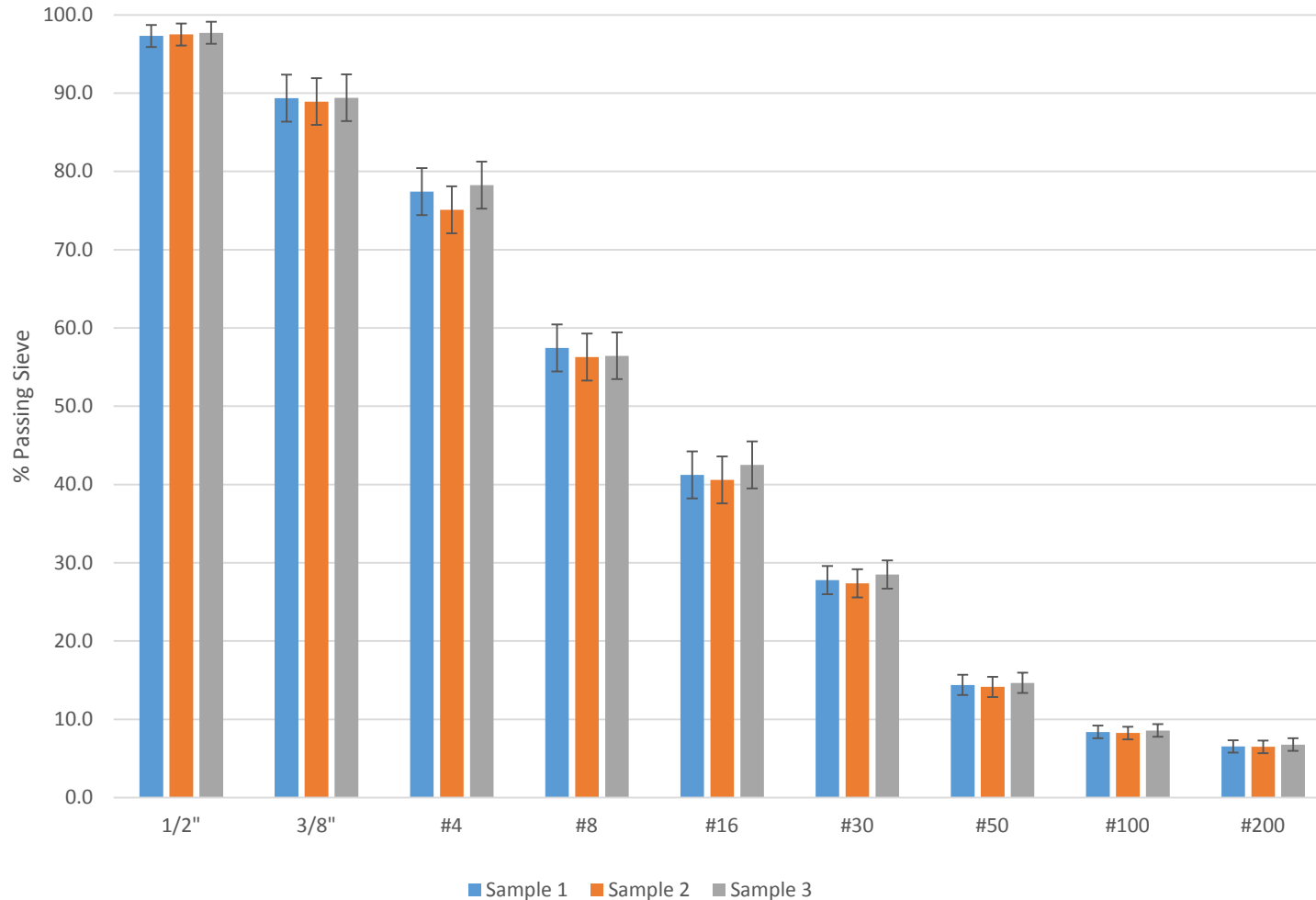
**Error bars are based on PSP d2s

Instrument Verification Repeatability – AASHTO T164



**Error bars are based on AASHTO T164 d2s

Instrument Verification Repeatability



**Error bars are based on AASHTO R30 d2s



WHRP 16-02

- Ignition Oven
- Centrifuge Extraction
- Reflux Extraction
- Automated Extraction System



Ruggedness Study

- Collaboration with ASTM ILS
- Using Reflux Method as Control
- Evaluating Percent Binder and Aggregate Gradation

Factor	Factor Name	Low -	High +
A	Binder Type (depends on G)	64-22 or 52-34	64-22E or 52-34E
B	Aggregate Absorption	0.75	2.0
C	% Fines	3 to 5%	10%
D	Sample Size (g)	1000	2000
E	% Recycled RAP	0%	45%
F	% Recycled RAS	0%	5%
G	Low PG Grade	-34	-22



ASTM ILS

- Solvent pH and Alkalinity
- Aggregate Drying
- Percent Fines in Binder Solution
- Percent Binder
- Aggregate Gradation
- PG Grading of Recovered Binder