

Is It Time to Revise the Precision and Bias Sections in T313, T315 and T316?

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Precision Estimates for M320 - 2005

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Precision Estimates for AASHTO Test Method T308 and the Test Methods for Performance-Graded Asphalt Binder in AASHTO Specification M320

Prepared for:

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Summary of the Study

- The study used the AMRL Proficiency Sample results for the PG Graded Asphalt Binder.
- The sample sets were from 181 – 196.
- Covering the years 2000 – 2004.
- They further tightened the data than what was in the AMRL reports and it became the Precision and Bias for several AASHTO standards.

The Report for T315 PAV Residue

3.2.7.3 PAV Residue: $G^* \sin \delta$

Results from analyzing the data for the DSR testing on PAV residue can be found in Appendix Q. One pair of modified binders, sample numbers 187 and 188, was used in the analysis.

Sample Type	Sample Numbers	No. of Labs	PG Grade	AC Grade	Average Results		Repeatability			Reproducibility		Reproducibility	
					odd samples	even samples	1s	odd samples CV%	even samples CV%	odd samples		even samples	
										1s	CV%	1s	CV%
PGB	181 & 182	181	PG 64-16	AC 10	4557	4489	249	5.5	5.6	695	15.3	656	14.6
PGB	183 & 184	178	PG 70-22	--	2310	2334	117	5.1	5.0	293	12.7	313	13.4
PGB	185 & 186	178	PG 64-22	AC 20	3830	3818	223	5.8	5.8	526	13.7	486	12.7
PGB	187 & 188	185	PG 76-22	--	1100	1102	61	5.6	5.6	167	15.1	157	14.3
PGB	189 & 190	182	PG 64-22	AC 30	4335	4340	143	3.3	3.3	597	13.8	603	13.9
PGB	191 & 192	185	PG 52-34	AC 10	3640	3673	171	4.7	4.7	660	18.1	660	18.0
PGB	193 & 194	188	PG 64-22	AC 20	2922	2937	137	4.7	4.7	364	12.5	359	12.2
PGB	195 & 196	199	PG 70-22	--	3163	3171	137	4.3	4.3	432	13.7	424	13.4

Table 14 – Summary Table for T315, PAV $G^* \sin \delta$

A review of the data shown in Table 14 indicated that the form of the precision estimates should be based on the coefficient of variation (CV%). The average repeatability coefficient of variation for the eight pairs of samples analyzed was determined to be 4.9 percent. The corresponding average reproducibility coefficient of variation was determined to be 14.2 percent. In each case, the average coefficient of variation was determined by calculating the “simple arithmetic average” as described in Section 8.4.2 of ASTM C802-96 [15].

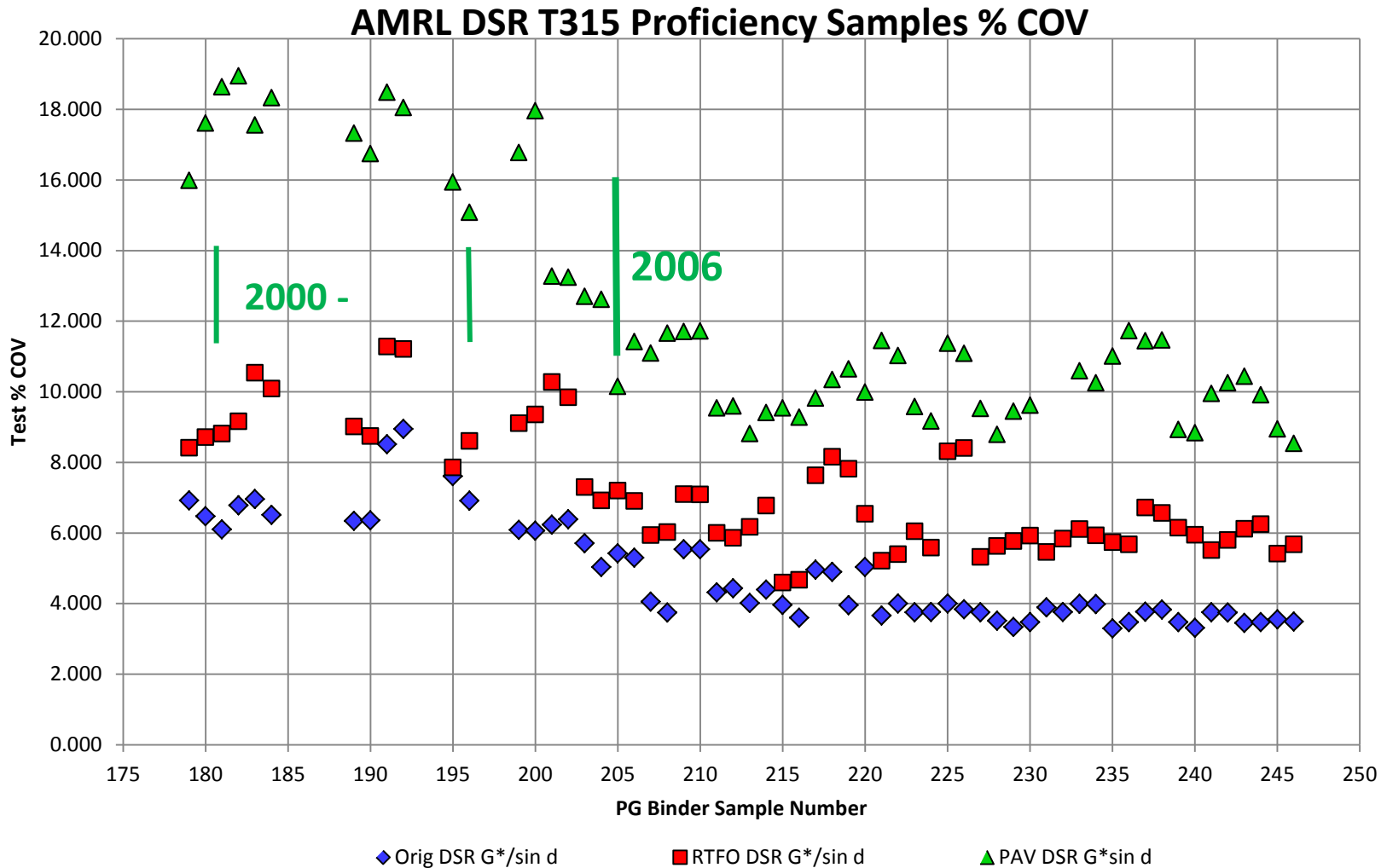
DSR T315-12 (2016) PAV Residue

- Precision and Bias, Section 14
- Single Operator $1s\% = 4.9$, $d2s\% = 13.8$
- Multi-laboratory $1s\% = 14.2$, $d2s\% = 40.2$

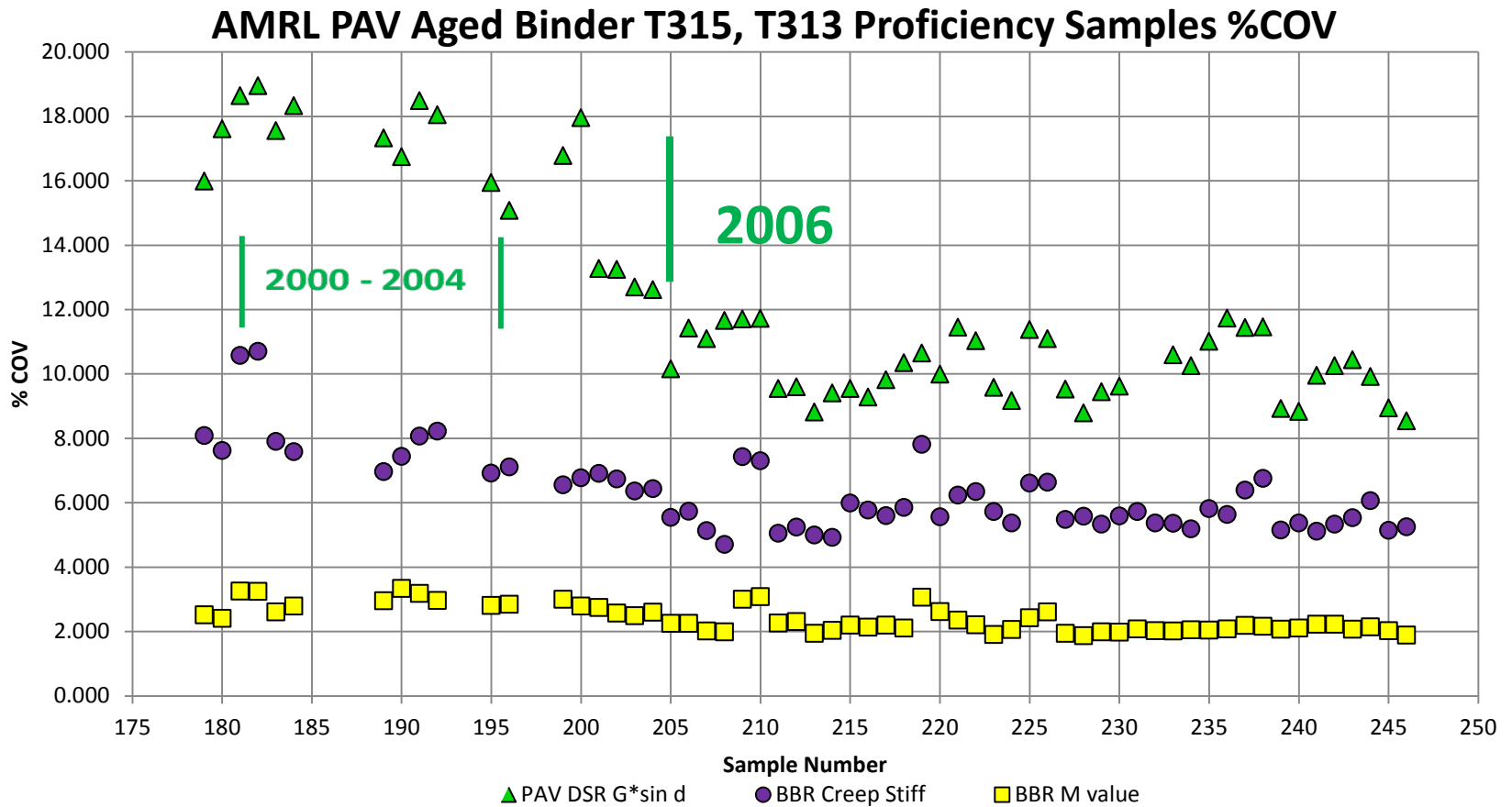
Review of AMRL's Average and Standard Deviation

- The Average and Standard Deviation for the PG Asphalt Binder Proficiency Samples were compiled from 2000 – 2016.
- The 1s% (%COV) was calculated and plotted.

T315 DSR, Original, RTFO, PAV

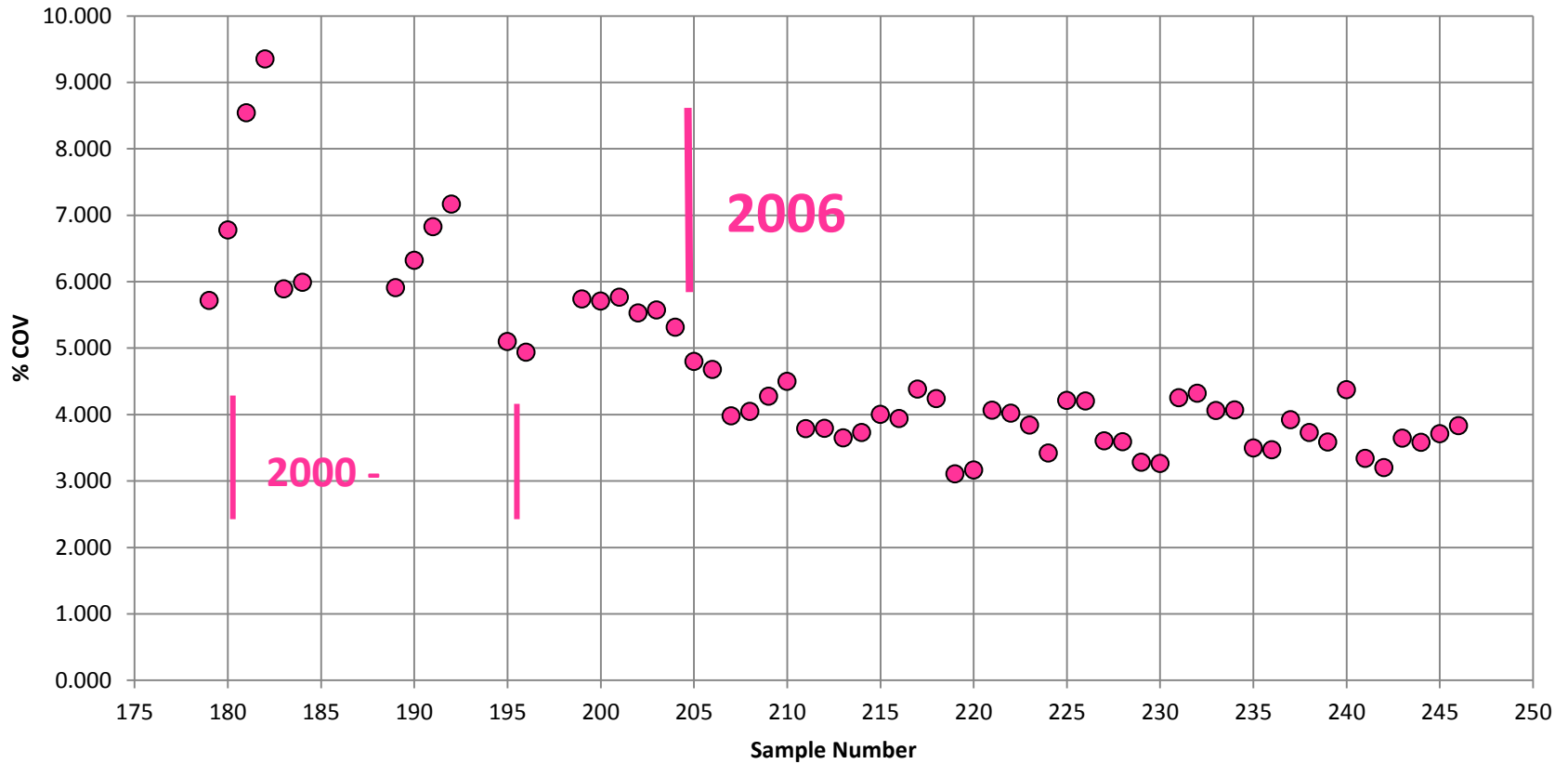


PAV Residue, T315 DSR, T313 BBR



T316 Rotational Viscosity

AMRL Rotational Viscometer T316 Proficiency Sample % COV



Multi-Lab d2s% Using Newer AMRL

- The 2005 report tightened up the AMRL data lowering the 1s% by 10-15% in most cases.
- The AASHTO P&B is compared to the average 1s% of the AMRL data from 2006-2016.

Multi-Lab		AASHTO	AMRL 2006-16
Std #	Test	d2s%	d2s%
T315	O DSR	17.0	11.2
T315	R DSR	22.2	17.4
T315	P DSR	40.2	28.6
T313	Crp Stf	17.8	16.0
T313	M	6.8	6.2
T316	Rot Visc	12.1	10.8

Conclusion

- It is time to do another study using the AMRL proficiency sample data from the last decade to update the precision & bias in AASHTO.
- The most dramatic effect will be with the DSR test (T315). The improvement probably reflects the labs retiring the circulating water systems and switching to Peltier units.