

The background of the slide is a light gray gradient, decorated with numerous realistic water droplets of various sizes. Some droplets are large and prominent, while others are small and subtle, scattered across the top and bottom edges of the frame.

ASPHALT & MIX QUALITY CONTROL TEST

RAJ DONGRE – DONGRE LAB SERV. INC. (DLSI)

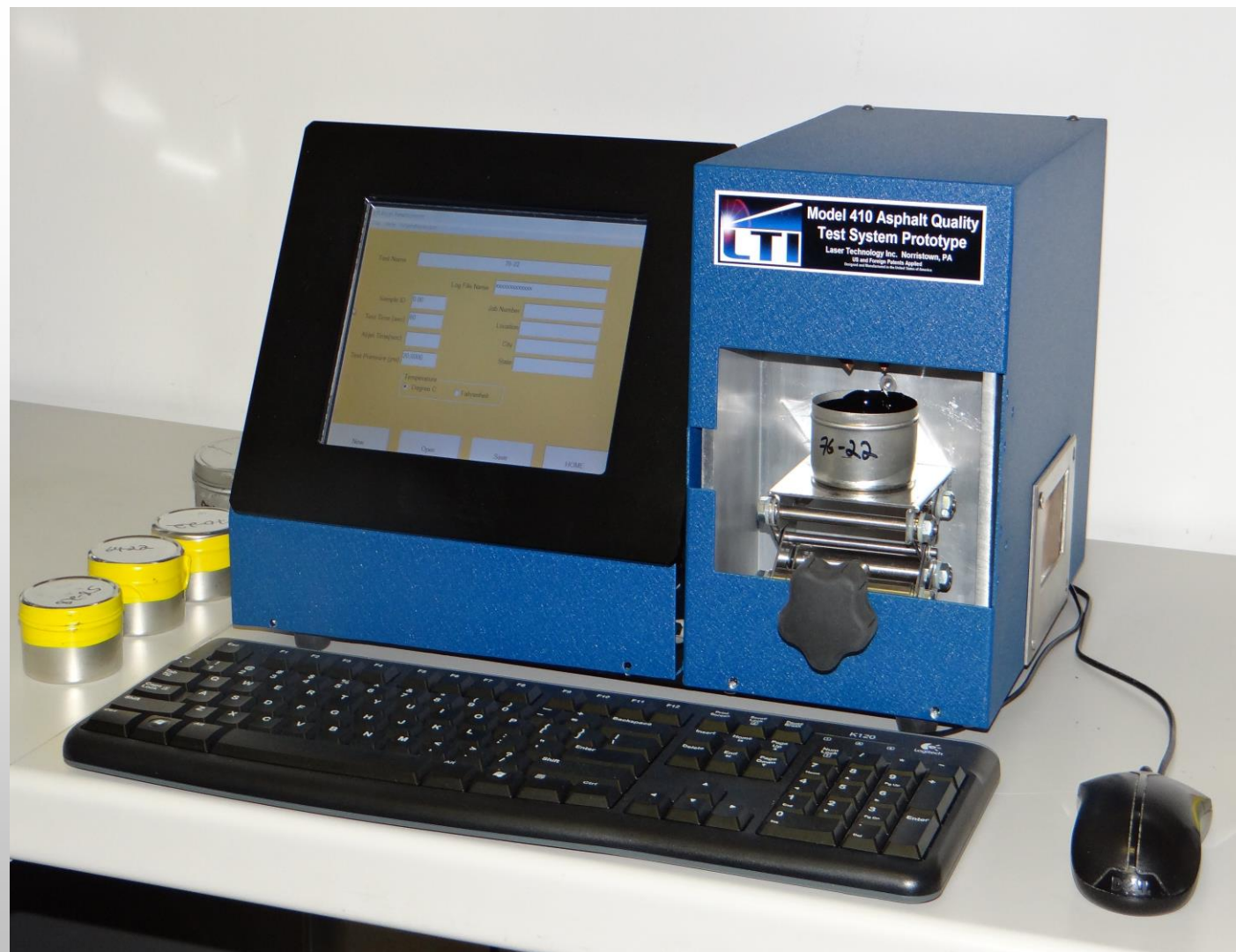
JACK YOUTCHEFF - FHWA

WHY DEVELOP A QUALITY CONTROL TEST FOR ASPHALT BINDER?

- NEED A PORTABLE, QUICK AND EASY TEST METHOD FOR DAY-TO-DAY QC OF PRODUCTION ASPHALT BINDER DURING A PAVEMENT CONSTRUCTION PROJECT – UTAH DOT
- SEVERAL METHODS HAVE BEEN TRIED WITHOUT SUCCESS! – UTAH DOT
 - DYNAMIC SHEAR RHEOMETER – QUICK VERSION
 - MELT INDEXER
- A SINGLE TEST METHOD THAT CAN TAKE YOU FROM MIX-DESIGN TO PRODUCTION

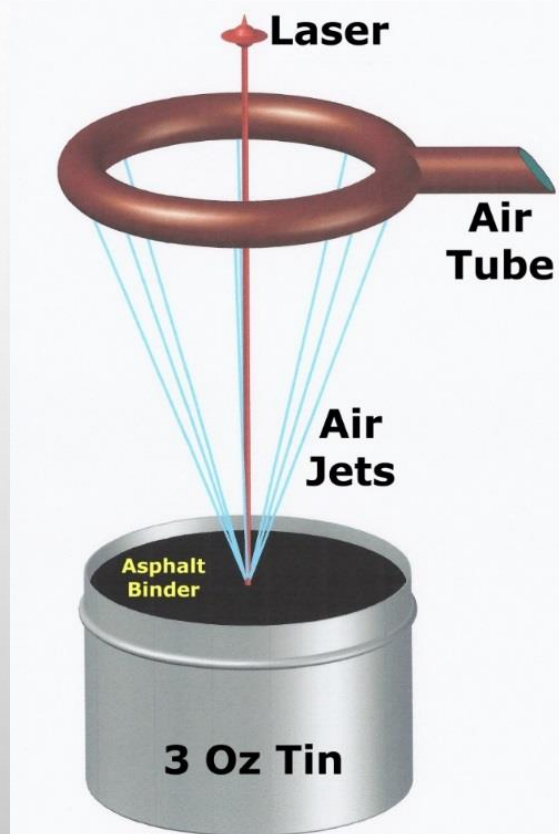


Penetrometer



Binder Quality Control Tester

SCHEMATIC OF NOZZLE WITH AIR JET & LASER



The background is a light gray gradient. It features several realistic water droplets of various sizes, some with highlights and shadows, scattered across the frame. In the upper center, there is a faint, circular, textured pattern that resembles a ripple or a seal.

ASPHALT BINDER TEST DEMO

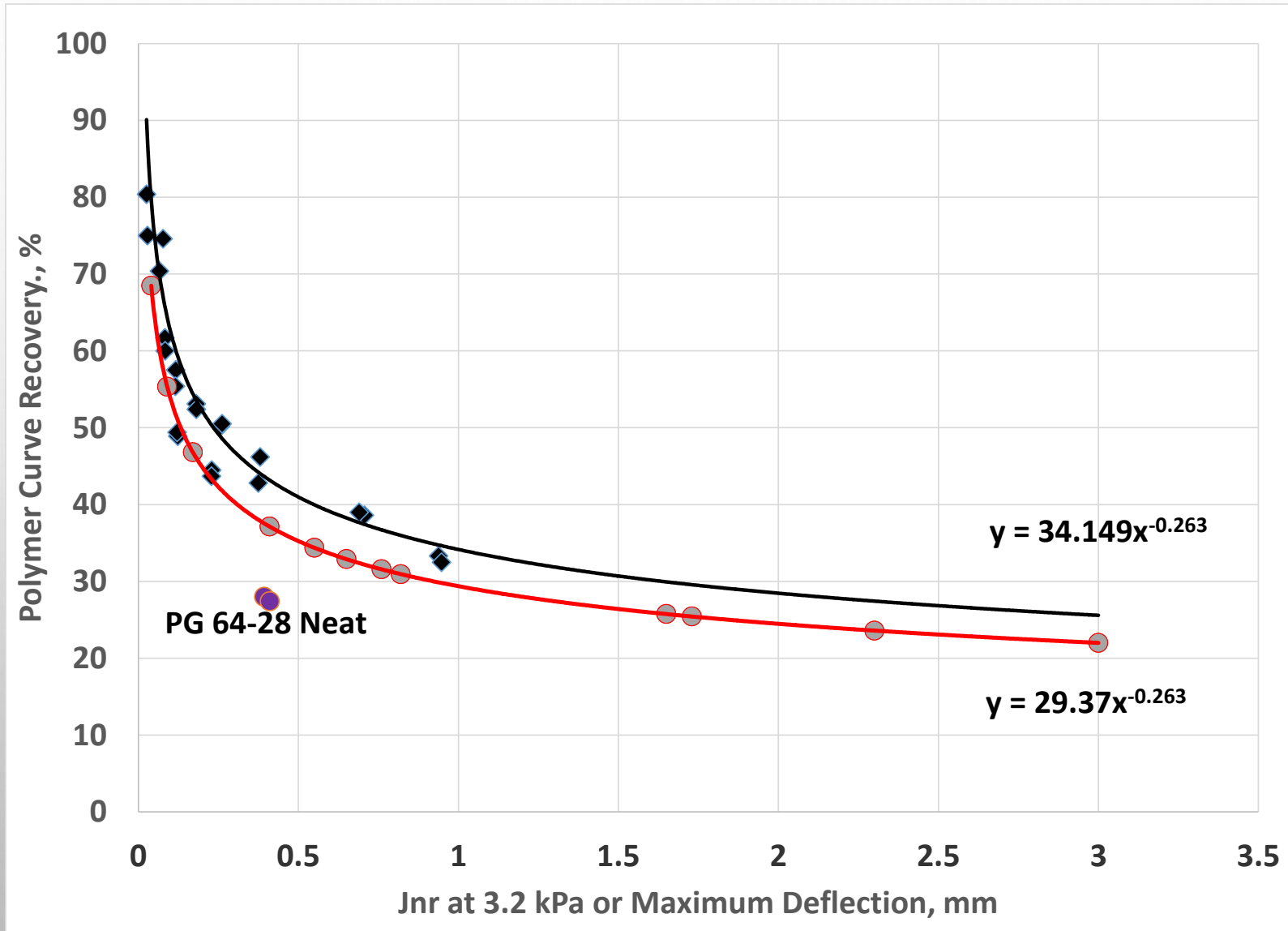
REPEATABILITY OF QC DATA

Binder ID	Binder Type	Number of Replicates	QCT Max. Deflection, mm			QCT % Recovery		
			Average	Std. Dev	COV %	Average	Std. Dev	COV %
200/300 Pen	UnModified	5	2.8598	0.0437	2	14.4	0.4	3
#1 PG 58-28		5	0.5929	0.0370	6	20.1	1.0	5
PG 64-22		5	0.1588	0.0032	2	41.5	0.9	2
PG 76-10		5	0.0092	0.0006	6	82.0	7.8	10
#2 PG 58-28		5	0.7638	0.0192	3	15.5	0.1	1
PG 64-34	PMA	4	0.3383	0.0058	2	77.4	0.7	1
PG 76-22		5	0.0689	0.0023	3	58.0	1.1	2
PG 82-22	Crumb Rubber Modified	5	0.0533	0.0030	6	57.3	2.5	4
#1 PG 76-22		2	0.1377	0.0049	4	54.7	1.2	2
#2 PG 76-22		2	0.1055	0.0028	3	57.3	1.1	2
#3 PG 76-22		2	0.0908	0.0009	1	59.9	1.8	3
Pooled Average					3			3

POTENTIAL APPLICATIONS

- QUICK SCREENING OF BINDERS
- IDENTIFY PRESENCE OF CONTAMINANTS
- MONITOR ADDITION OF ADDITIVES/ASPHALT BLENDING
- RELATIONSHIP TO MSCR
- MONITOR BINDER DURING PAVING
 - UTAH DOT 2015 SEASON
- CHARACTERIZE CRUMB RUBBER MODIFIED BINDERS
 - HIGH CRUMB RUBBER CONTENT – GRANITE BINDERS
 - FHWA TERMINAL BLEND BINDERS

RELATIONSHIP TO MSCR

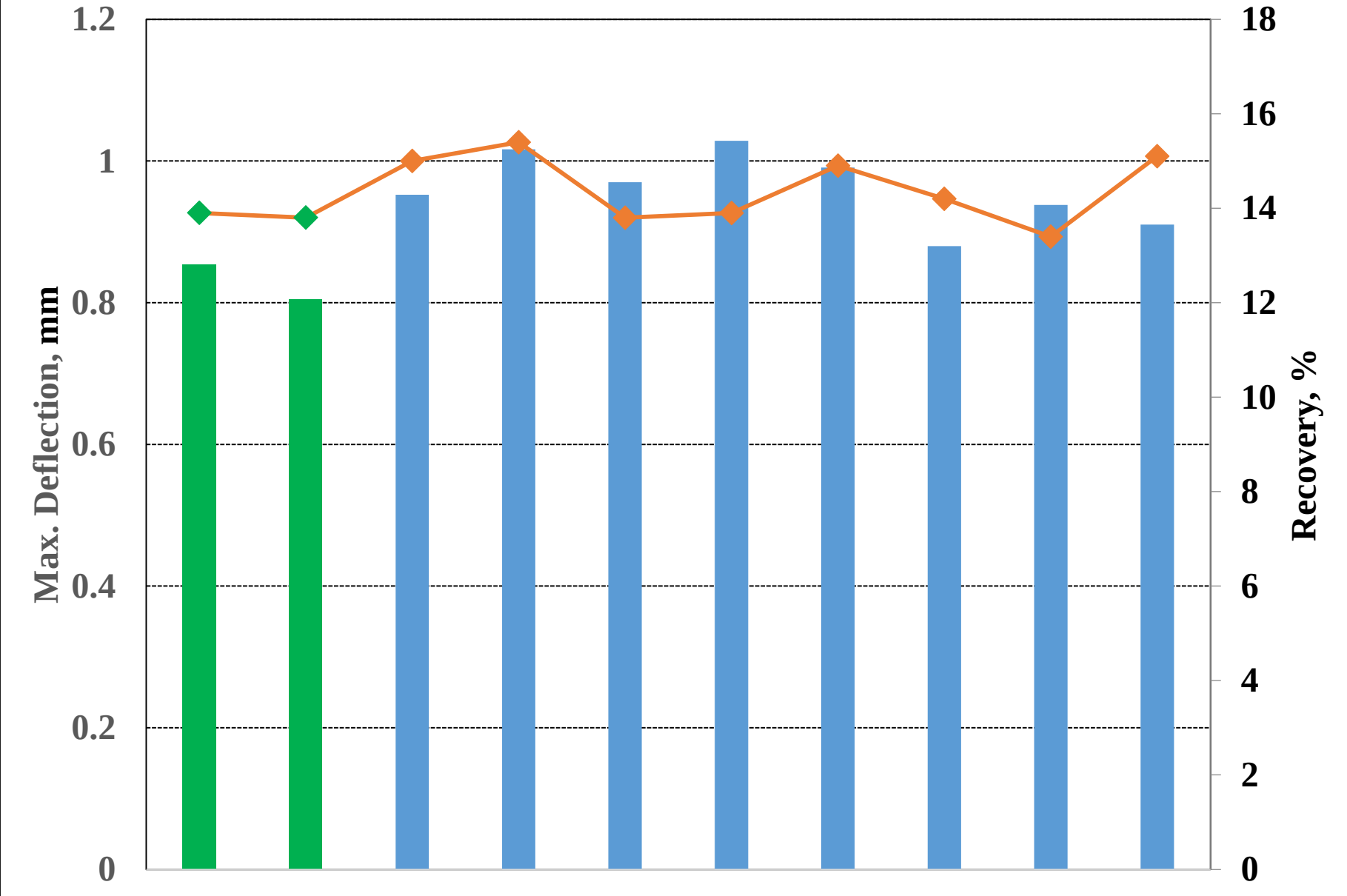


The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are large and prominent, while others are small and subtle. They are scattered across the slide, with a higher concentration in the top-left and bottom-right corners, and a few near the center. The droplets have highlights and shadows, giving them a three-dimensional appearance.

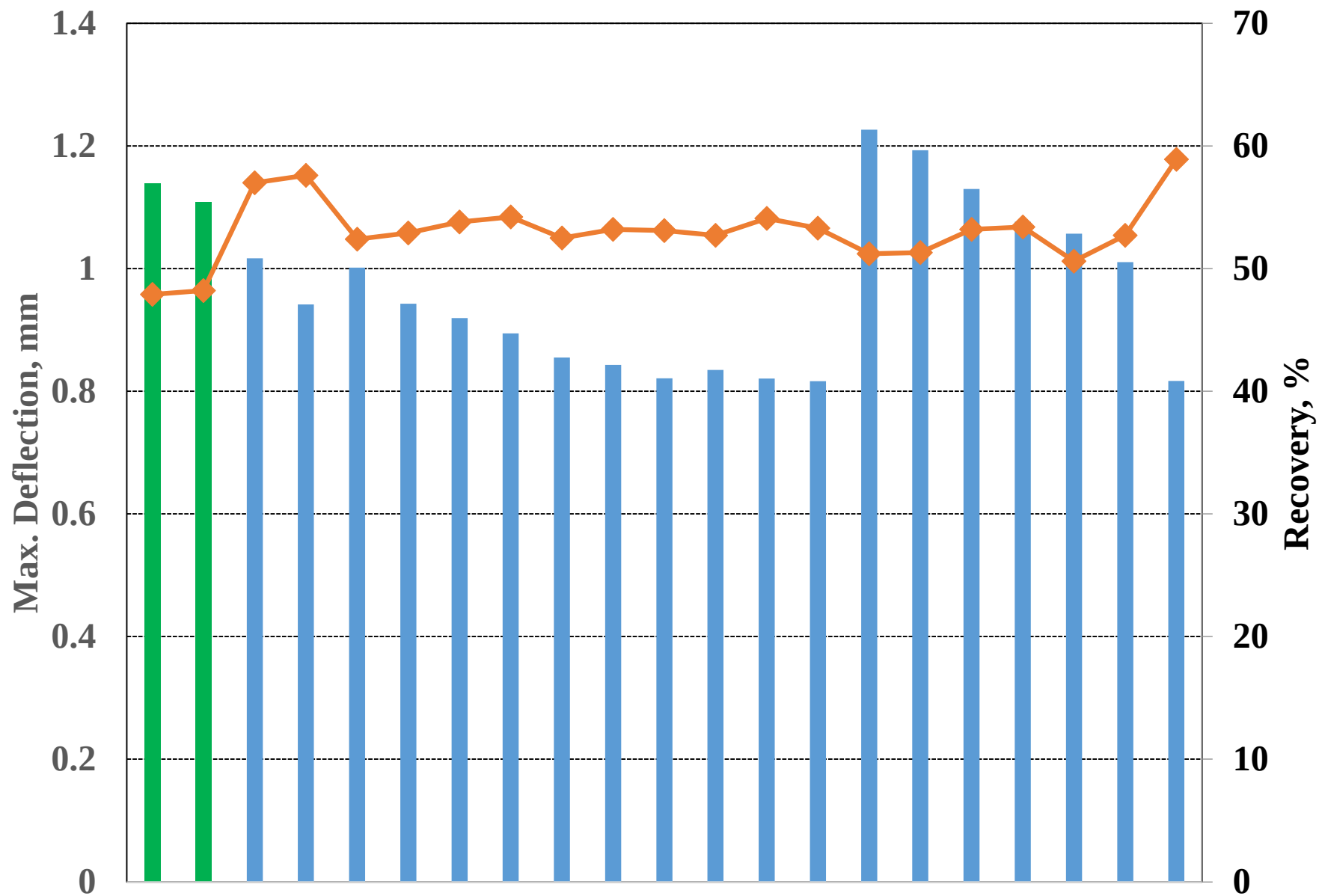
MONITOR BINDER DURING PAVING

UTAH DOT 2015 SEASON

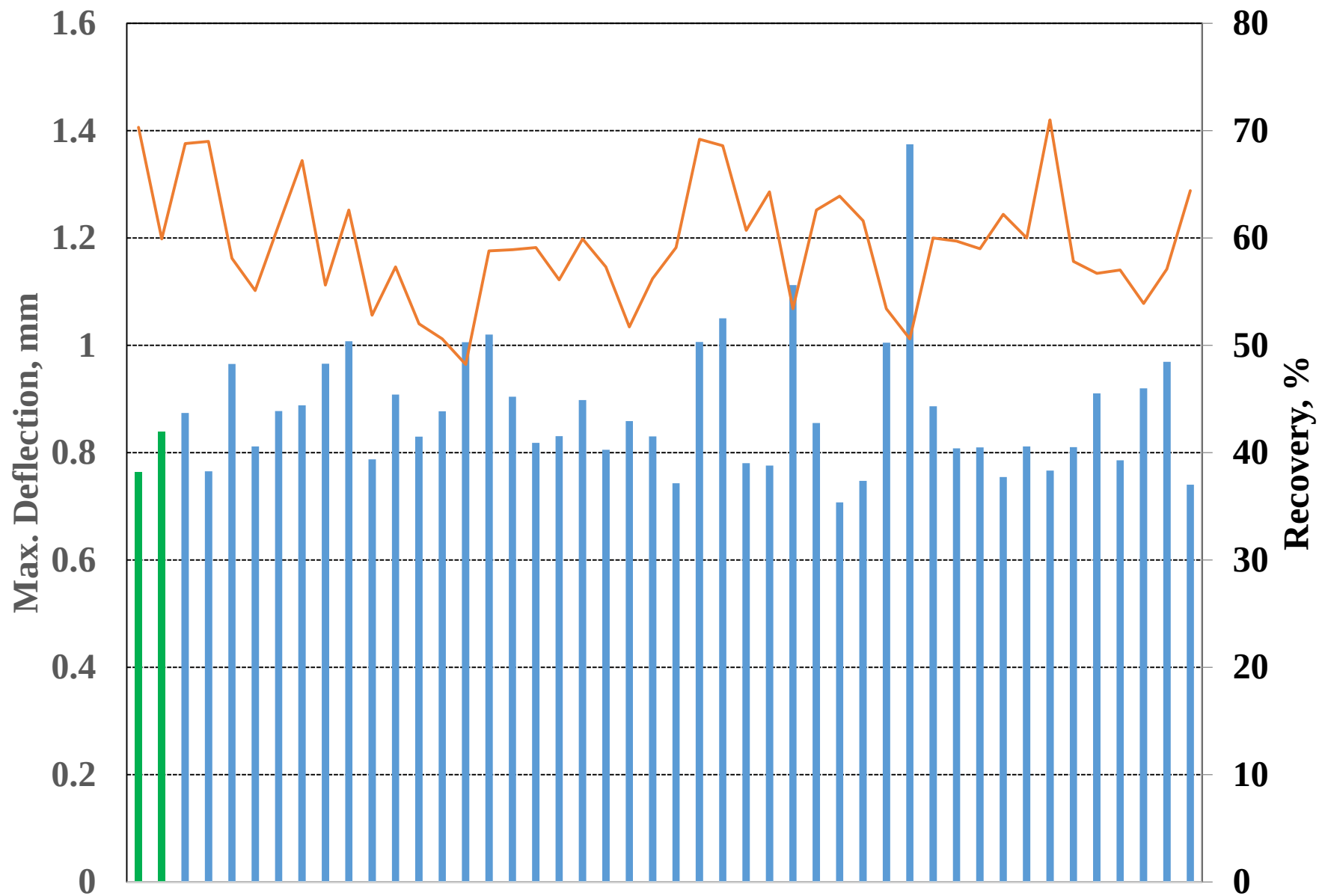
PG 58-28



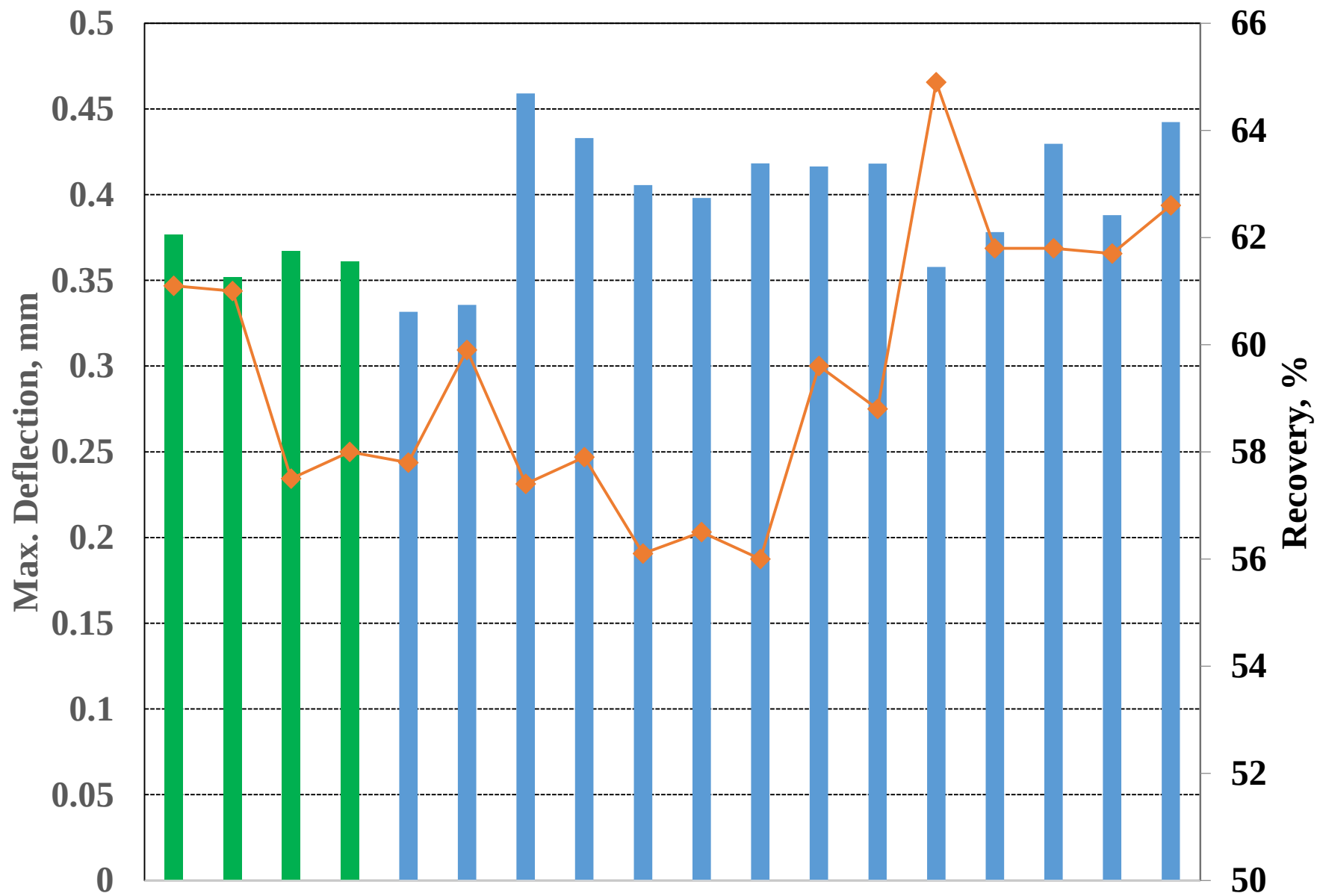
PG 58-34



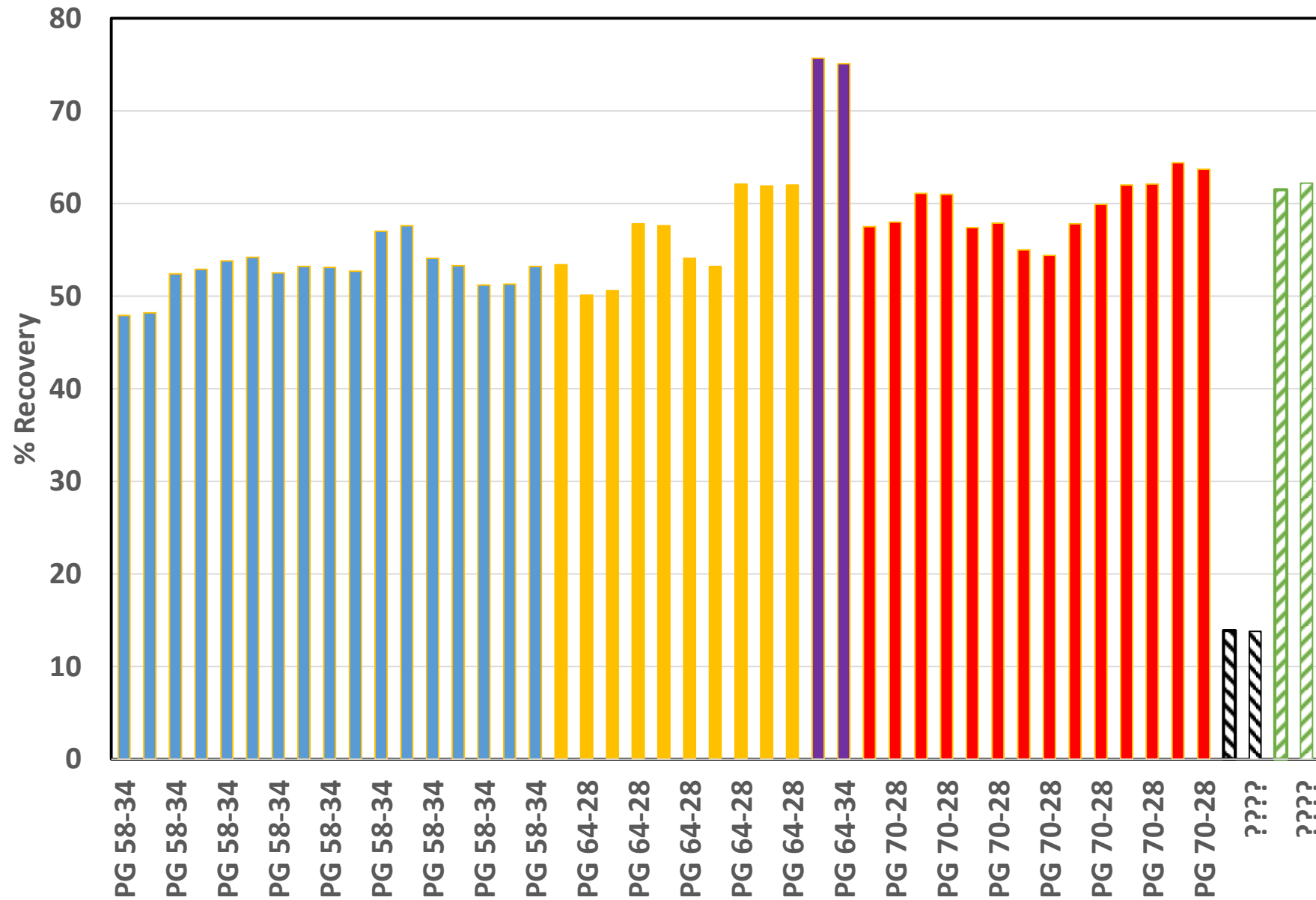
PG 64-34



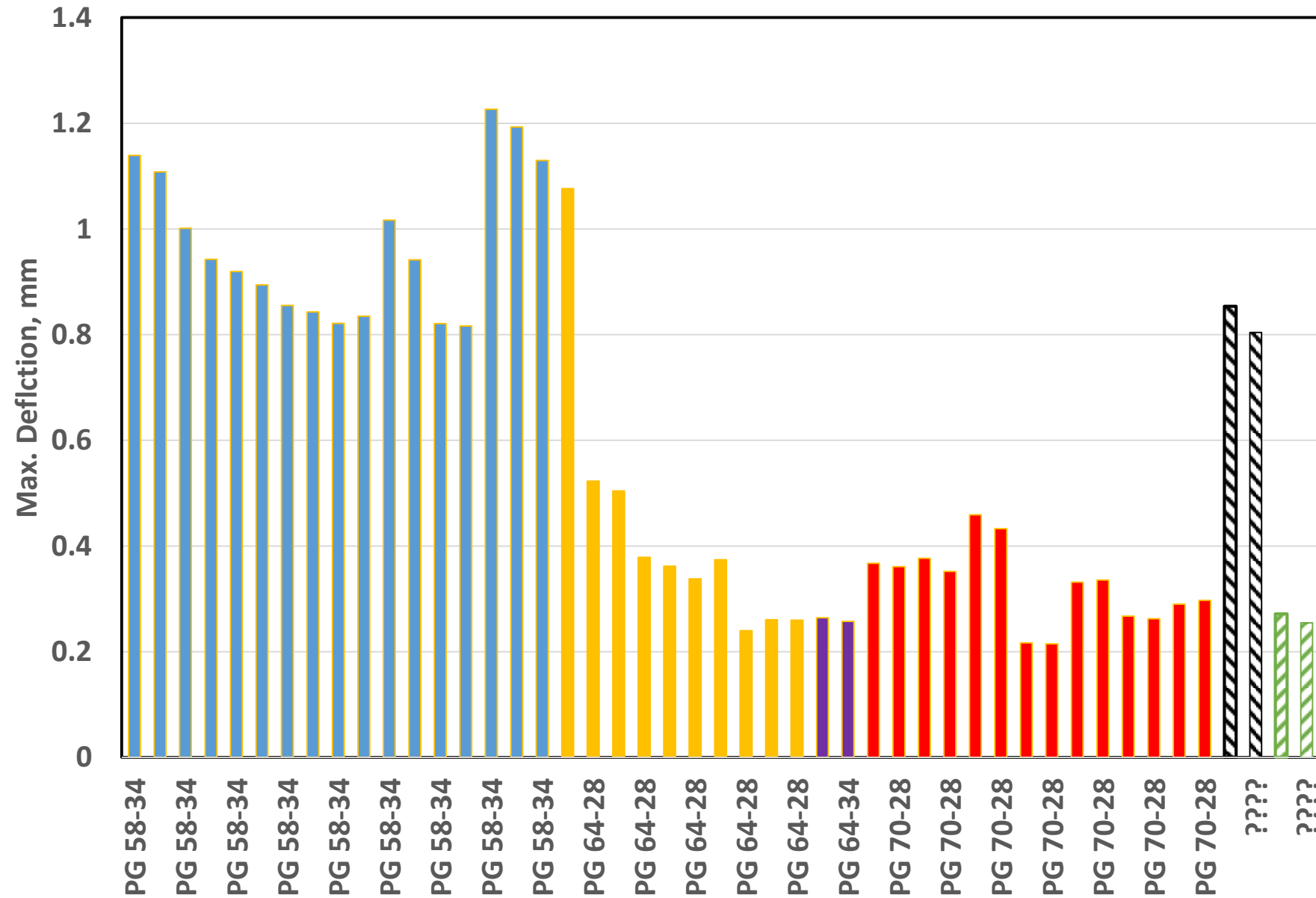
PG 70-28

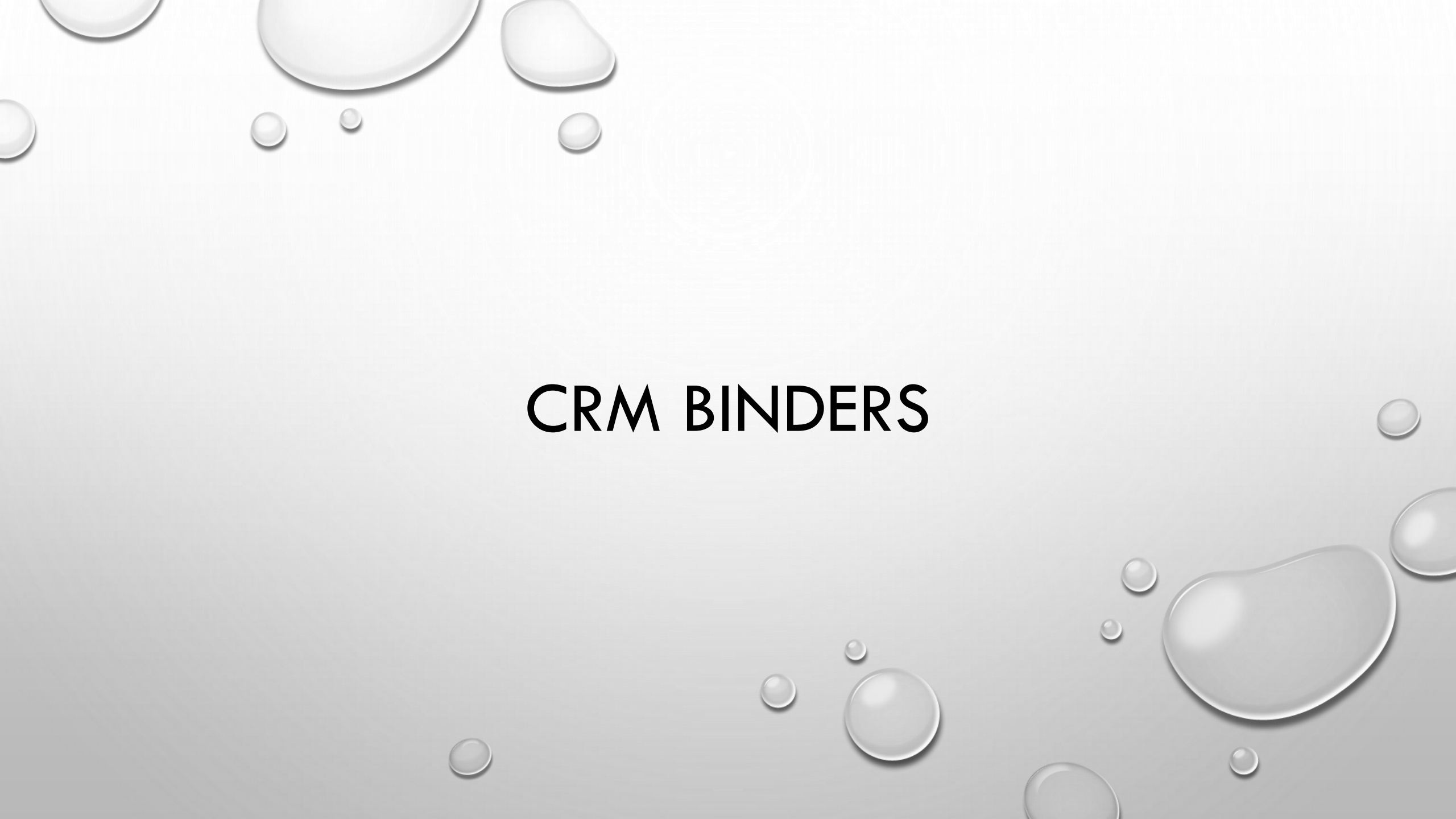


UDOT 2015 Season

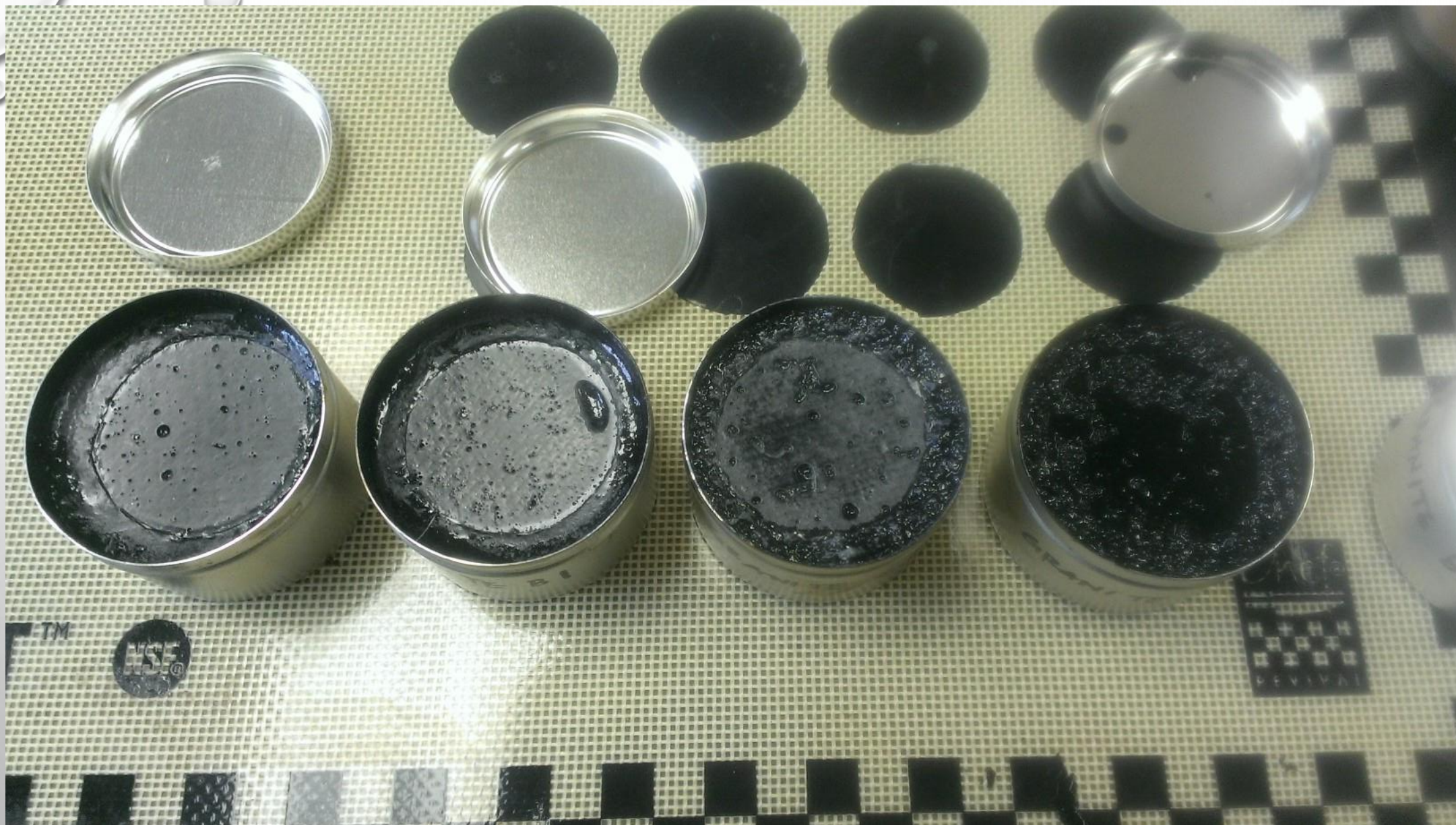


UDOT 2015 Season



The background is a light gray gradient. It features several realistic water droplets of various sizes, some with highlights and shadows, scattered across the frame. In the upper center, there is a faint, circular, textured pattern that resembles a lens flare or a subtle watermark.

CRM BINDERS



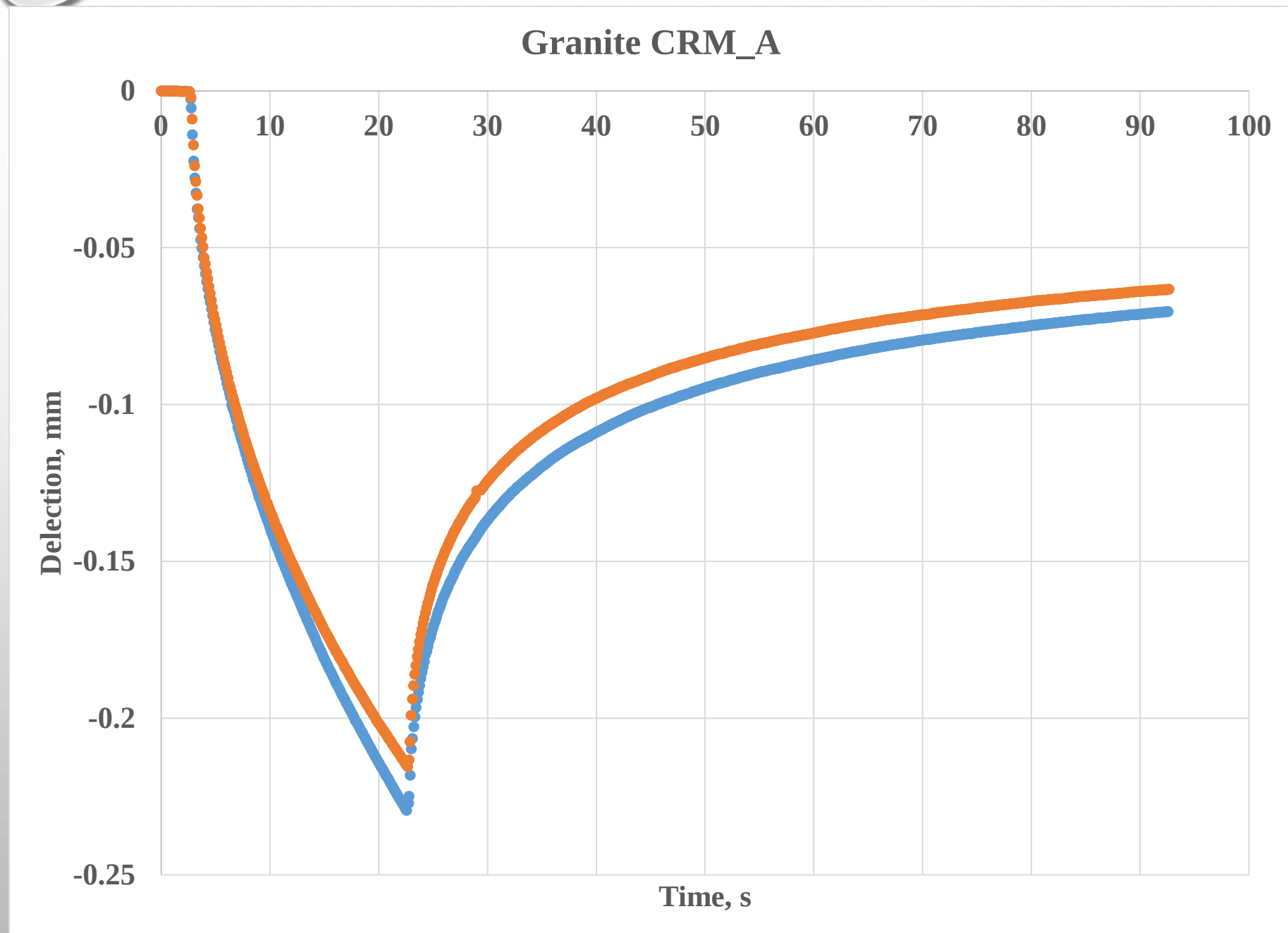


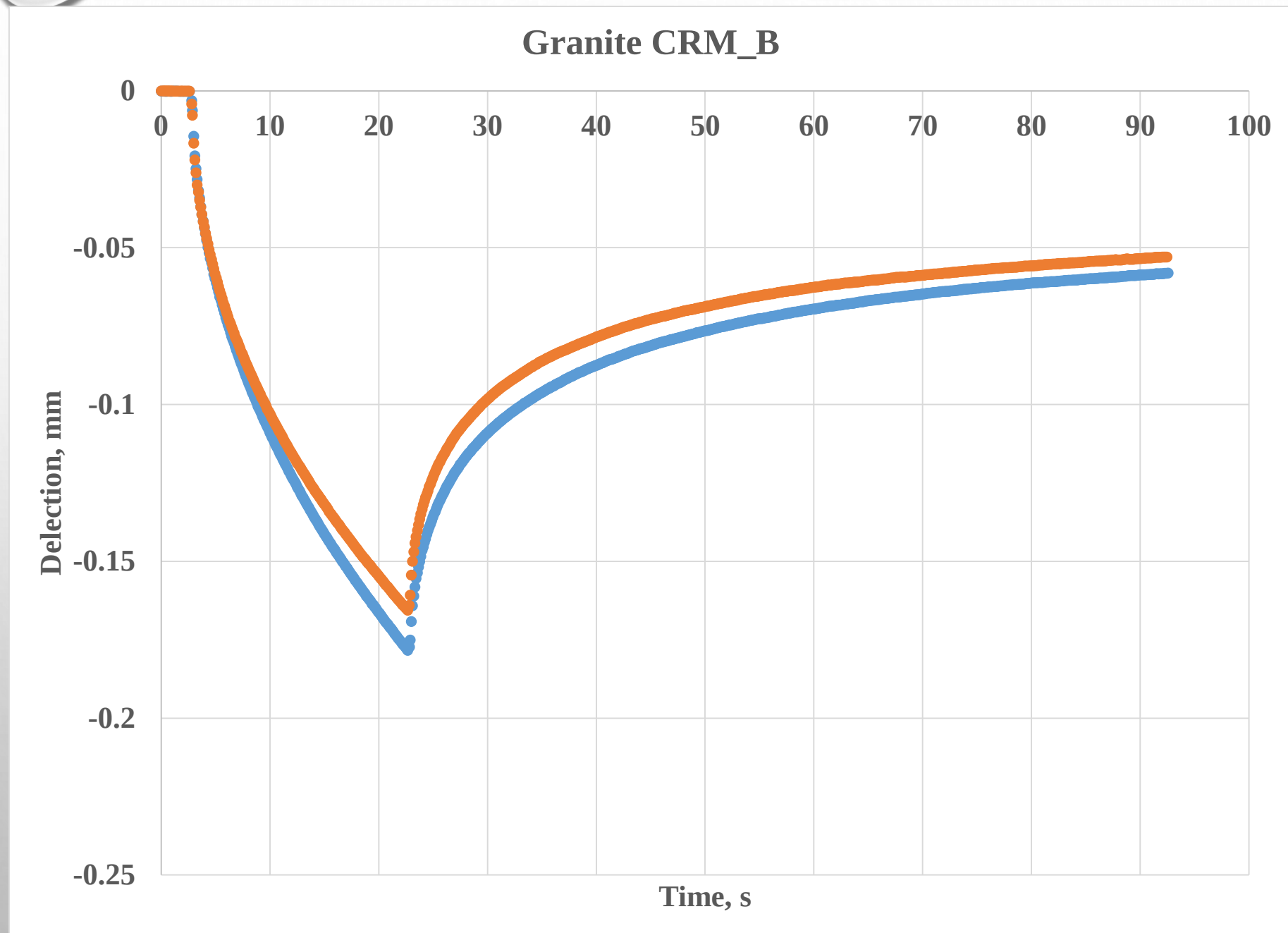
GRANITE CRM BINDERS

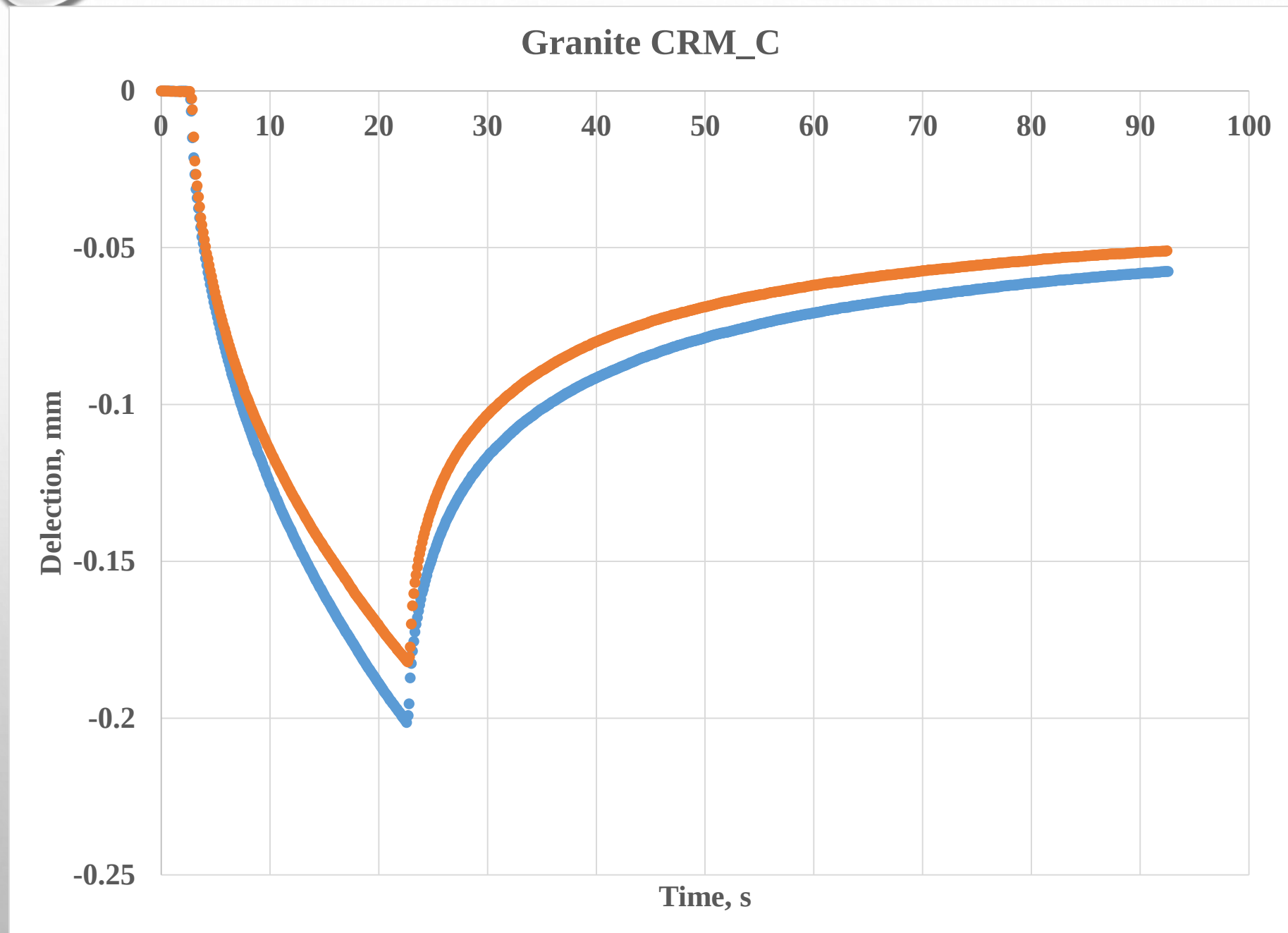
				Averages		
SampleID	Max. Deflection mm	Recovery %	Recovery mm	Max. Deflection mm	Recovery %	Recovery mm
GRNT_A1	-0.229	69	-0.070	-0.222	70	-0.067
GRNT_A2	-0.216	71	-0.063			
GRNT_B1	-0.178	67	-0.058	-0.172	68	-0.056
GRNT_B2	-0.166	68	-0.053			
GRNT_C1	-0.201	71	-0.058	-0.192	72	-0.054
GRNT_C2	-0.182	72	-0.051			
GRNT_D1	-0.140	74	-0.036	-0.143	74	-0.037
GRNT_D2	-0.145	73	-0.039			

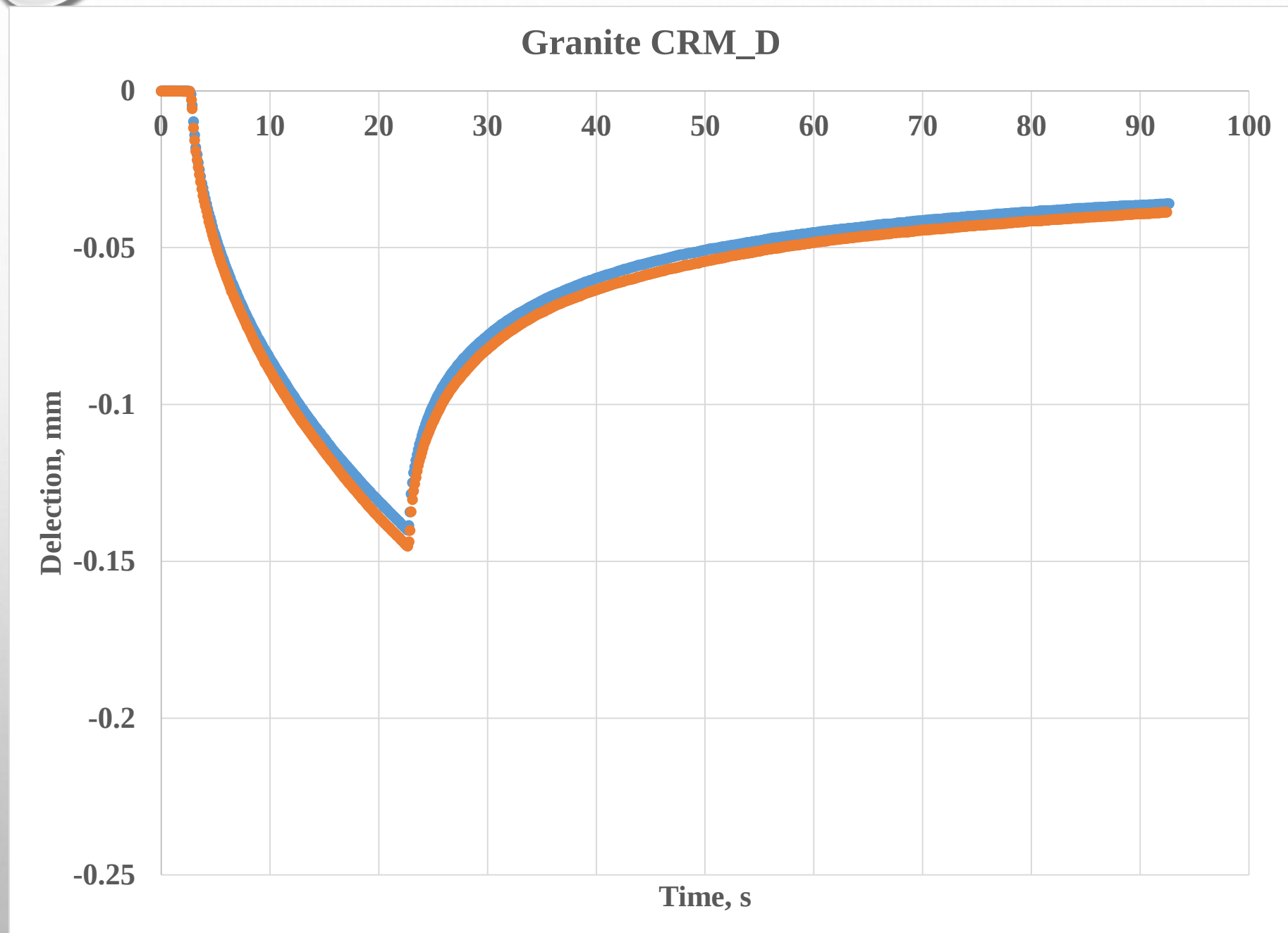
GRANITE CRM BINDERS

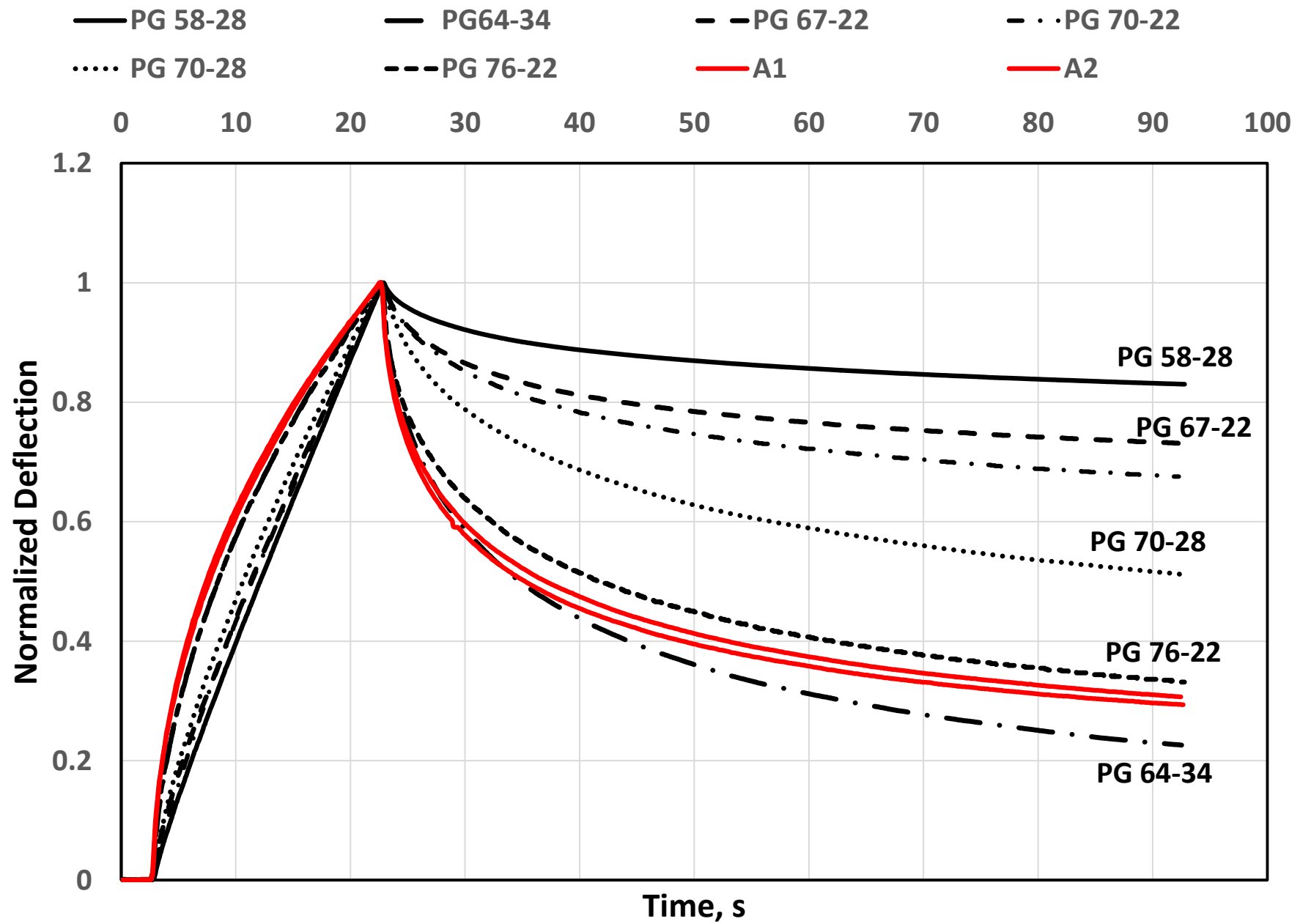
Statistics					
Max. Defl.		% Recov		Recovered Defl.	
Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average
0.00983	-0.2225	0.91923882	69.95	0.00502	-0.0669
0.00905	-0.172	0.42426407	67.7	0.00361	-0.0556
0.01365	-0.1918	0.42426407	71.7	0.00467	-0.0543
0.00361	-0.1427	0.70710678	73.8	0.00191	-0.0374
Averages					
0.00903	-0.1822	0.61871843	70.7875	0.0038	-0.0535
5		0.9		7	

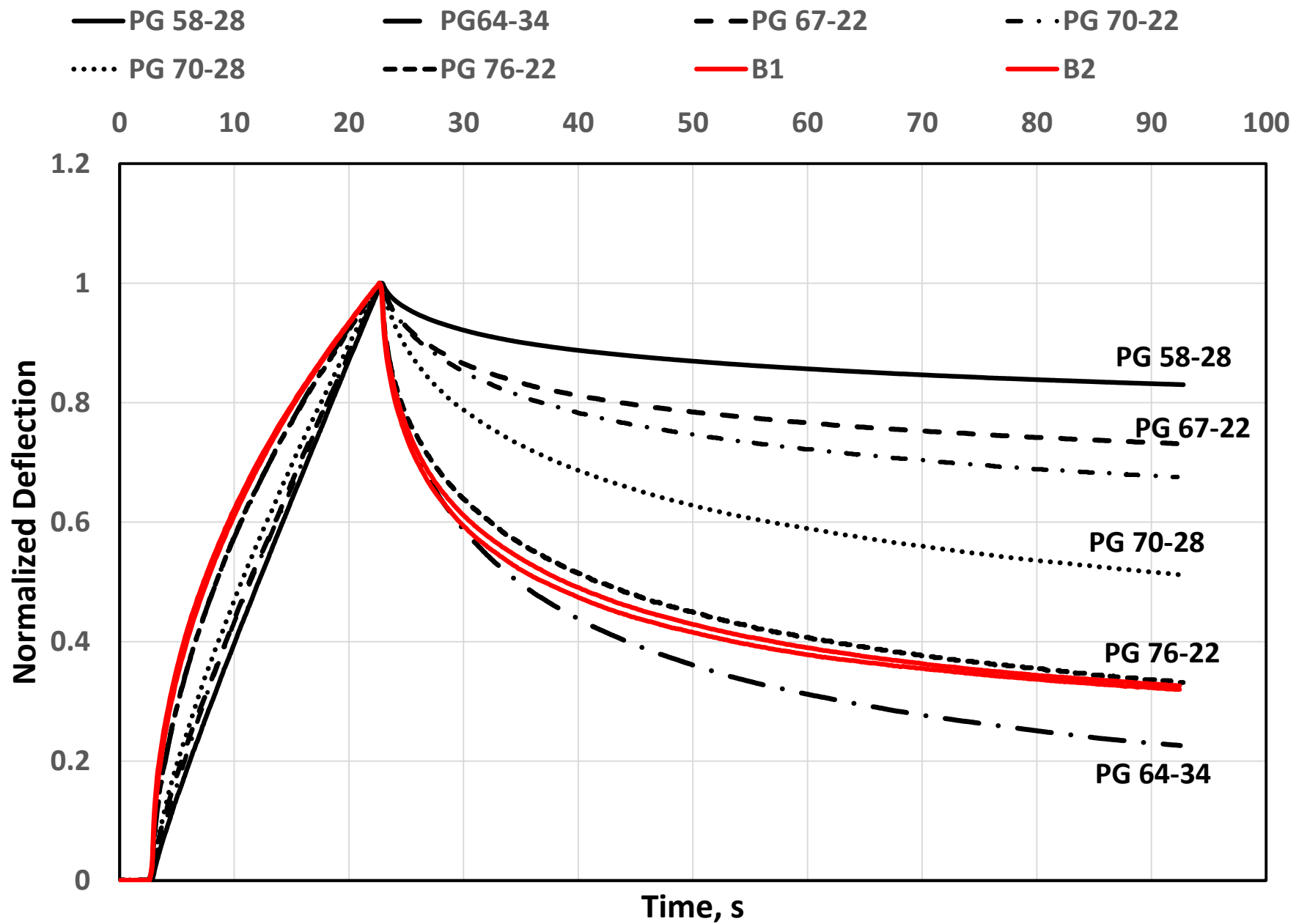


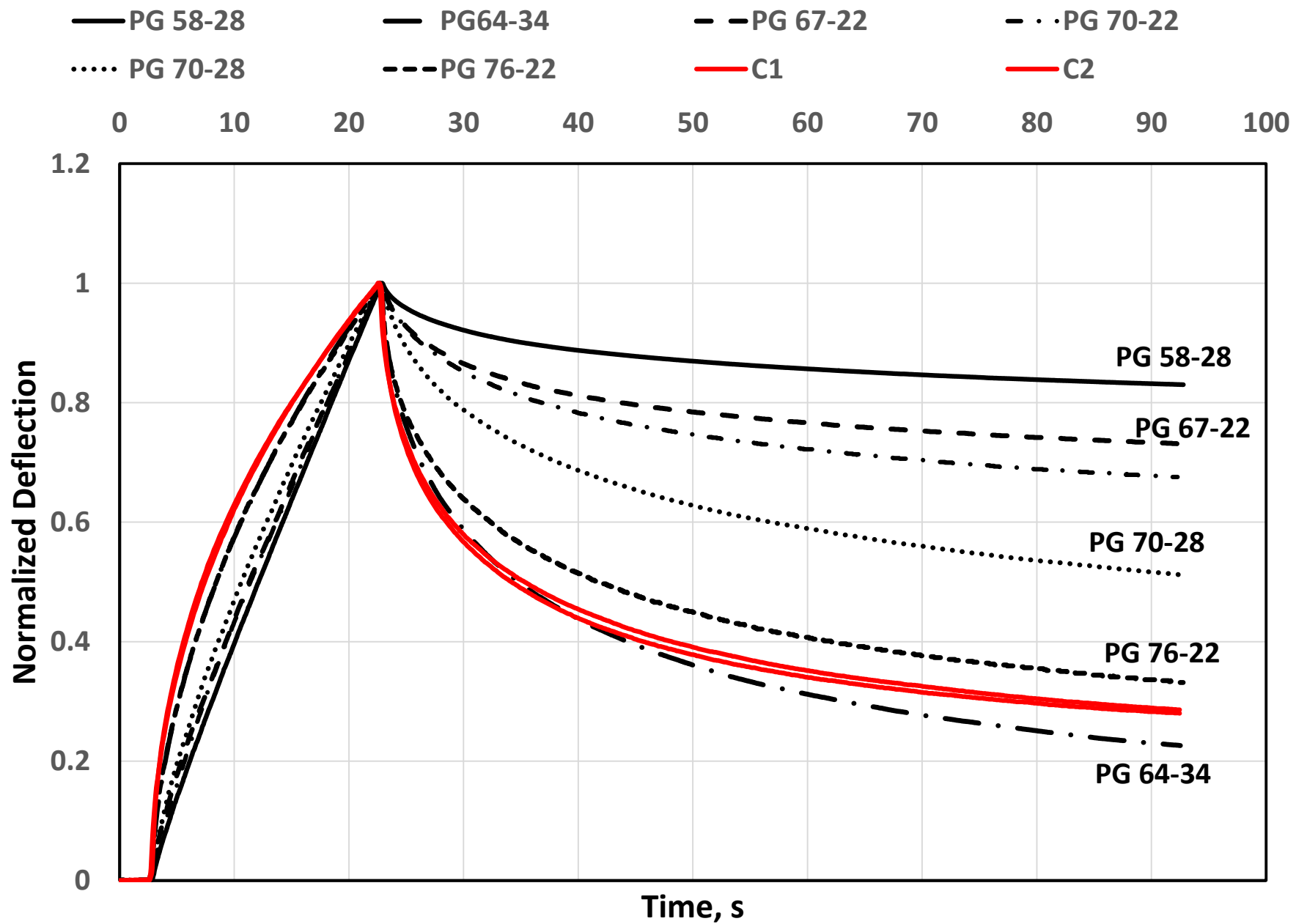


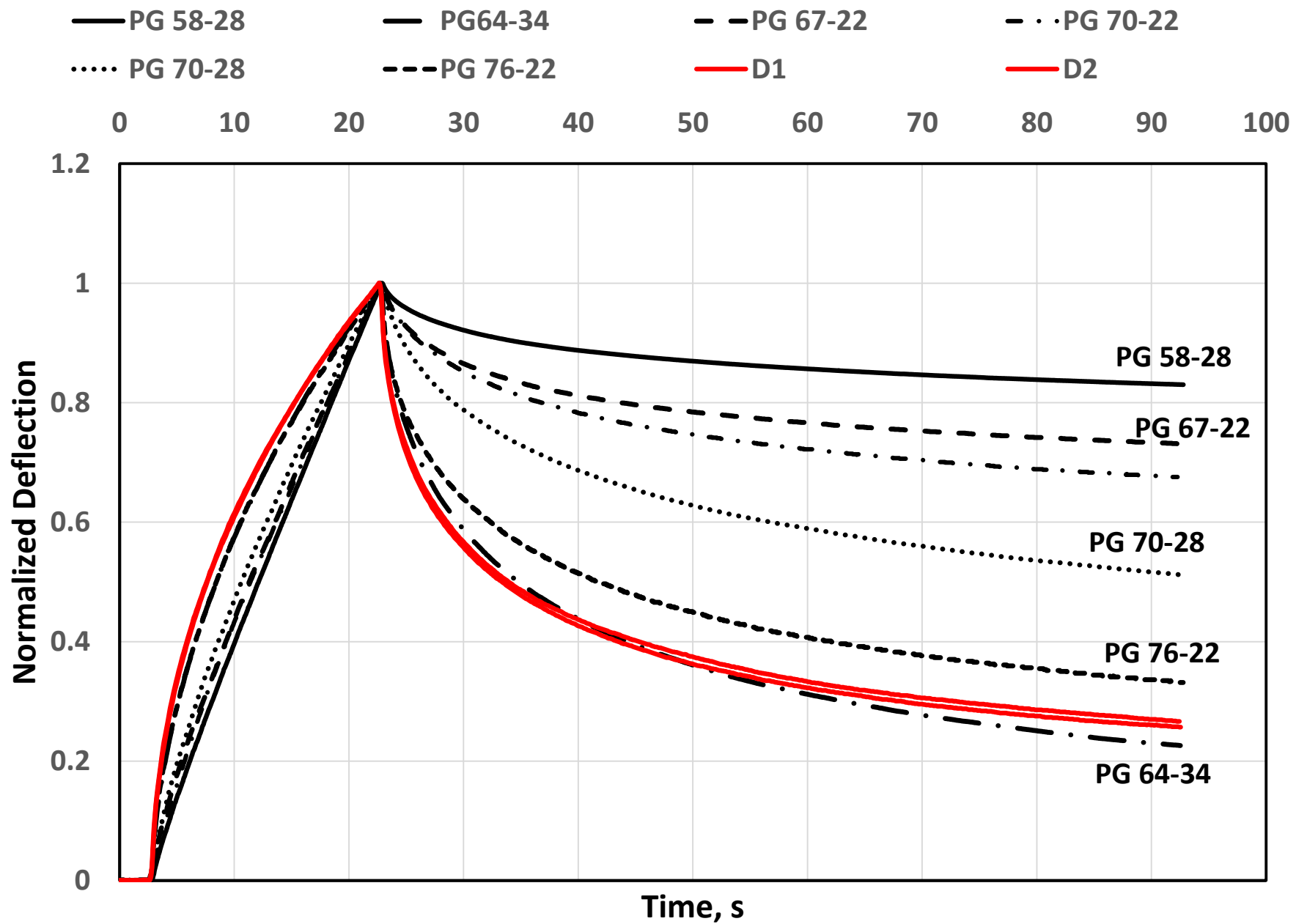






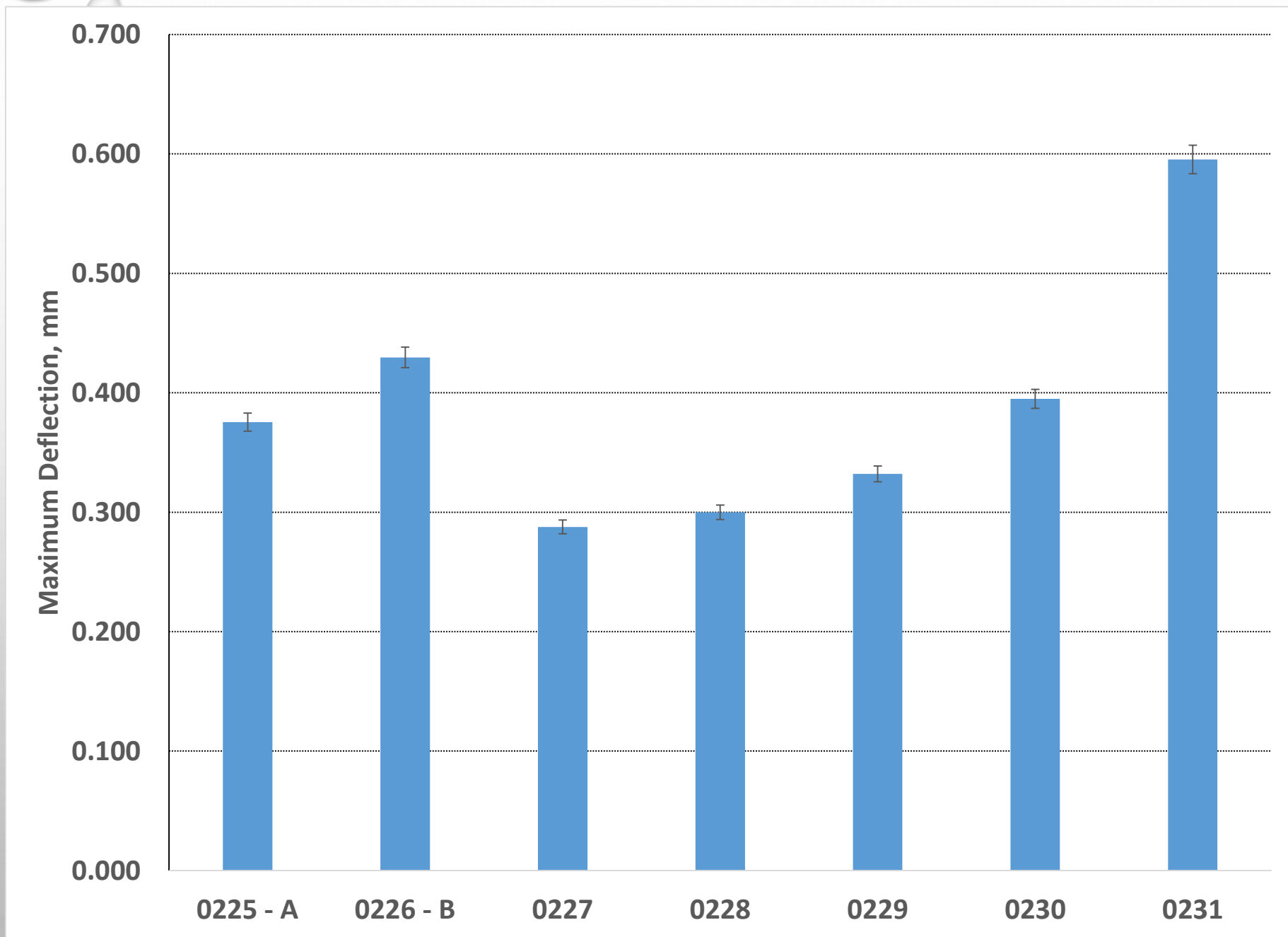


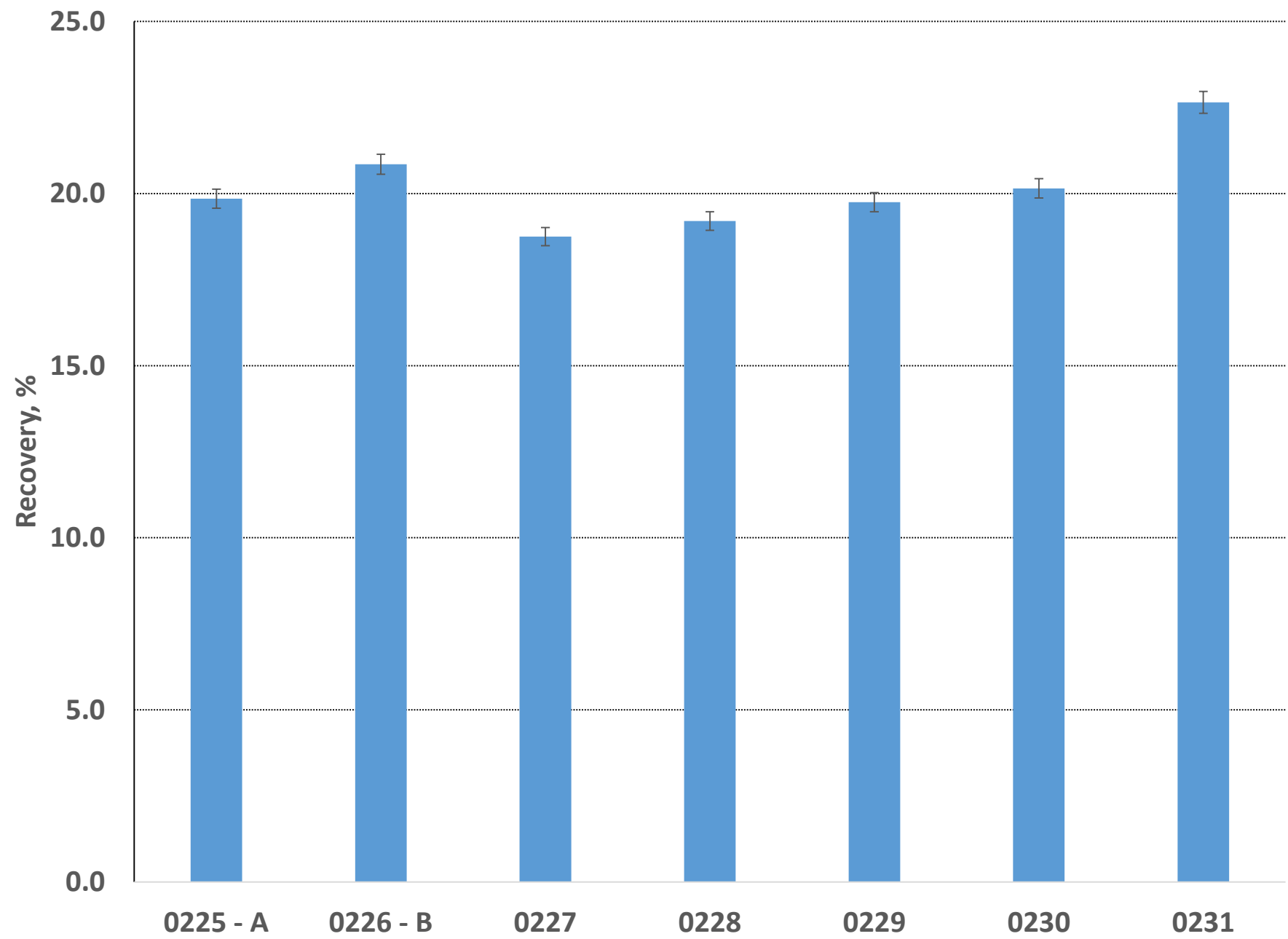


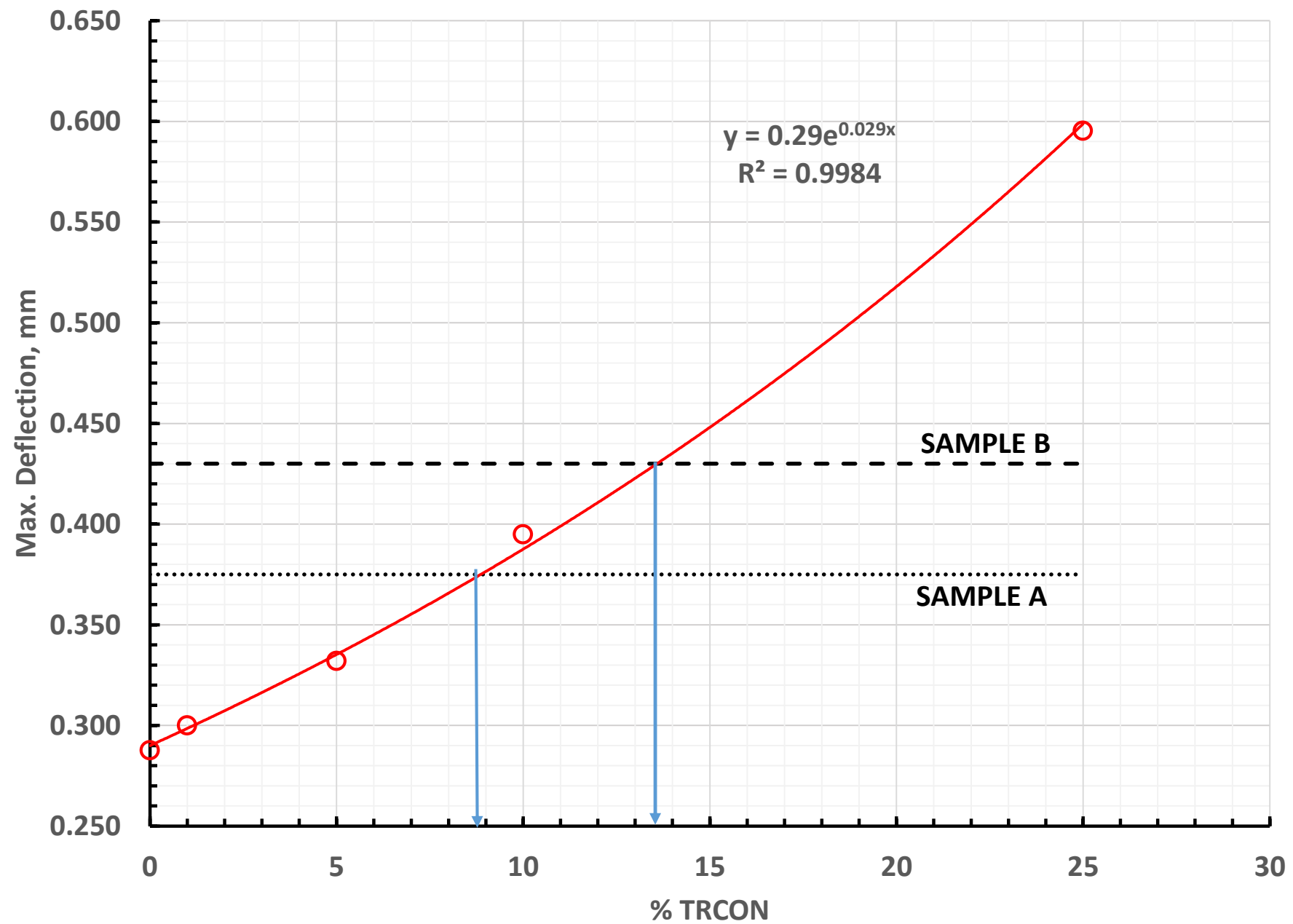


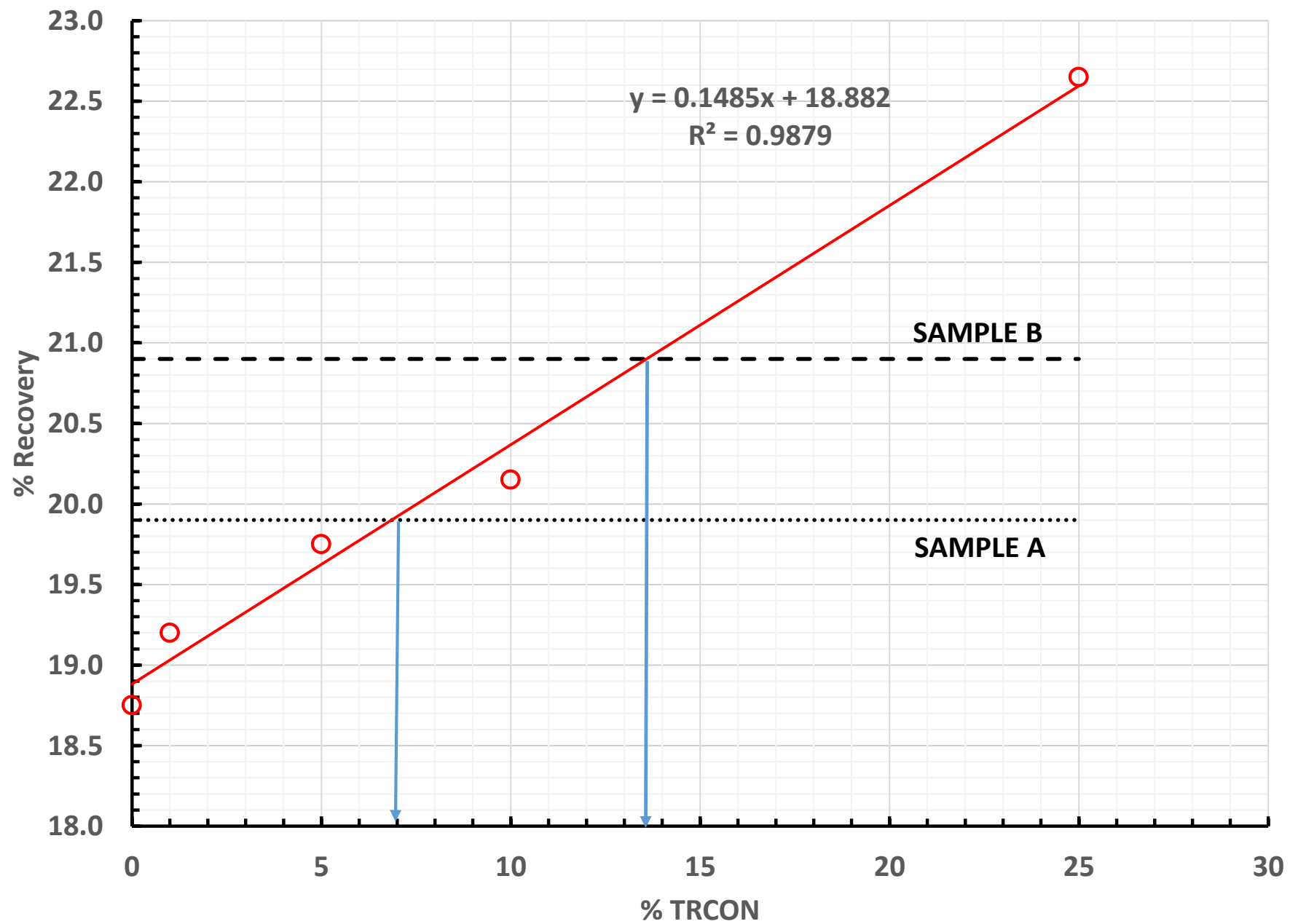
FHWA TRCON EXPERIMENT

Sample ID	Max. Deflection, mm			% Recovery			TRCON Content
	avg	std dev	COV %	avg	std dev	COV %	
0225 - A	0.375	0.00177	0.5	19.9	0.35355	1.8	?
0226 - B	0.430	0.01379	3.2	20.9	0.49497	2.4	?
0227	0.288	0.00191	0.7	18.8	0.35355	1.9	0
0228	0.300	0.00615	2.1	19.2	0.42426	2.2	1
0229	0.332	0.0094	2.8	19.8	0.21213	1.1	5
0230	0.395	0.00905	2.3	20.2	0.07071	0.4	10
0231	0.595	0.01287	2.2	22.7	0.07071	0.3	25
			2.0			1.4	





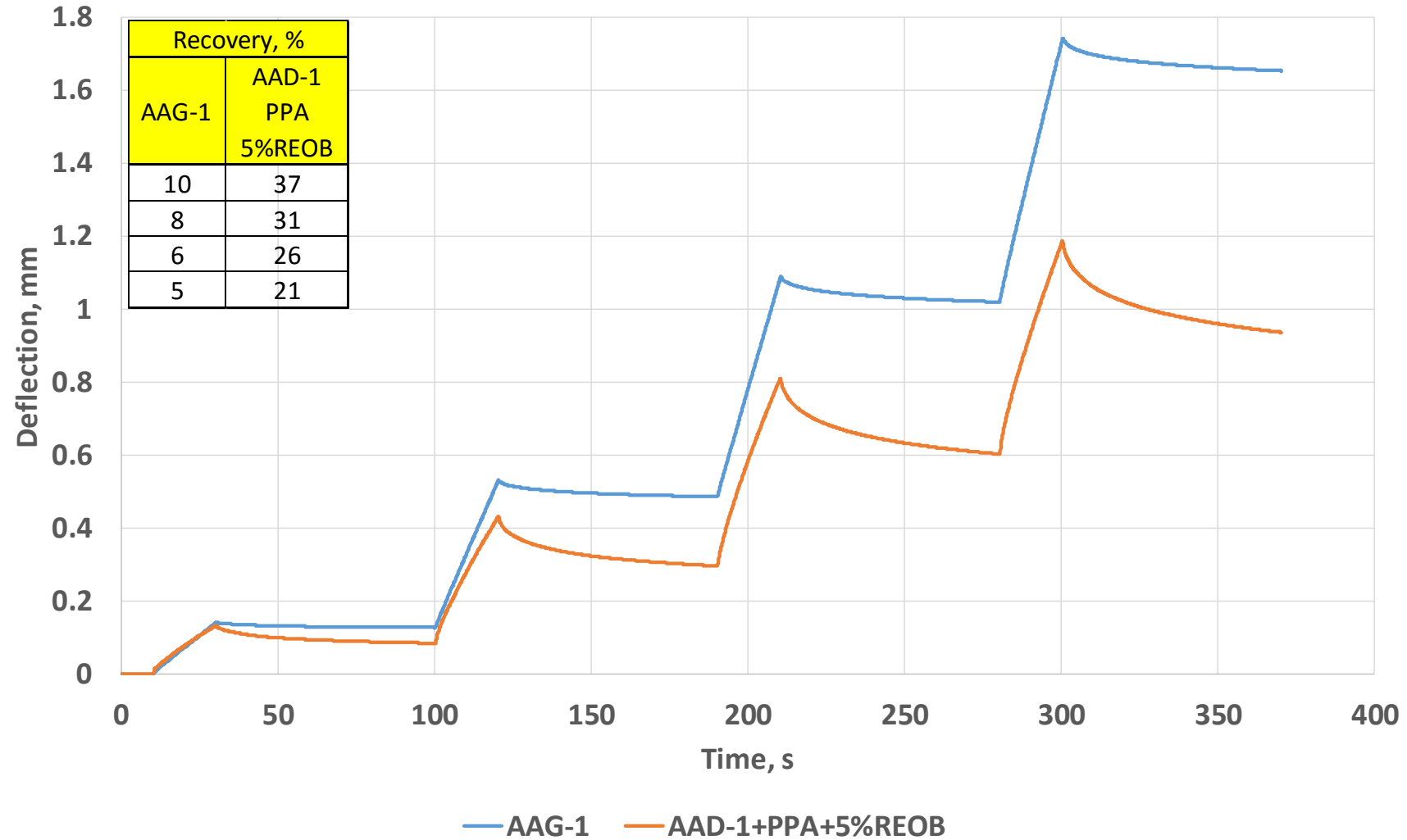




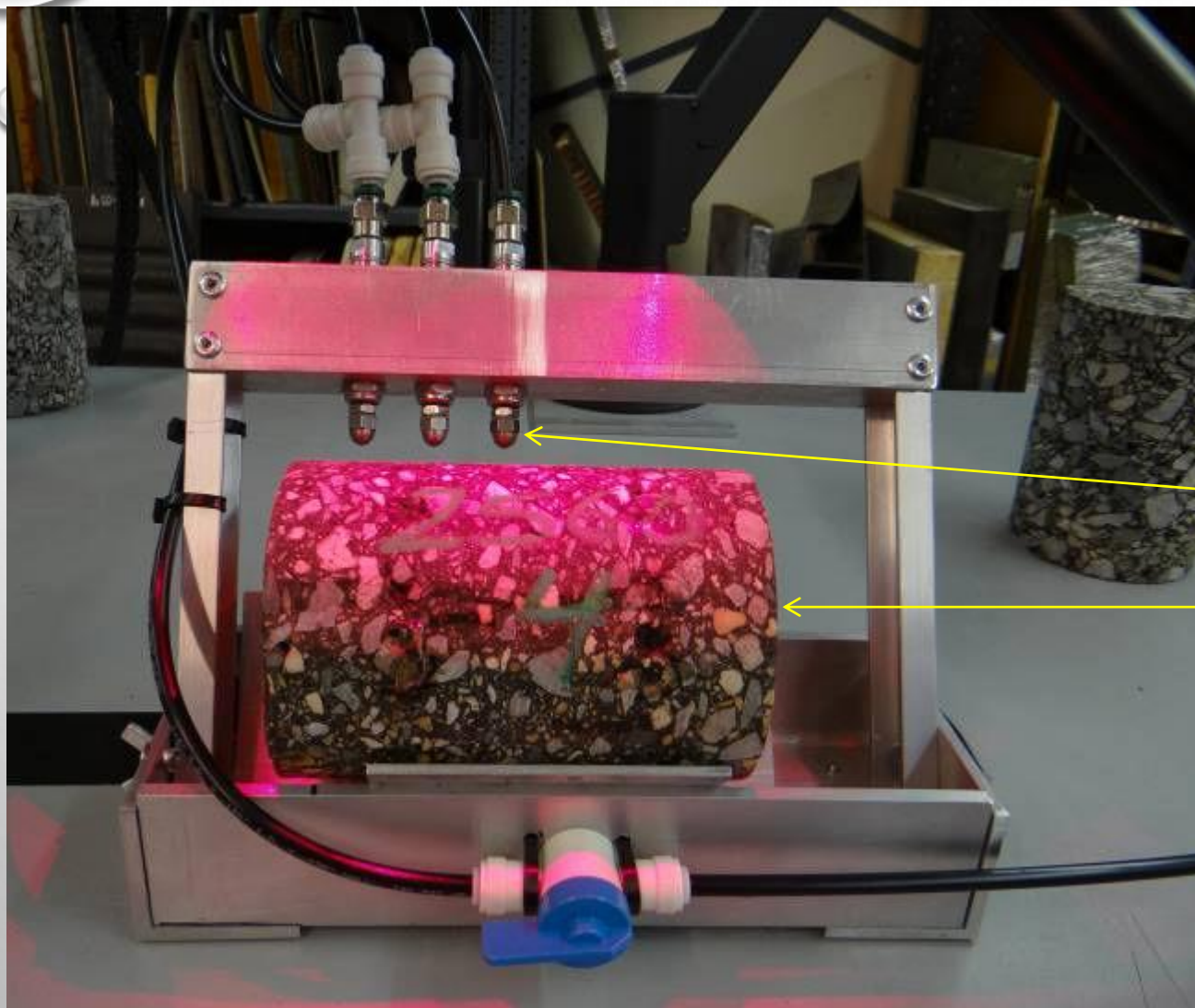
SUMMARY

- DEVELOPED QUICK EASY TO USE QC TEST THAT MEASURES LOADING AND RECOVERY CHARACTERISTICS OF BINDERS
 - ABLE TO DISTINGUISH PG AND PEN GRADED BINDERS
 - ABLE TO DISCRIMINATE BETWEEN VARIOUS TYPES AND CONTENTS OF MODIFIERS
 - COMPARES WELL WITH OTHER RHEOLOGICAL BINDER TEST METHODS
- PROOF OF CONCEPT MIX TESTING EXPERIMENTS ARE PROMISING—STAY TUNED

Multiple Stress Creep Recovery

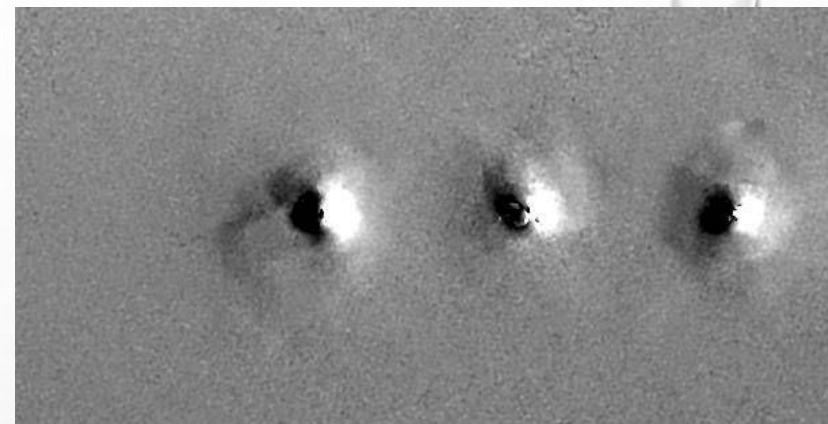


Test Fixture for Loading Asphalt Core Samples

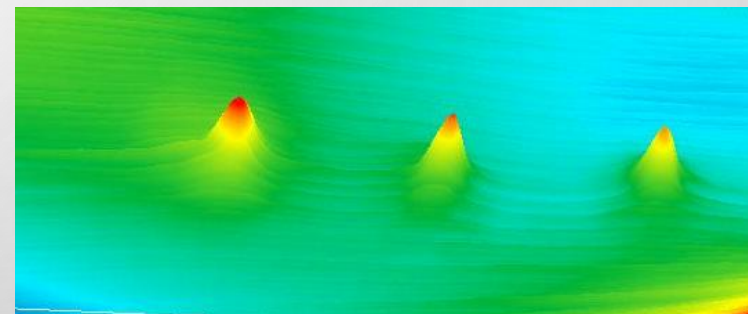


Pneumatic cylinders

Core Sample



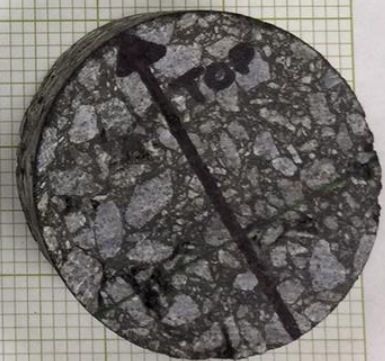
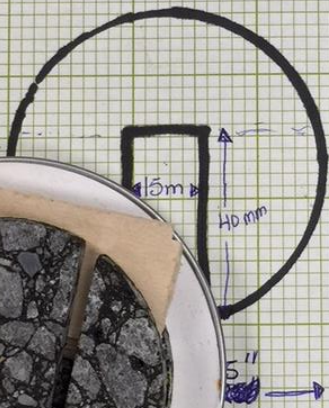
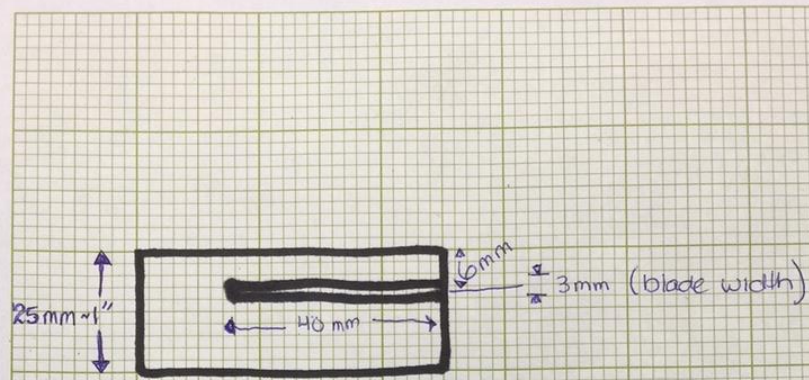
Shearogram of asphalt recovery



Integrated Image

The background is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes, some clustered in the top left and bottom right corners. A faint, circular logo is centered in the upper half of the image, featuring a globe and the text "UNIVERSITY OF THE SOUTH ALABAMA".

MIX TEST DEMO







Model 210 Asphalt Emulsion Quality Test System

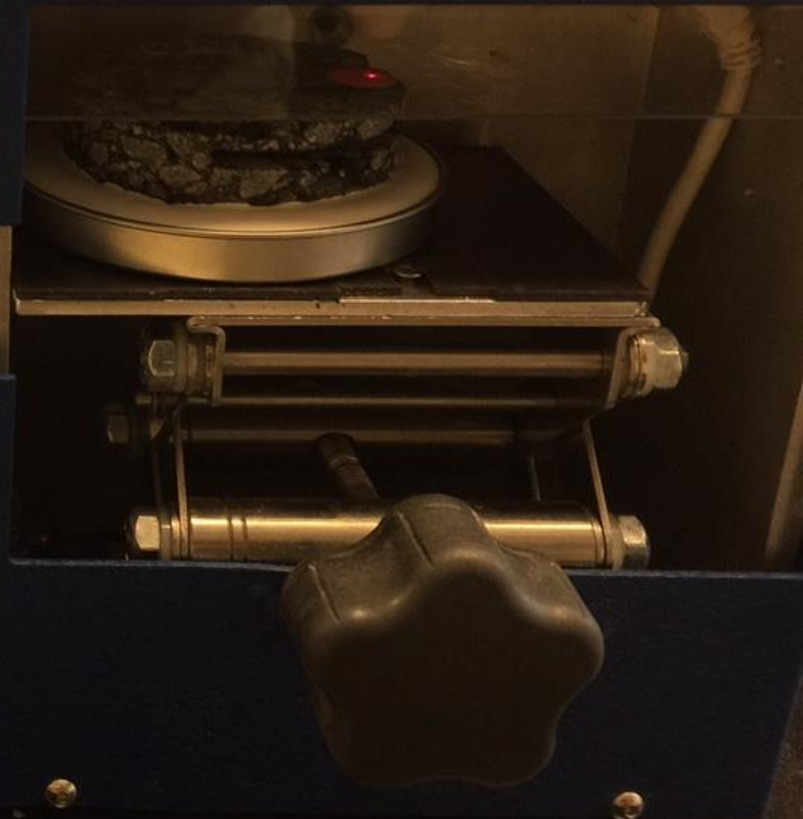
LTI

LASER TECHNOLOGY INC.

NORRISTOWN, PA USA

US and Foreign Patents Pending

Designed and Manufactured in the USA



F3 F4 F5 F6 F7 F8 F9 F10 F11 F12

Print Screen Scroll Lock Pause

K120-TAA





Samples
1-9

A
XXXXXXXXXX
XXXXXXXXXX
B

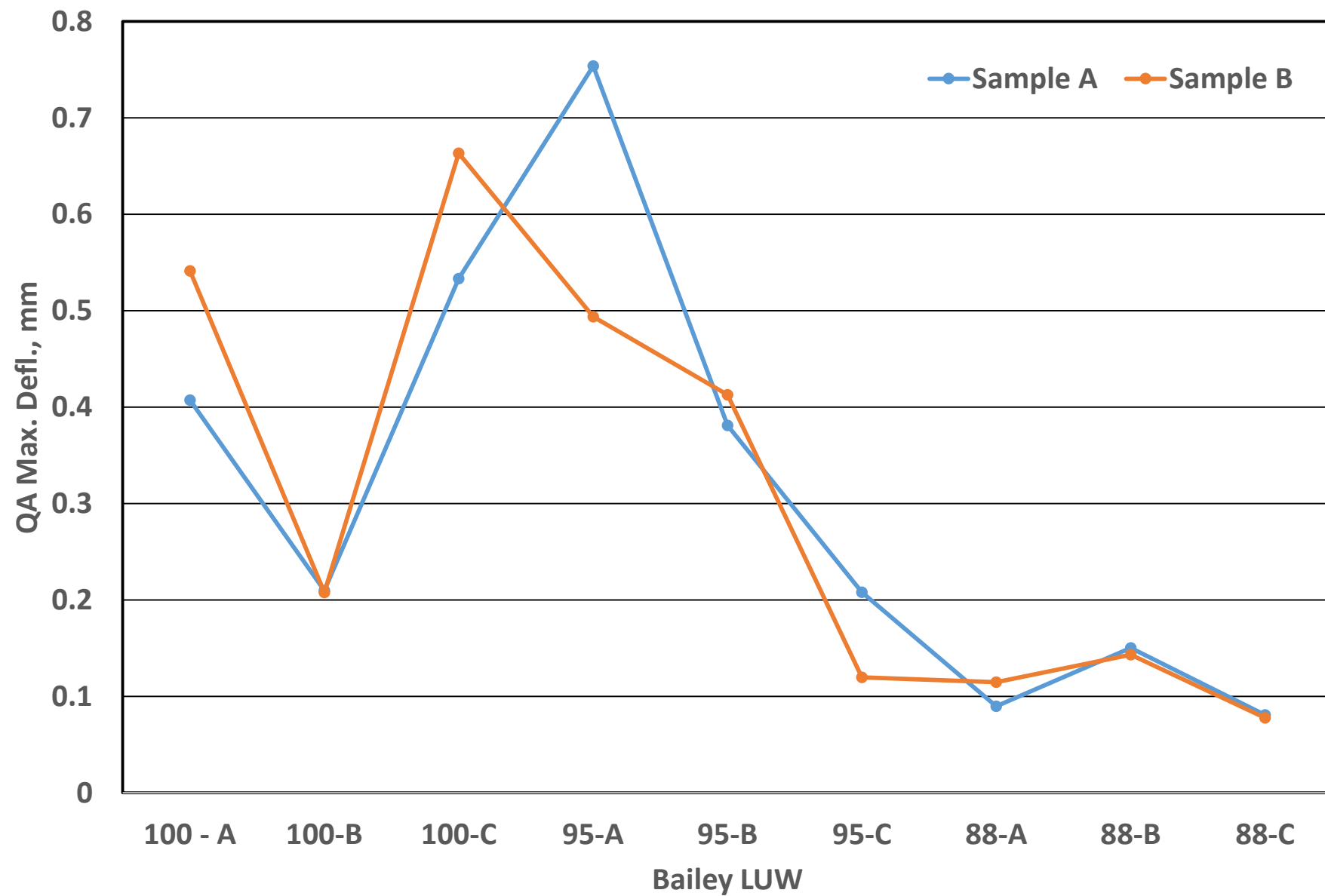
Samples
10-20

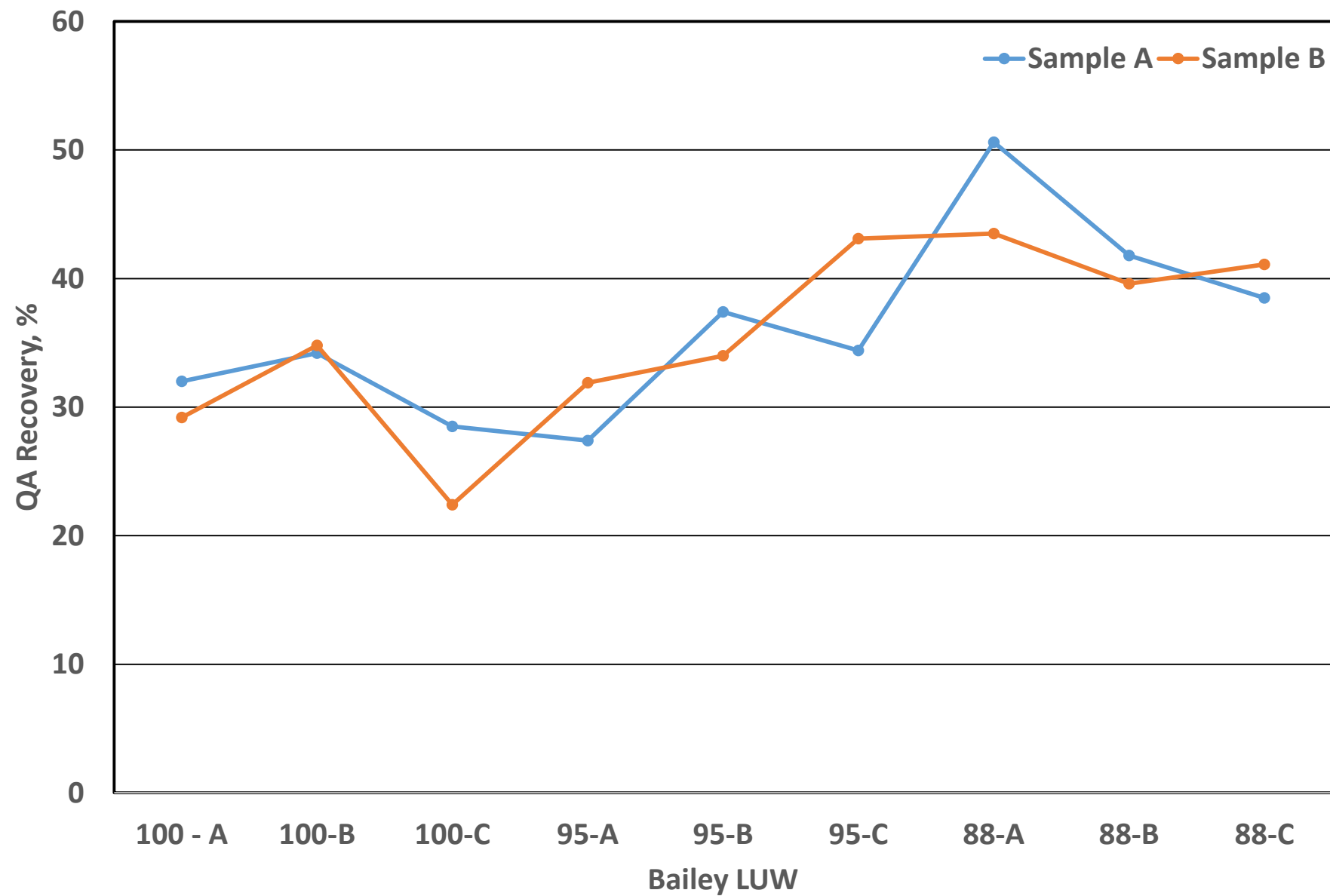
A
XXXXXXXXXX
XXXXXXXXXX
B
C
XXXXXXXXXX

NOT TO SCALE

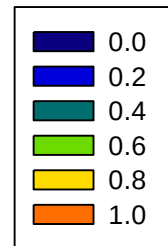
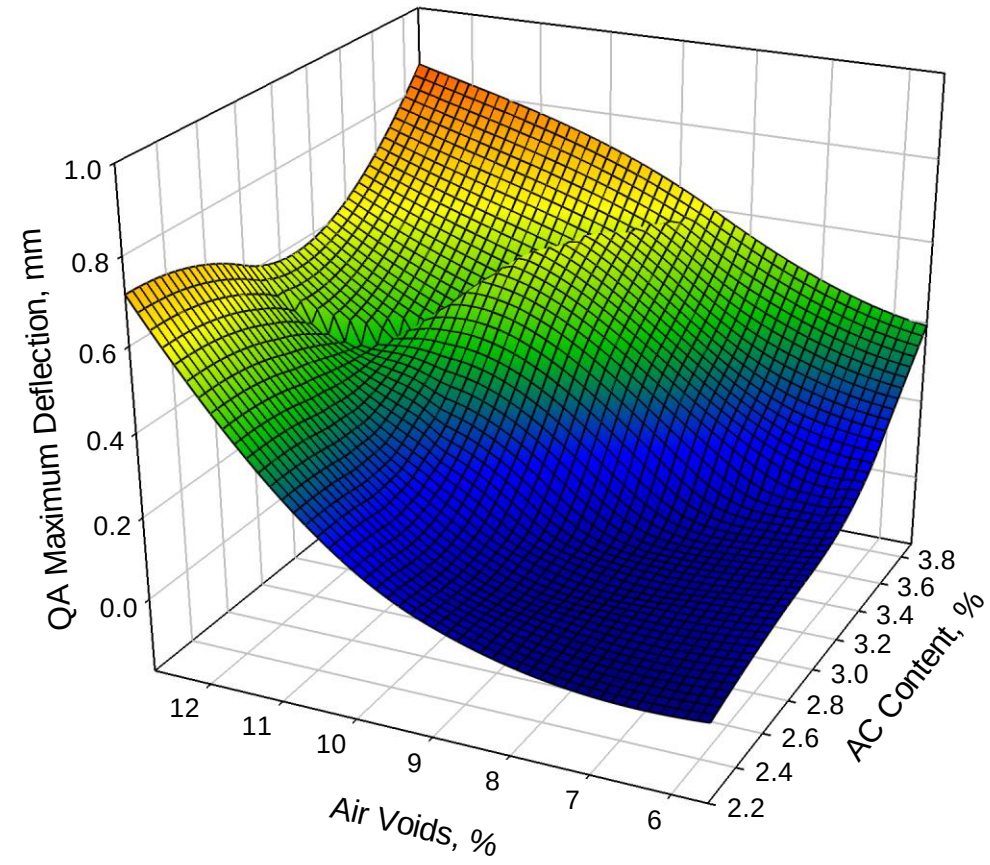
PBMD EXPERIMENT – SAMPLES 1-9

Sample ID	Sample No.	LUW	Binder Content, %	Air Voids, %
1	100A 40-2	100 - A	3.2	10.8
2	100B 00-1	100-B	3.5	5.8
3	100C 40-1	100-C	3.9	8.5
4	95A 40-1	95-A	2.8	12.8
5	95B 40-2	95-B	3.1	11.6
6	95C 00-1	95-C	3.4	6.0
7	88A 80-2	88-A	2.2	9.2
8	88B 00-2	88-B	2.6	9.7
9	88C 80-3	88-C	2.9	5.6

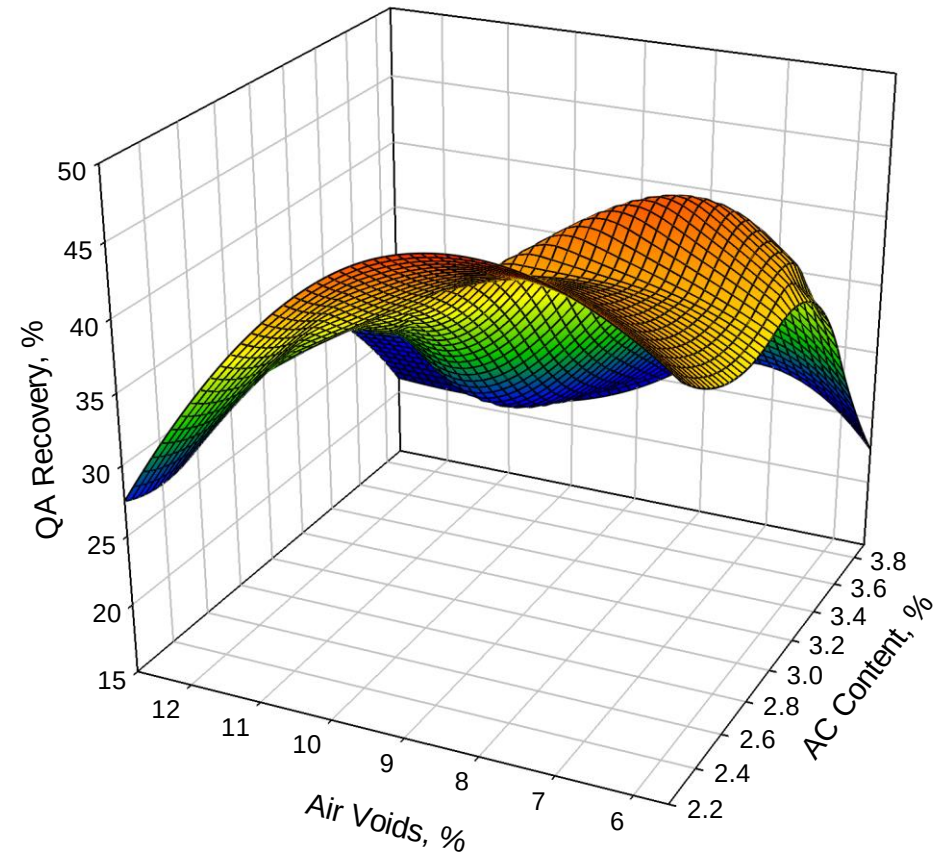


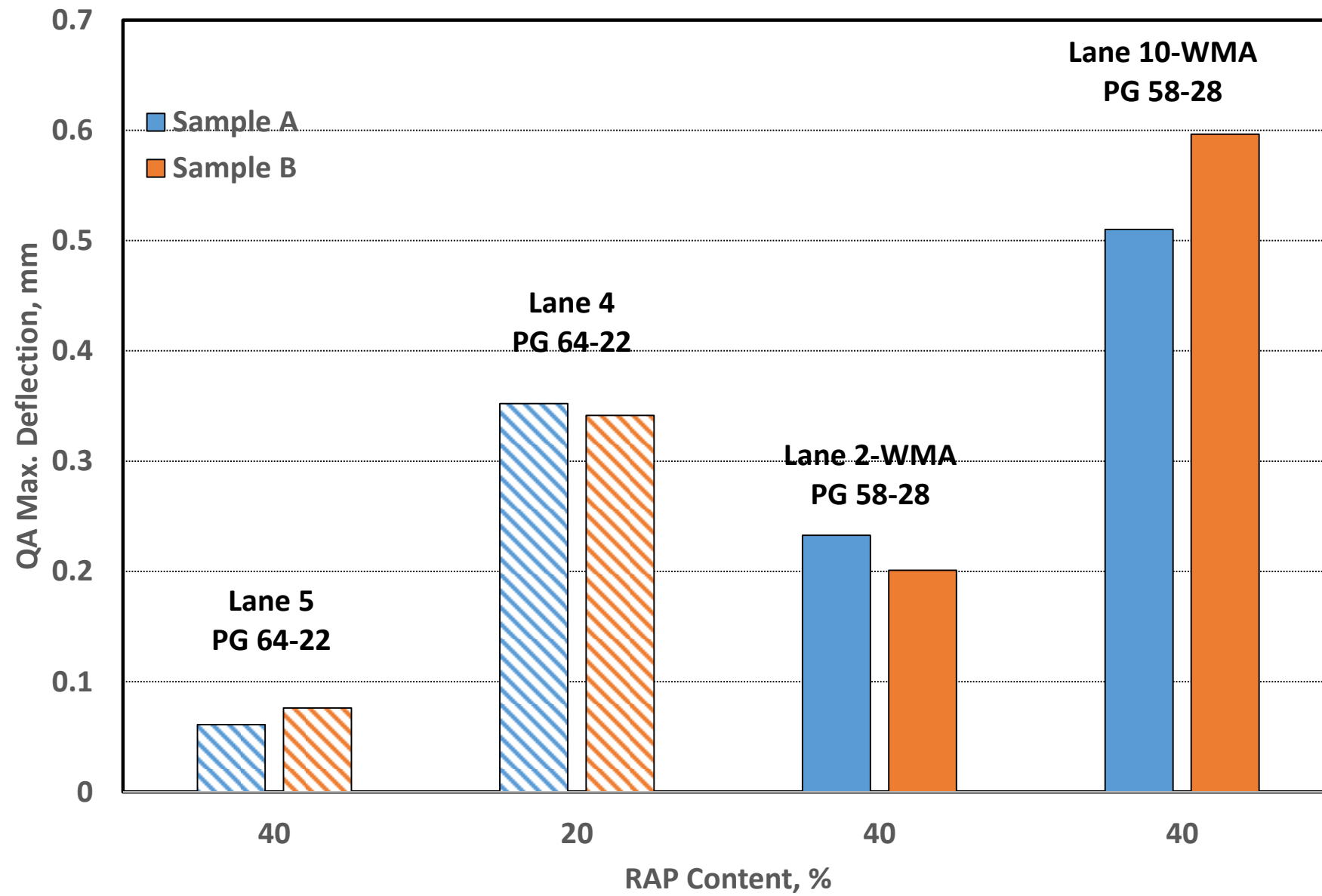


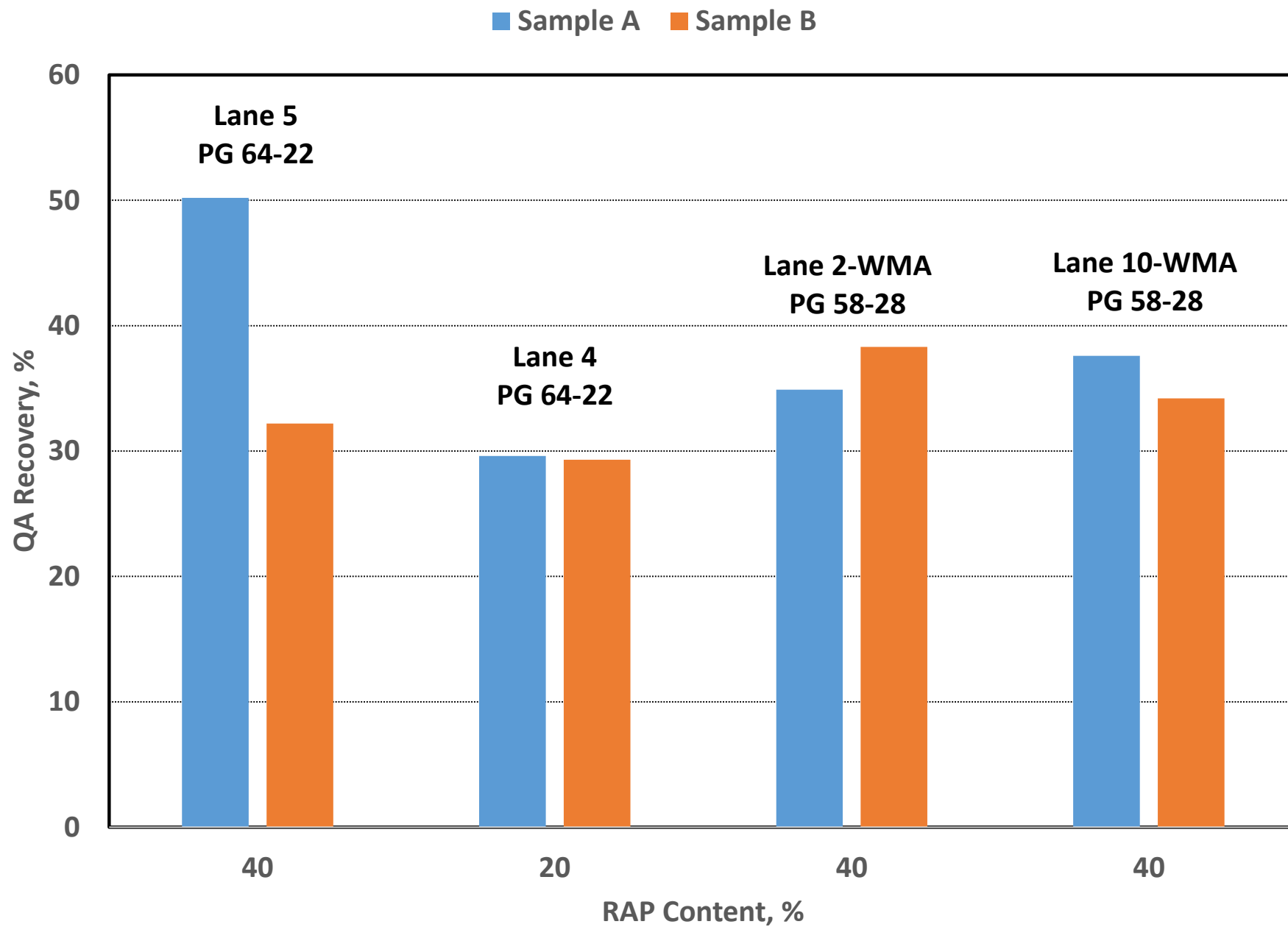
3D Graph 4

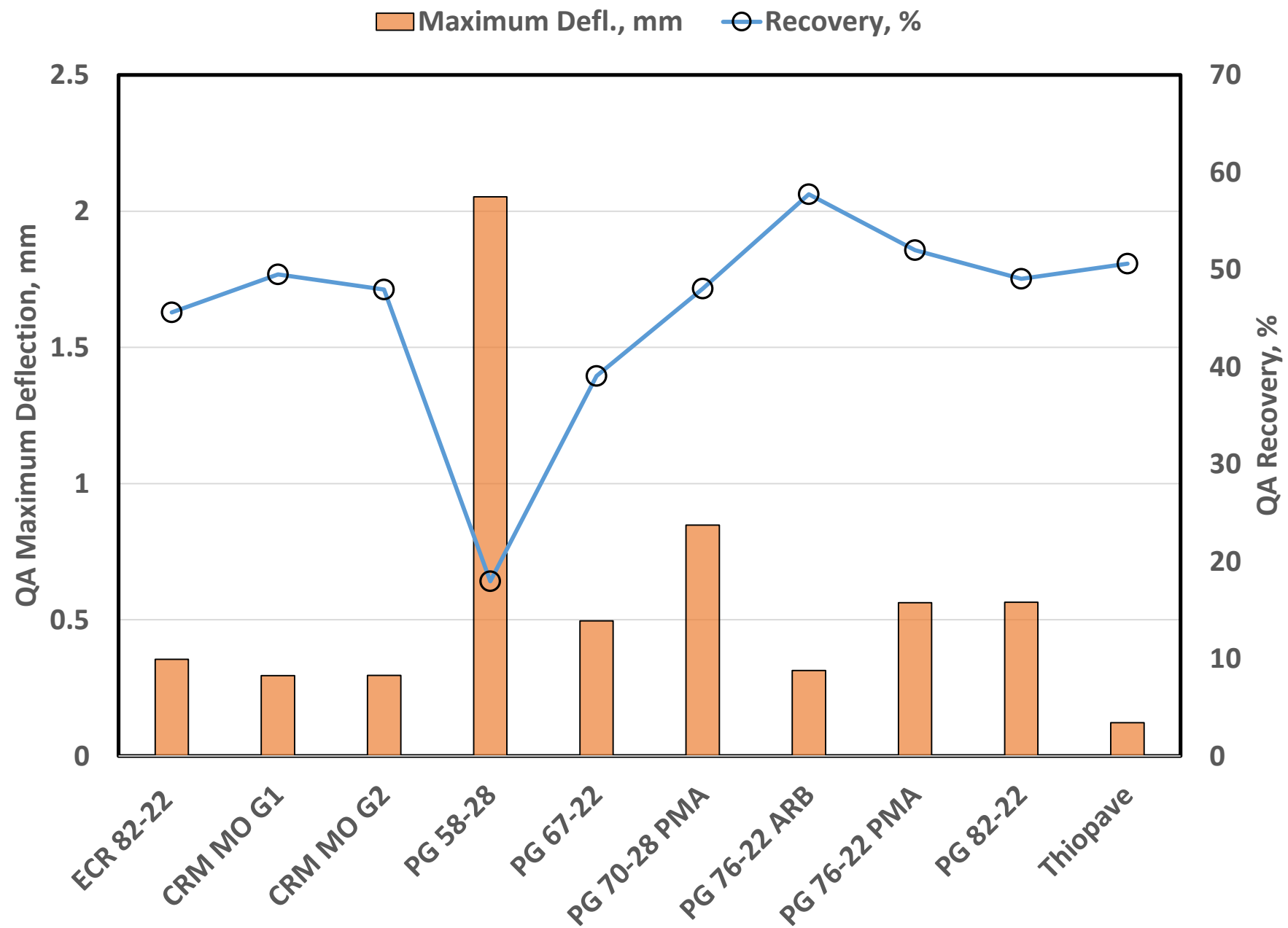


3D Graph 3











SUMMARY

- DEVELOPED QUICK EASY TO USE QC TEST THAT MEASURES LOADING AND RECOVERY CHARACTERISTICS OF BINDERS AND MIXES
 - ASPHALT BINDER QC TEST IS READY FOR USE
 - PROOF OF CONCEPT MIX TESTING EXPERIMENTS ARE PROMISING—STAY TUNED
- 

THANK YOU
ANY QUESTIONS?