CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Masonry Cement Proficiency Samples
Number 59 and Number 60

October 2007

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

October 16, 2007

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

SUBJECT: Final Report on Masonry Cement Proficiency Samples No. 59 and No. 60

Enclosed is your copy of the final report on the test results for the pair of CCRL **Masonry Cement** Proficiency Samples which were distributed in August 2007. Masonry Cement Samples No 59 and No. 60 were ASTM C91 Type S cements.

This report consists of a statistical Summary of Results, a set of general Scatter Diagrams, and associated detailed information. The Table of Results with test results and ratings for your laboratory can be downloaded at our website located at: http://www.ccrl.us/.

The CCRL Proficiency Sample Programs are intended for internal use by the laboratory as a tool to identify potential problems in laboratory procedures or test equipment and to initiate remedial actions. These programs are designed to complement the CCRL Laboratory Inspection Program as part of a total quality system. Care should be taken when using this program for any other purpose.

Additional samples of these two cements and other CCRL samples are available for purchase. These samples may be useful for equipment verification, technician training, and research. Contact CCRL for availability and price.

It is presently anticipated that the next Masonry Cement Proficiency Samples will be distributed in August 2008.

Sincerely,

Robin K. Haupt

Robin K. Haupt
Supervisor, Proficiency Sample Programs
Cement and Concrete Reference Laboratory

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests on Masonry Cement Proficiency Samples No. 59 and No. 60

This letter, and the material included with it, constitute the final report and summary of results for the current pair of Masonry Cement Proficiency Samples, which were distributed in August 2007. This material includes a Table of Results for individual laboratory data, a statistical Summary of Results, and a set of general Scatter Diagrams. Your unique laboratory number is displayed at the top of the individual Table of Results.

An explanation of the program is contained in the paper: "Statistical Evaluation of Interlaboratory Cement Tests" by J. R. Crandall and R. L. Blaine View document, and "Statistical Aspects of the Cement Testing Program" by W.J. Youden View document, which can be found in Volume 59, Proceedings of the 62nd Annual Meeting of the Society, June 25, 1959, American Society for Testing and Materials.

Laboratory Ratings

Each laboratory receives an individualized Table of Results. The Table of Results shows the test title and the reporting unit in the first two columns. After that it lists the laboratory's results for the odd and even numbered samples, overall averages for the odd and even numbered samples, and the laboratory's ratings for the odd and even samples.

The ratings for the individual laboratory were determined in the manner described by Crandall and Blaine using a rating scale of 1 to 5 instead of 0 to 4. The ratings have no valid standing beyond showing the difference between the individual laboratory result and the average for a particular test.

The following table details the relationship between the ratings and the averages.

Ratings	Range (Number of Standard Deviations)	Number (Per 100) of Laboratories achieving the rating [1]
5	Less than 1	69
4	1 to 1.5	18
3	1.5 to 2	9
2	2 to 2.5	3
1	Greater than 2.5	1

Note:The sign of the rating shows whether the result reported was greater or less than the average obtained.

[1]Youden, W.J., "Statistical Aspects of the Cement Testing Program",Volume 59, *Proceedings of the 62nd Annual Meeting of the Society, June 25, 1959, American Society for Testing and Materials.*

Continued on Next Page

Please note that individual laboratory ratings were not given for the flow of air content mortar and initial water retention flow. Mortar flows in the range of 110 ± 5 are satisfactory, labs with flow values outside this range will be flagged as a "Labs Off Diagram" on the scatter diagram. Averages, standard deviations, and a scatter diagram are provided for your information. This information may be a helpful indicator of a problem with flow table apparatus or mortar mixing procedures.

In cases where some laboratories' results are eliminated, averages, standard deviations, coefficients of variation, and the ratings of the other laboratories' results, are recalculated using the data remaining after the elimination. Since the laboratory ratings given are the results from this one series of tests, you need not attach too much significance to a single low rating, or pair of ratings, from this one series. A continuing tendency to get low ratings on several pairs of samples should lead a laboratory to consider the types of error, systematic and random, that contribute to ratings that are low. Systematic error, which is indicated by low ratings with the same signs on each pair of samples, means a consistent error is occurring in equipment and/or test procedures. One indication of random error is low ratings on both samples with different signs. Since systematic error occurs with more regularity, its cause is generally easier to find than the cause of random error.

Summary of Results

Usually, averages, standard deviations, and coefficients of variation are given with all results reported, and then with one or more outlying results omitted. Sometimes, two or more recalculations with laboratories omitted, have been done for the same test. In these cases, all of the laboratories omitted in previous recalculations are also omitted in subsequent ones. Results omitted are values that are more than three standard deviations from the mean of one or both samples. Often, elimination of these outlying results has little effect on the average, but may have a more pronounced effect on the standard deviation and coefficient of variation.

Scatter Diagrams

General scatter diagrams are supplied with this report. Crandall and Blaine describe the manner of preparing scatter diagrams, and their interpretation, in the paper published in the 1959 ASTM Proceedings.

Using the results received from each laboratory, a scatter diagram is generated for each test method by plotting the value for the odd numbered samples on the X, or horizontal axis, against the value for the even numbered samples on the Y, or vertical axis. To find your point, just plot as you would when plotting any scatter diagram. Vertical and horizontal dashed lines, which divide the diagrams into four sections or quadrants, place the average values for the odd and even numbered samples, respectively. The first line of print under the diagram includes the test number, as given on the data sheet, the test title, and the number of data points on the diagrams. The number of plotted points may not agree with the total number of data pairs included in the analysis because a few points may be off the diagram, and some points may represent several data pairs, which are identical. Laboratories whose points are off the diagram will have a rating of $\pm$ 1 for that particular test.

As described in Crandall and Blaine, a tight circular pattern of points around the intersection of the median lines is the ideal situation. Stretching out of the pattern into the first (upper right) and third (lower left) quadrants, suggests some kind of bias, or tendency for laboratories to get high or low results on both samples. Examination of the scatter diagrams may indicate strong evidence of bias in many cases.

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 59 and No. 60
Final Report - October 16, 2007

SUMMARY OF RESULTS

Test		#Labs	Sample No. 59 Average	S.D.	C.V.	Sample No. 60 Average	S.D.	C.V.
N.C. Water	prcnt	68	25.6	0.41	1.62	25.6	0.55	2.16
N.C. Water	prcnt	* 67	25.5	0.40	1.56	25.6	0.51	1.99
Gillmore TS Initial	min	67	274	32.2	11.8	171	24.0	14.0
Gillmore TS Initial	min	* 66	274	32.4	11.8	170	21.4	12.6
Gillmore TS Final	min	66	393	35.6	9.06	278	41.7	15.01
Gillmore TS Final	min	* 63	389	29.7	7.63	274	30.2	11.05
Autoclave Expan	prcnt	66	-0.01	0.017	-216.48	-0.01	0.012	-215.56
Autoclave Expan	prcnt	* 64	-0.01	0.014	-142.89	-0.01	0.011	-174.50
Air Content	prcnt	68	18.7	1.3	6.74	16.6	1.4	8.23
Air Content	prcnt	* 66	18.6	1.1	5.82	16.6	1.3	7.78
AC Mix Water	prcnt	68	44.8	3.5	7.83	46.0	4.8	10.54
AC Mix Water	prcnt	* 64	44.2	1.2	2.84	45.6	1.2	2.70
AC Flow	prcnt	70	110	5.0	4.59	108	4.4	4.11
AC Flow	prcnt	* 68	111	2.1	1.92	108	2.5	2.32
Comp Str, 7 day	psi	70	2138	295.8	13.8	2283	235.9	10.3
Comp Str, 7 day	psi	* 68	2141	250.1	11.7	2284	238.0	10.4
Comp Str, 28 day	psi	61	2745	302.4	11.0	2758	426.0	15.4
Comp Str, 28 day	psi	* 60	2751	300.3	10.91	2799	277.4	9.91

CONTINUED ON NEXT PAGE

* ELIMINATED LABS: Data over three S.D. from the mean

N.C. Water	438
Gillmore TS Initial	354
Gillmore TS Final	90 354 694
Autoclave Expansion	407 1936
Air Content	52 98
AC Mix Water	218 918 354 2522
AC Flow	354 918
Comp Strength, 7 day	103 1053
Comp Strength, 28 day	158

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 59 and No. 60
Final Report - October 16, 2007

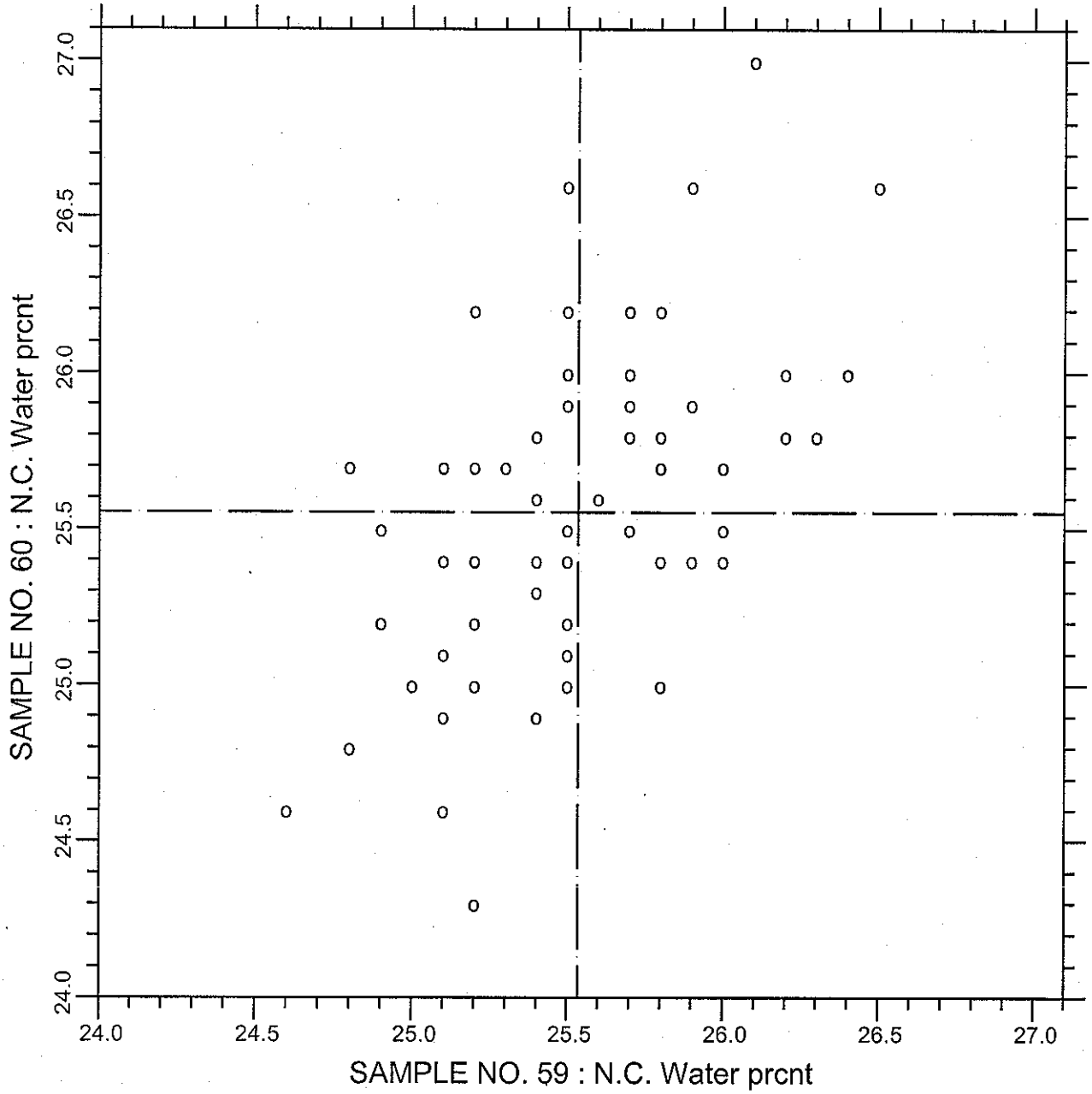
SUMMARY OF RESULTS

			Sample No. 59			Sample No. 60		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
45µm Sieve	prcnt	68	3.60	0.66	18.4	6.38	1.94	30.4
45µm Sieve	prcnt	* 62	3.49	0.48	13.9	6.00	0.62	10.4
Density	g/cm^3	56	2.94	0.050	1.71	2.99	0.054	1.81
Density	g/cm^3	* 52	2.94	0.038	1.30	2.98	0.038	1.28
				WATER RETENTION				
WR Mix Water	prcnt	61	43.7	2.7	6.28	44.9	4.0	8.97
WR Mix Water	prcnt	* 57	43.9	1.1	2.42	45.5	1.2	2.54
WR Initial Flow	prcnt	62	111	2.2	2.02	108	2.8	2.64
WR Initial Flow	prcnt	* 61	111	2.2	1.98	109	2.5	2.35
WR Final Flow	prcnt	62	94	5.6	5.91	93	4.8	5.16
Water Retention	prcnt	62	85	4.4	5.25	86	4.4	5.15

* ELIMINATED LABS: Data over three S.D. from the mean

45µm Sieve	181 441 93 125 178 694
Density	90 178 354 1053
WR Mix Water	90 918 694 1053
WR Initial Flow	1466

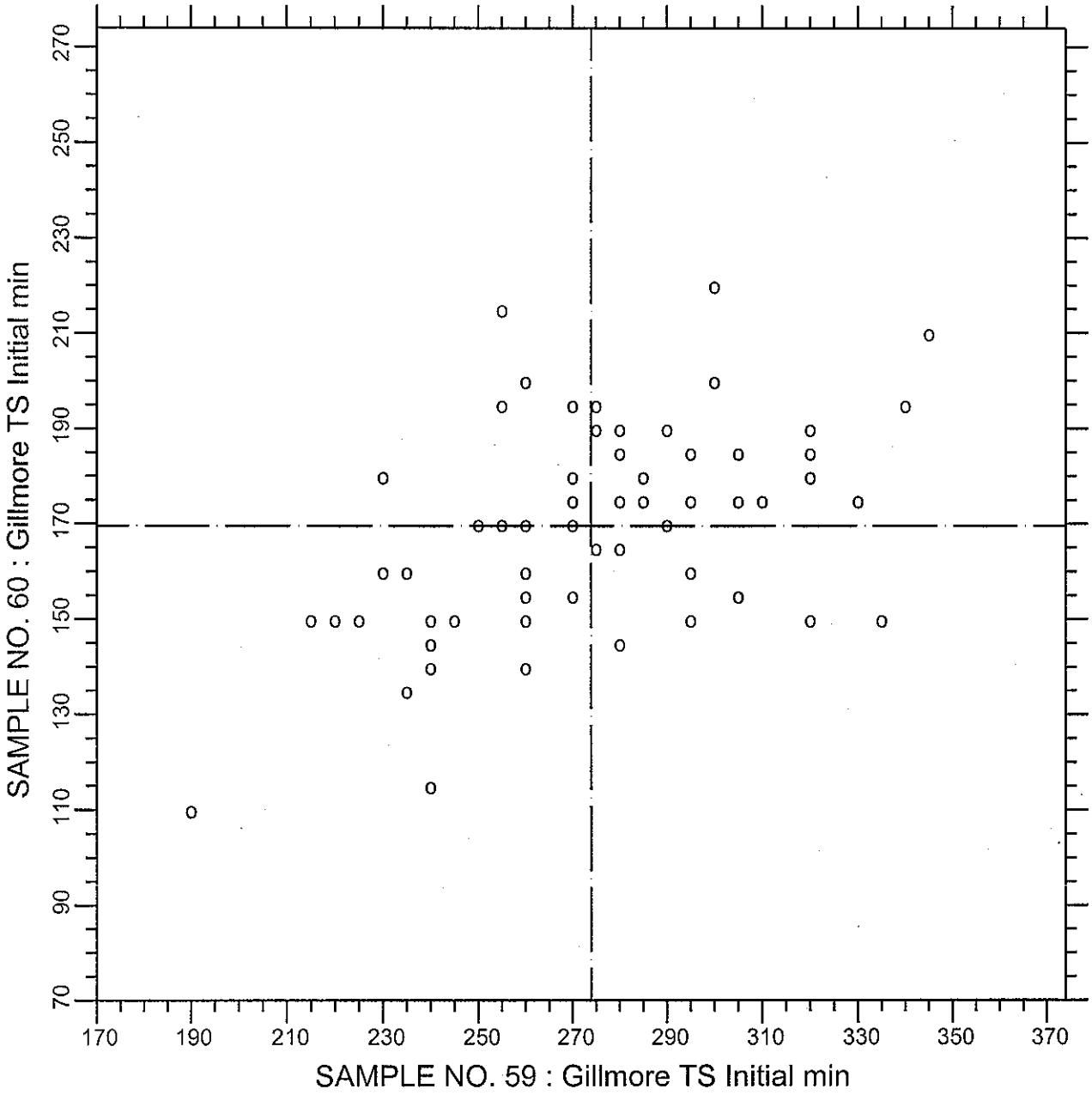
CCRL PROFICIENCY SAMPLE PROGRAM
Normal Consistency - Water
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.110 N.C. Water 67 POINTS

SAMPLE NO. 59 AVE 25.536 S.D. 0.40 C.V. 1.56
SAMPLE NO. 60 AVE 25.554 S.D. 0.51 C.V. 1.99
LABS ELIMINATED 438

CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Initial
MASONRY CEMENT SAMPLES NO. 59 & NO. 60

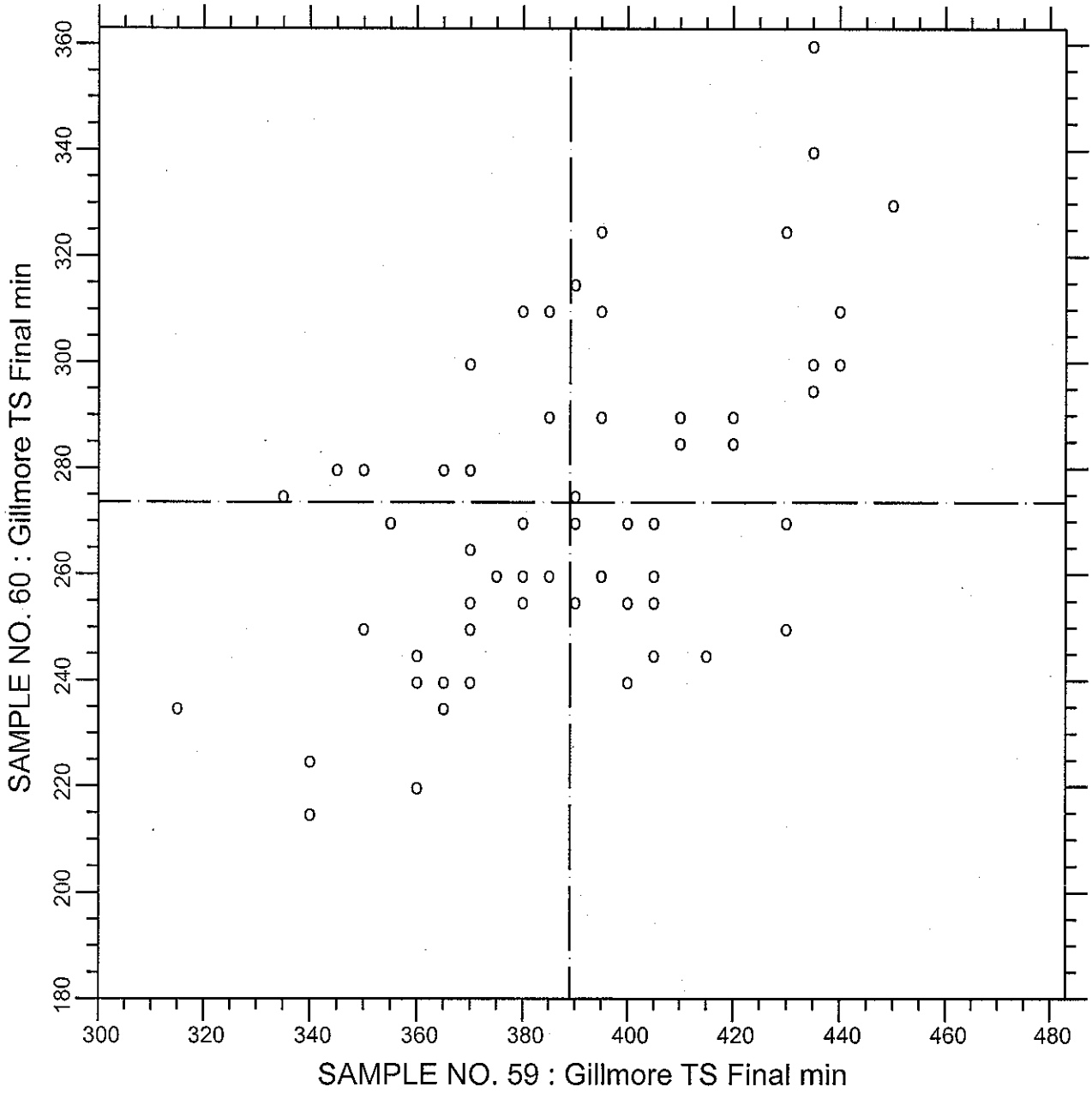


TEST NO.130 Gillmore TS Initial 66 POINTS

SAMPLE NO. 59	AVE	273.9	S.D.	32.4	C.V.	11.8
SAMPLE NO. 60	AVE	169.5	S.D.	21.4	C.V.	12.6

LABS ELIMINATED 354

CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Final
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



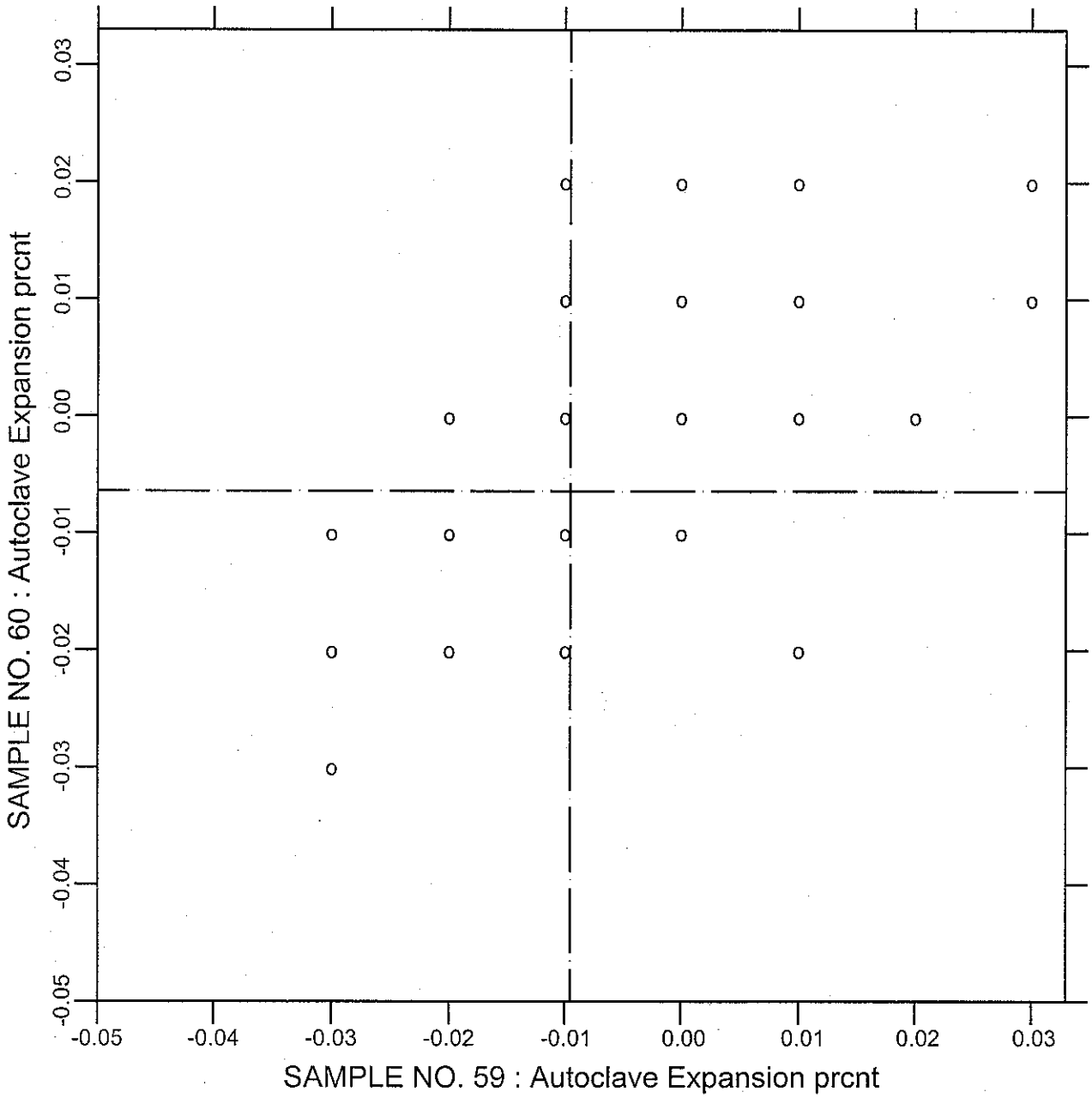
TEST NO.140 Gillmore TS Final 63 POINTS

SAMPLE NO. 59 AVE 389.0 S.D. 29.7 C.V. 7.63

SAMPLE NO. 60 AVE 273.6 S.D. 30.2 C.V. 11.05

LABS ELIMINATED 90 354 694

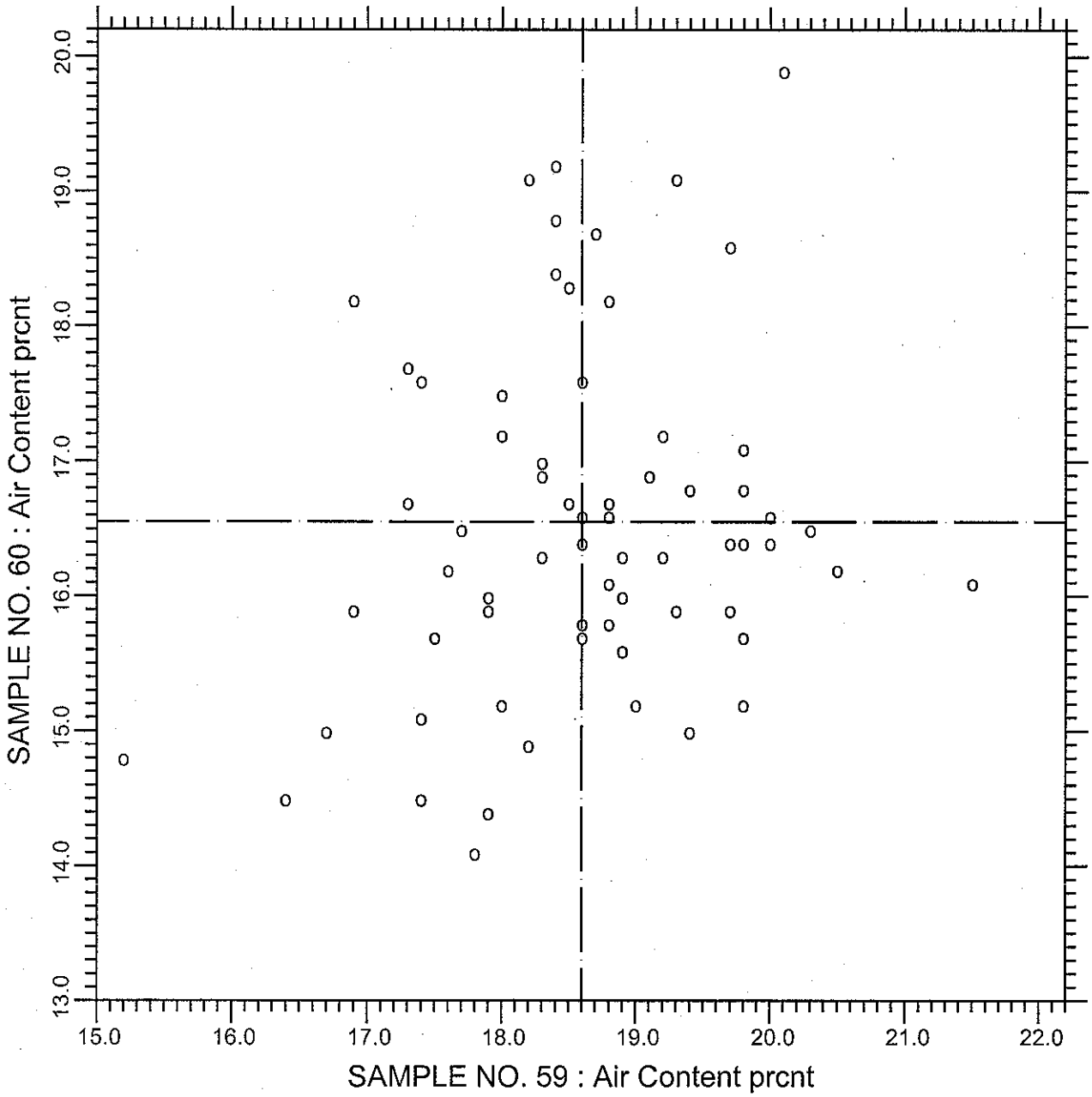
CCRL PROFICIENCY SAMPLE PROGRAM
Autoclave Expansion
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.160 Autoclave Expansion 64 POINTS

SAMPLE NO. 59 AVE -0.0095 S.D. 0.014 C.V. -142.893
SAMPLE NO. 60 AVE -0.0064 S.D. 0.011 C.V. -174.505
LABS ELIMINATED 407 1936

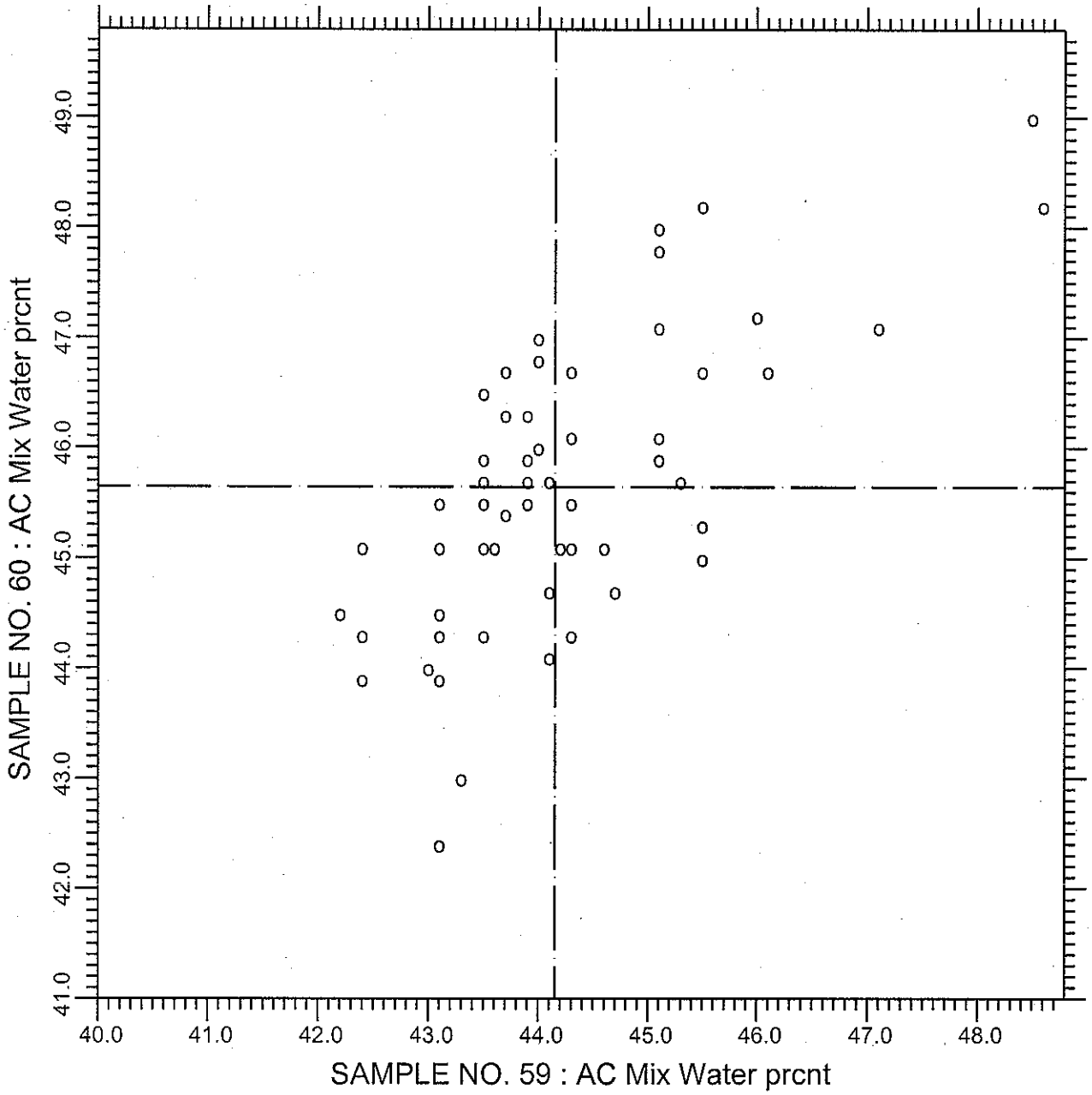
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.170 Air Content 66 POINTS

SAMPLE NO. 59 AVE 18.60 S.D. 1.1 C.V. 5.82
SAMPLE NO. 60 AVE 16.55 S.D. 1.3 C.V. 7.78
LABS ELIMINATED 52 98

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Water
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



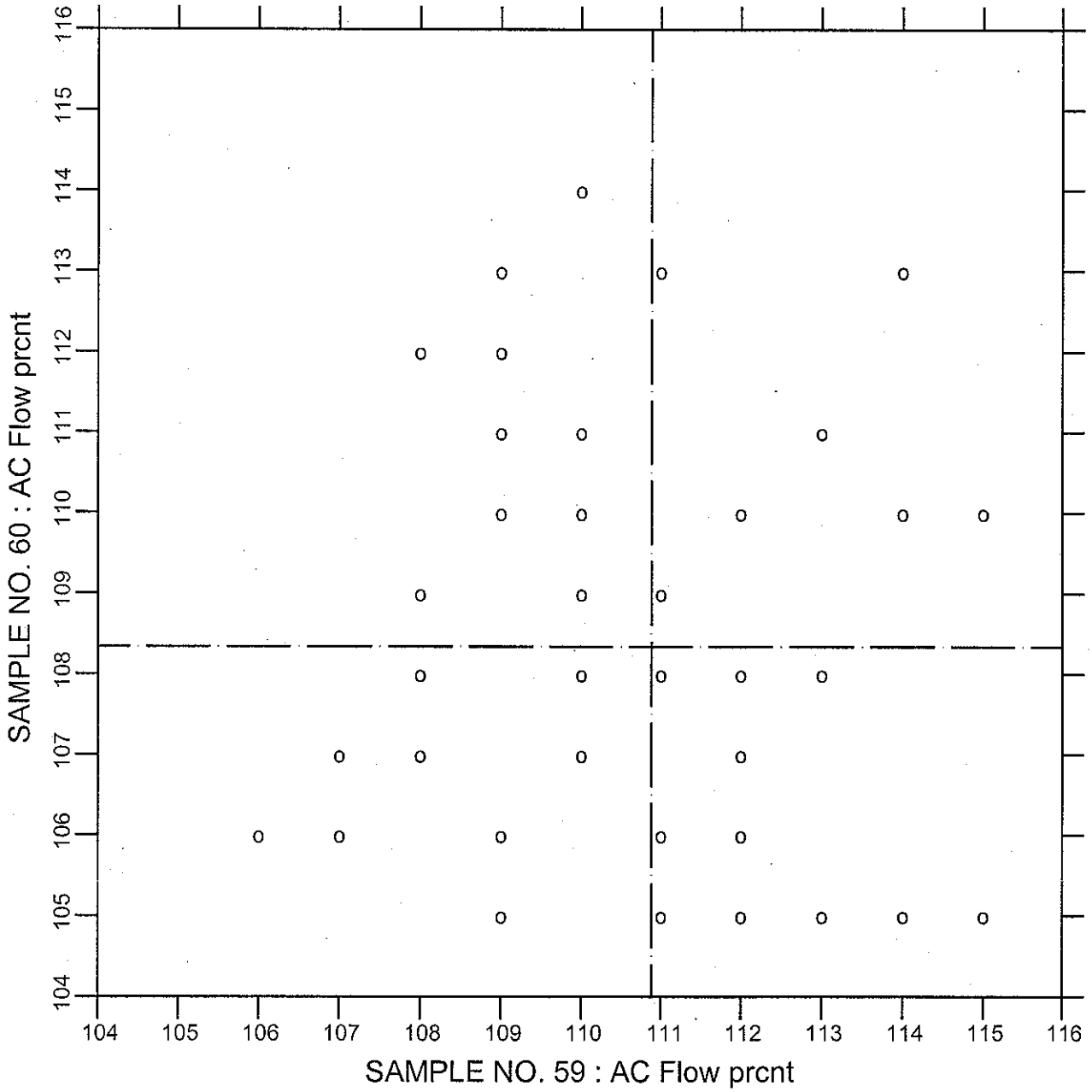
TEST NO.180 AC Mix Water 64 POINTS

SAMPLE NO. 59 AVE 44.15 S.D. 1.2 C.V. 2.84

SAMPLE NO. 60 AVE 45.64 S.D. 1.2 C.V. 2.70

LABS ELIMINATED 218 918 354 2522

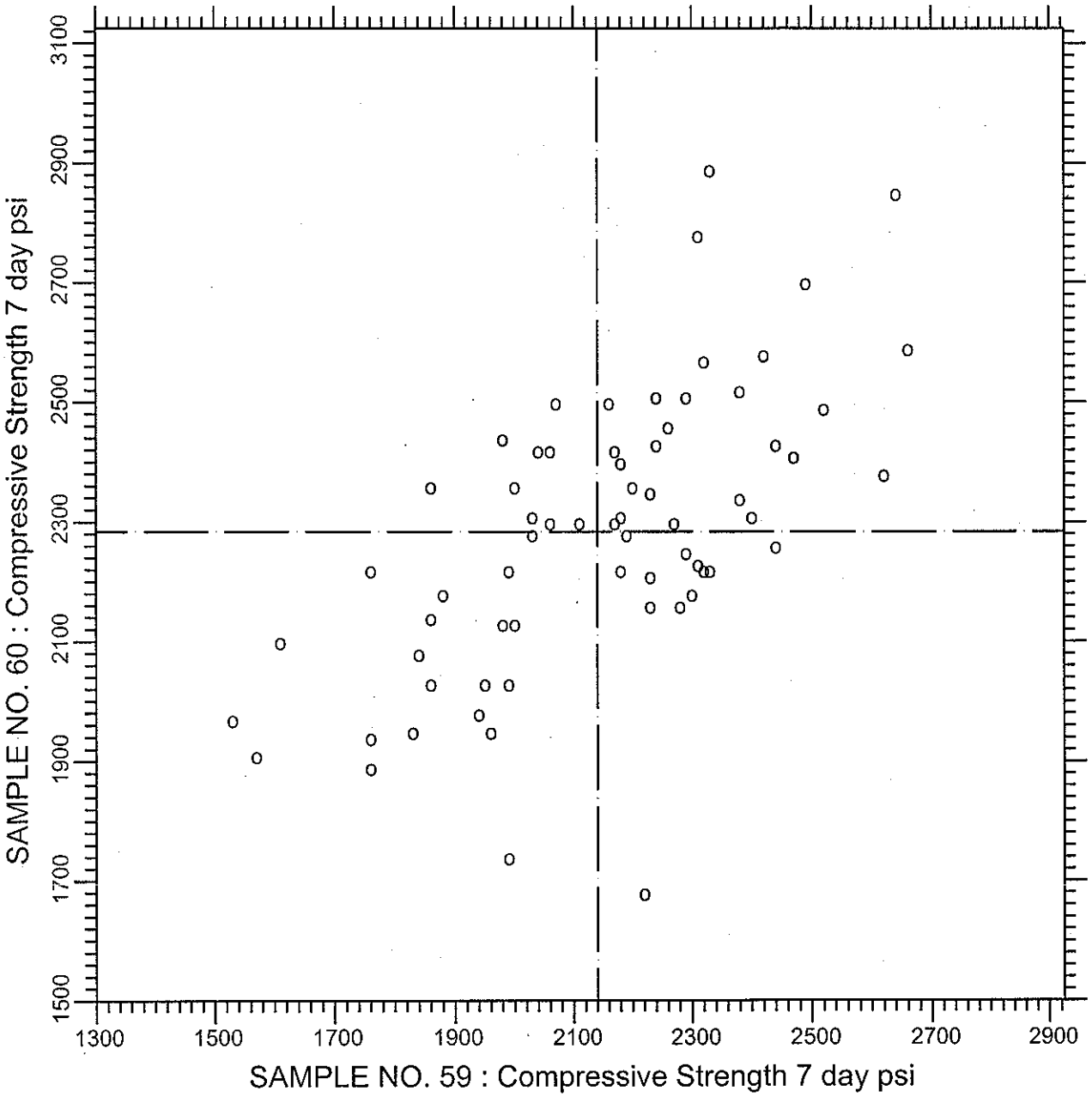
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Flow
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.190 AC Flow 68 POINTS

SAMPLE NO. 59 AVE 110.88 S.D. 2.1 C.V. 1.92
SAMPLE NO. 60 AVE 108.34 S.D. 2.5 C.V. 2.32
LABS ELIMINATED 354 918

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7 day
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



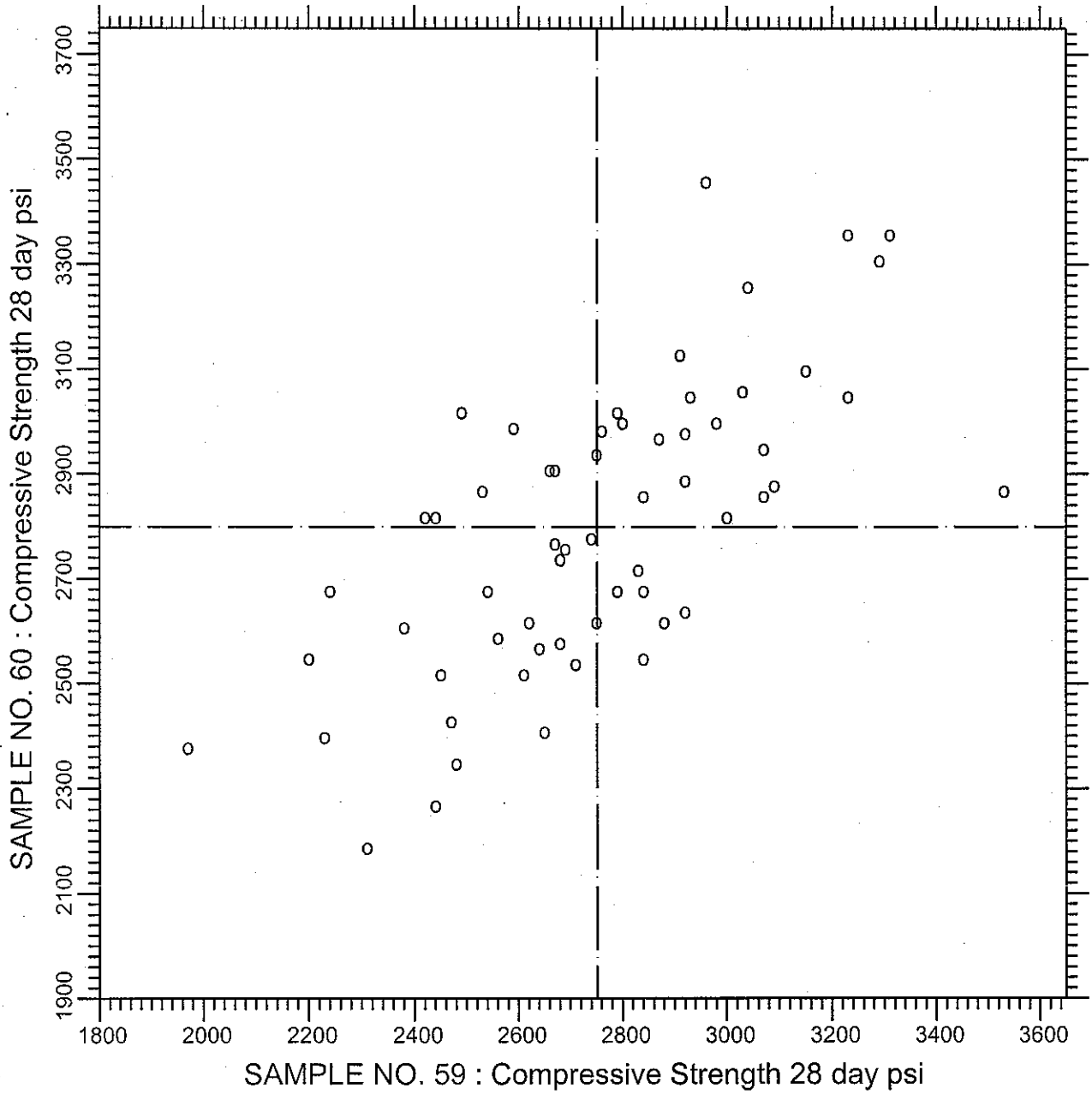
TEST NO.210 Compressive Strength 7 day 68 POINTS

SAMPLE NO. 59 AVE 2140.9 S.D. 250.1 C.V. 11.7

SAMPLE NO. 60 AVE 2283.7 S.D. 238.0 C.V. 10.4

LABS ELIMINATED 103 1053

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28 day
MASONRY CEMENT SAMPLES NO. 59 & NO. 60

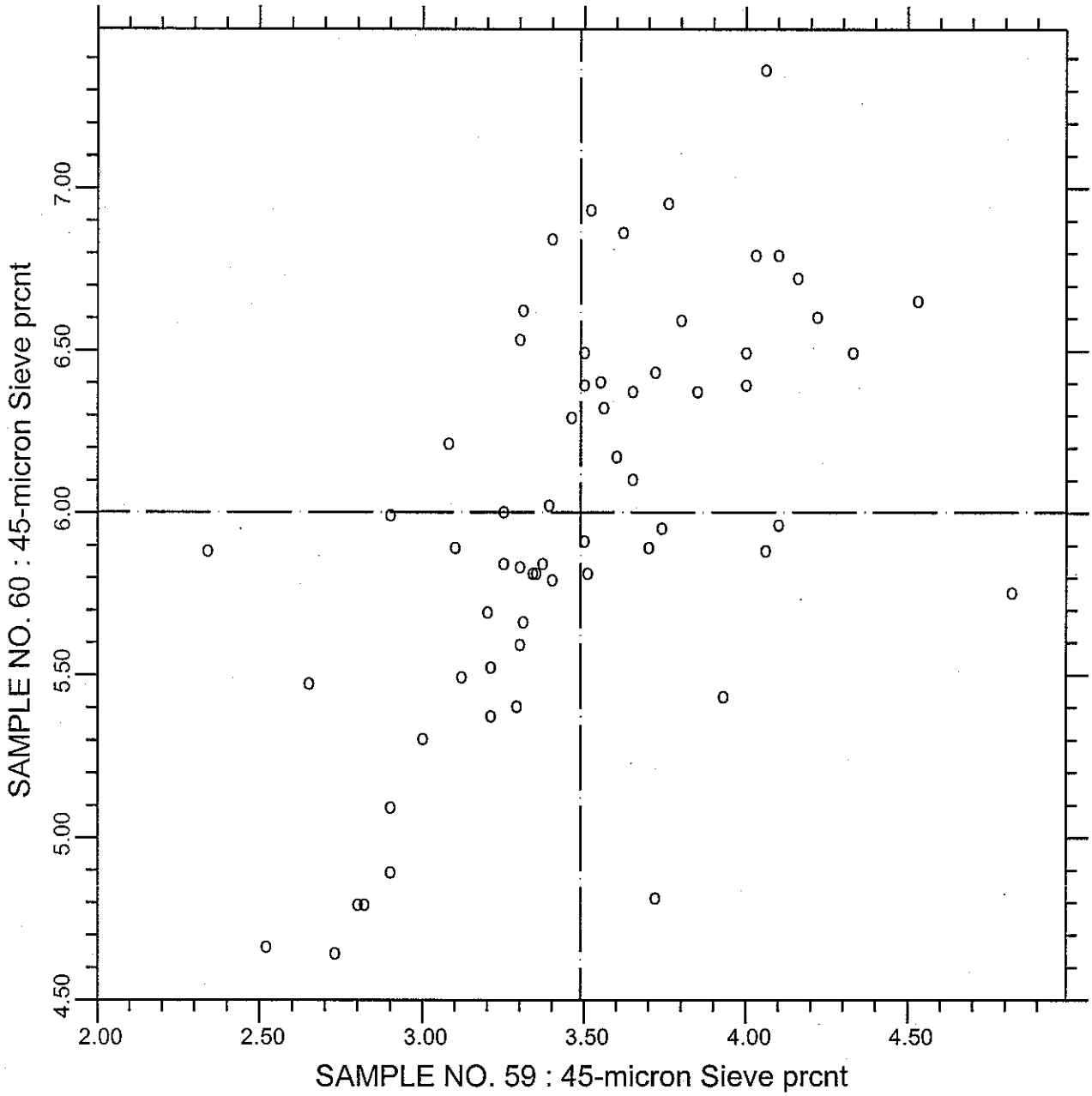


TEST NO.211 Compressive Strength 28 day 60 POINTS

SAMPLE NO. 59	AVE	2751.3	S.D.	300.3	C.V.	10.91
SAMPLE NO. 60	AVE	2799.2	S.D.	277.4	C.V.	9.91

LABS ELIMINATED 158

CCRL PROFICIENCY SAMPLE PROGRAM
Fineness - 45 micron Sieve Retained
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



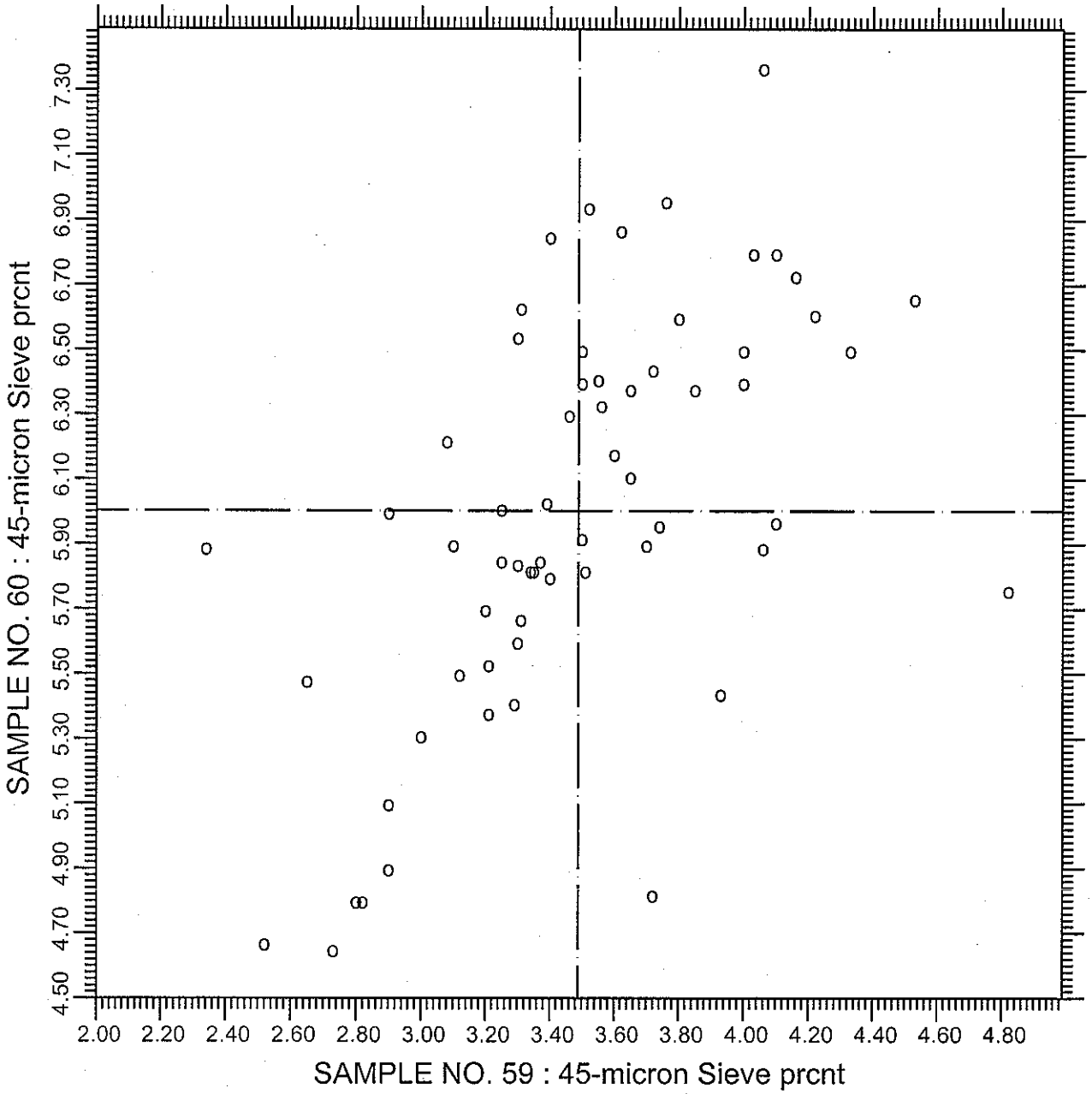
TEST NO.281 45-micron Sieve 62 POINTS

SAMPLE NO. 59 AVE 3.488 S.D. 0.48 C.V. 13.9

SAMPLE NO. 60 AVE 6.003 S.D. 0.62 C.V. 10.4

LABS ELIMINATED 181 441 93 125 178 694

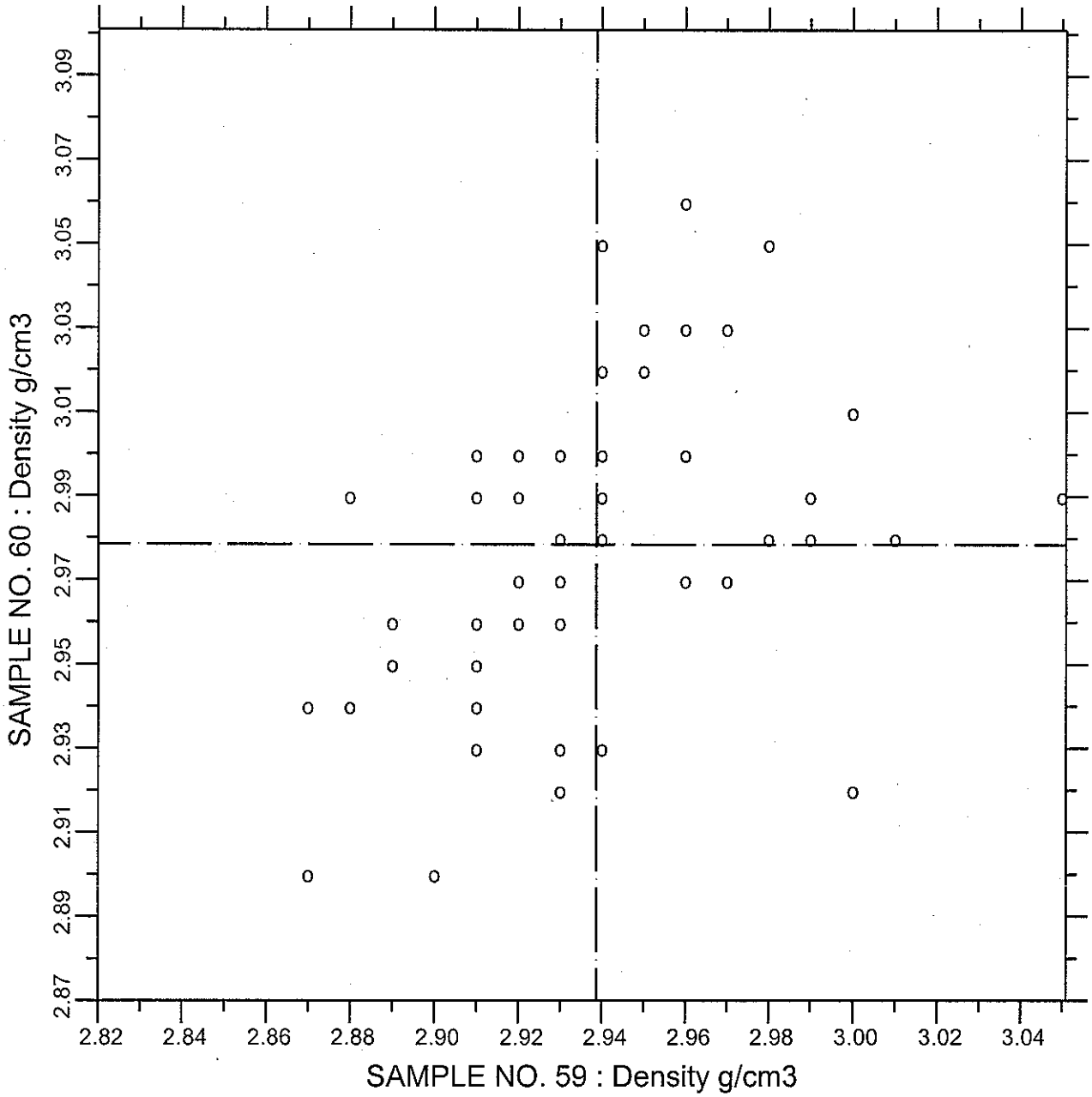
CCRL PROFICIENCY SAMPLE PROGRAM
Fineness - 45 micron Sieve Retained
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.281 45-micron Sieve 62 POINTS

SAMPLE NO. 59 AVE 3.488 S.D. 0.48 C.V. 13.9
SAMPLE NO. 60 AVE 6.003 S.D. 0.62 C.V. 10.4
LABS ELIMINATED 181 441 93 125 178 694

CCRL PROFICIENCY SAMPLE PROGRAM
Density
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



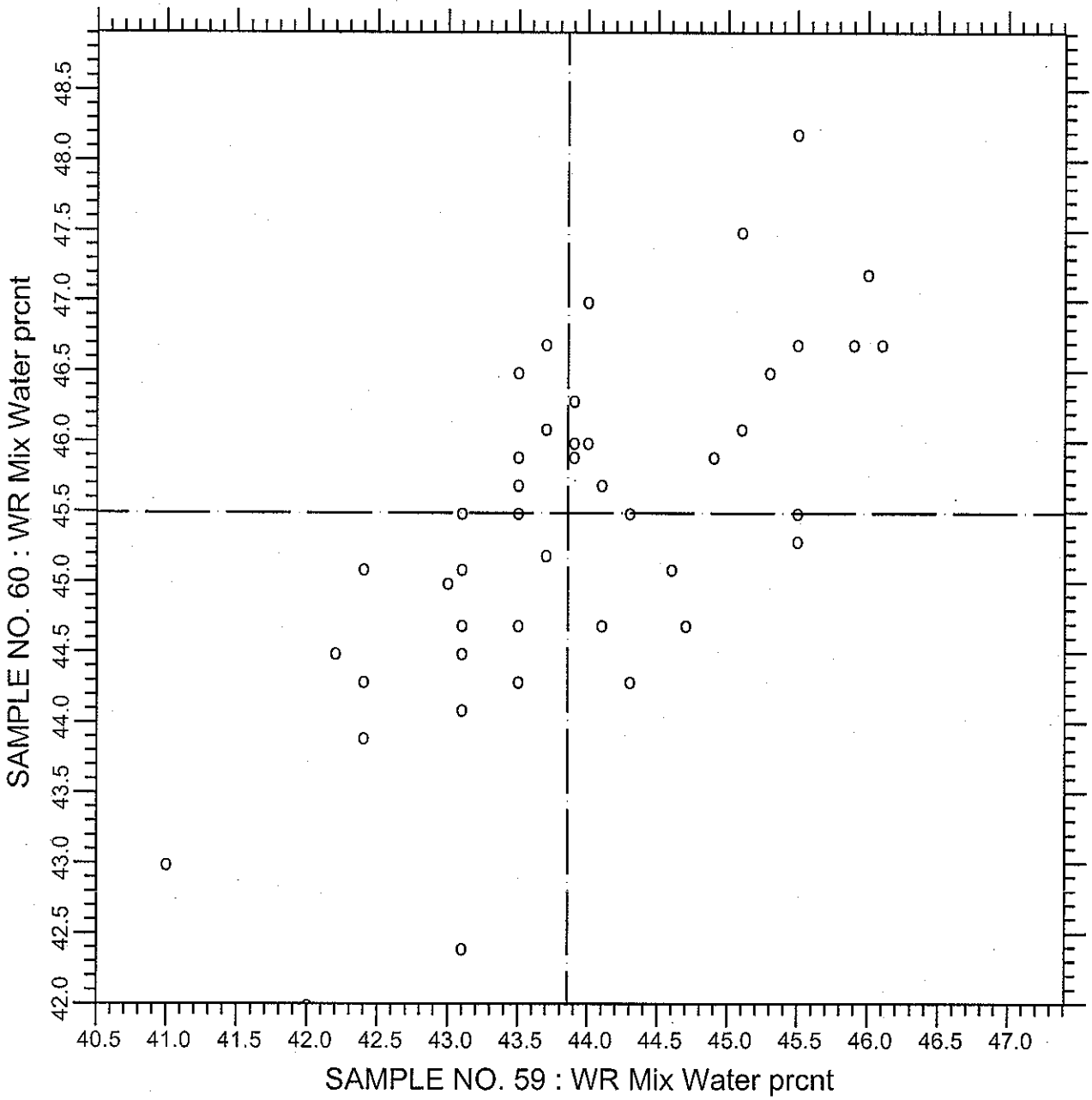
TEST NO.310 Density 52 POINTS

SAMPLE NO. 59 AVE 2.9386 S.D. 0.038 C.V. 1.30

SAMPLE NO. 60 AVE 2.9785 S.D. 0.038 C.V. 1.28

LABS ELIMINATED 90 178 354 1053

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Water
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



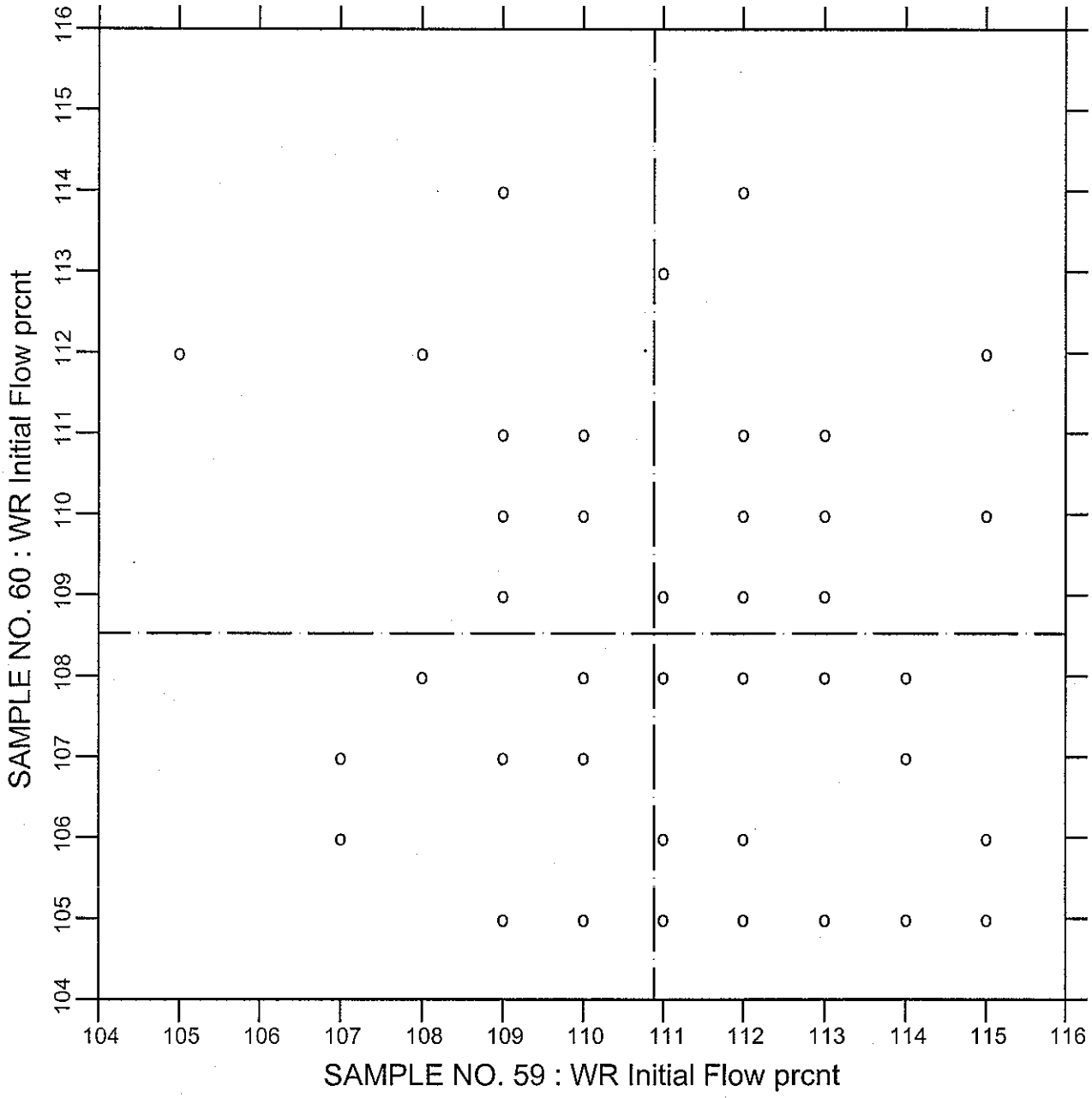
TEST NO.330 WR Mix Water 57 POINTS

SAMPLE NO. 59 AVE 43.86 S.D. 1.1 C.V. 2.42

SAMPLE NO. 60 AVE 45.49 S.D. 1.2 C.V. 2.54

LABS ELIMINATED 90 918 694 1053

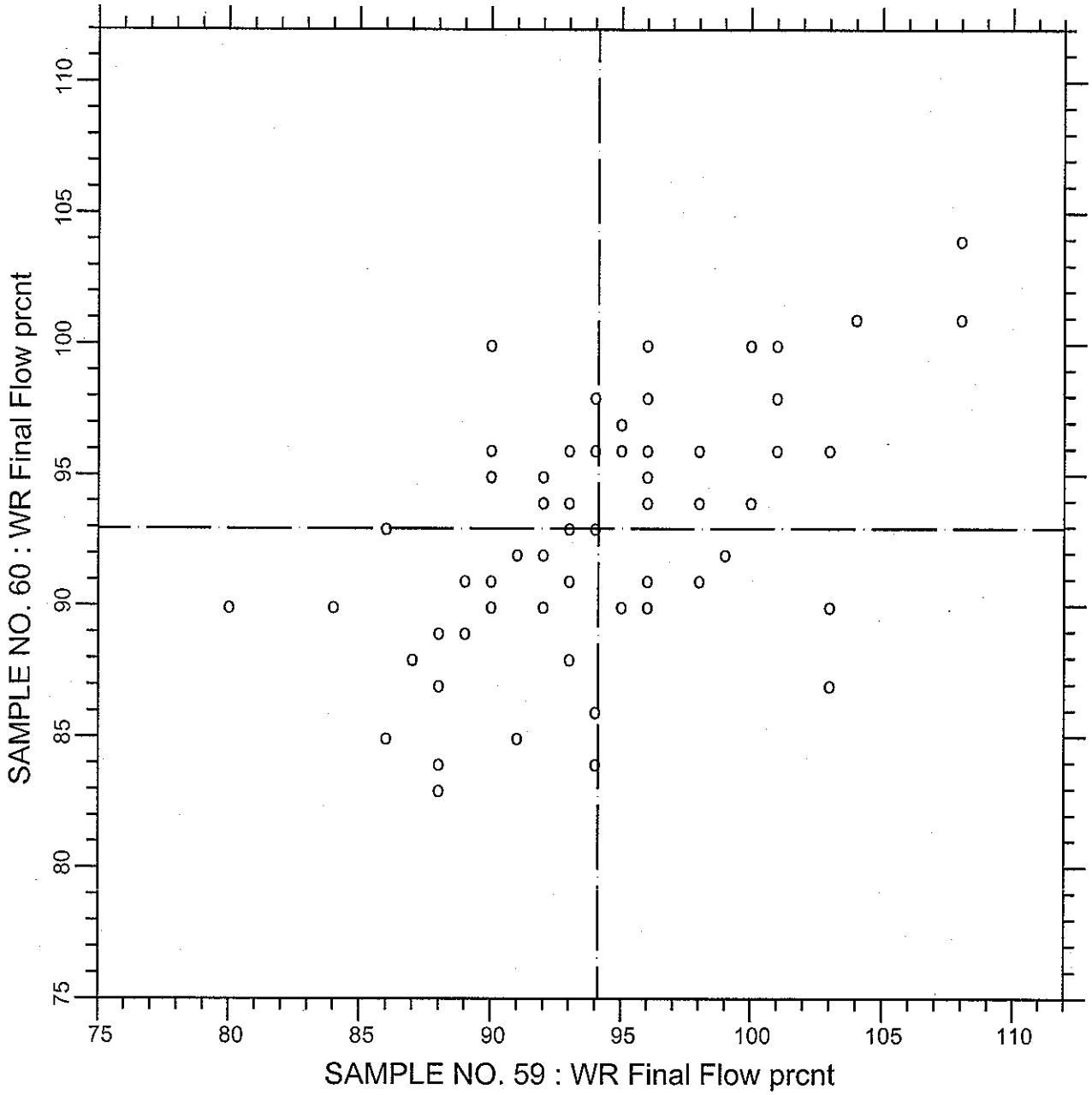
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Initial Flow
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.331 WR Initial Flow 61 POINTS

SAMPLE NO. 59 AVE 110.88 S.D. 2.2 C.V. 1.98
SAMPLE NO. 60 AVE 108.52 S.D. 2.5 C.V. 2.35
LABS ELIMINATED 1466

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Final Flow
MASONRY CEMENT SAMPLES NO. 59 & NO. 60



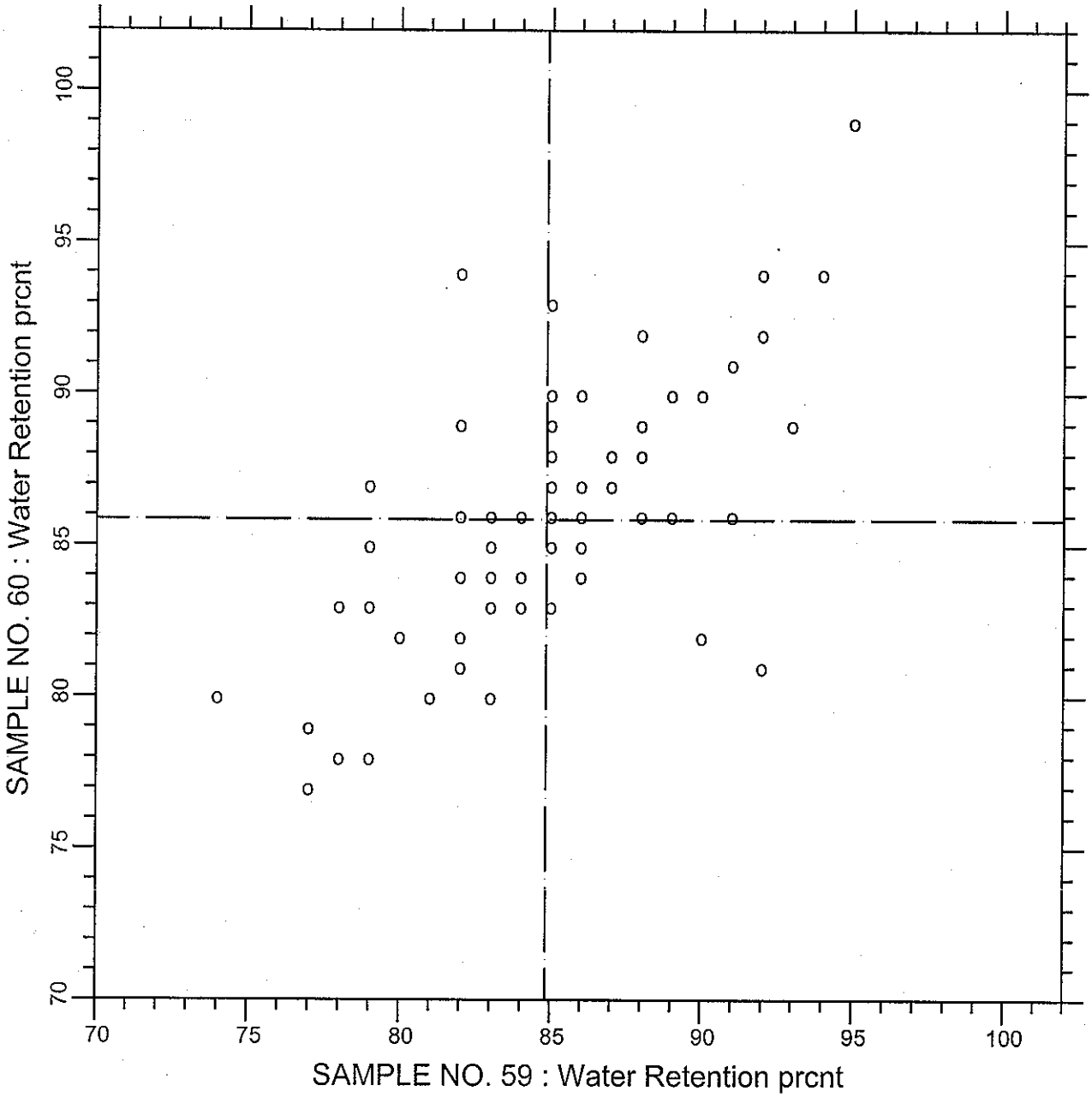
TEST NO.332 WR Final Flow 62 POINTS

SAMPLE NO. 59	AVE	94.13	S.D.	5.6	C.V.	5.91
SAMPLE NO. 60	AVE	92.95	S.D.	4.8	C.V.	5.16

CCRL PROFICIENCY SAMPLE PROGRAM

Water Retention Value

MASONRY CEMENT SAMPLES NO. 59 & NO. 60



TEST NO.333 Water Retention 62 POINTS

SAMPLE NO. 59	AVE	84.85	S.D.	4.4	C.V. 5.25
SAMPLE NO. 60	AVE	85.85	S.D.	4.4	C.V. 5.15