CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Masonry Cement Proficiency Samples
Number 55 and Number 56

January 2006

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CEMENT AND CONCRETE REFERENCE LABORATORY
AT THE
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SPONSORED BY
COMMITTEE C-1 ON CEMENT
COMMITTEE C-9 ON CONCRETE AND
CONCRETE AGGREGATES
AMERICAN SOCIETY FOR TESTING AND MATERIALS

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January 17, 2006

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

SUBJECT: Final Report on Masonry Cement Proficiency Samples No. 55 and No. 56

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 2005. Masonry Cement Samples No 55 and No. 56 were a ASTM C91 Type S cement.

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 2006.

Sincerely,

Robin K. Haupt

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

Enclosure

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. 55 and No. 56

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 2005. 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.*

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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. 55 and No. 56
Final Report - January 9, 2006

SUMMARY OF RESULTS

Test		#Labs	Sample No. 55 Average	S.D.	C.V.	Sample No. 56 Average	S.D.	C.V.
N.C. Water	prcnt	66	25.9	0.45	1.74	25.4	0.44	1.74
N.C. Water	prcnt	* 64	26.0	0.38	1.44	25.4	0.38	1.50
Gillmore TS Initial	min	62	189	26.3	13.9	196	37.4	19.1
Gillmore TS Initial	min	* 58	191	24.8	13.0	194	21.0	10.8
Gillmore TS Final	min	62	306	53.7	17.6	302	45.7	15.1
Gillmore TS Final	min	* 61	303	50.8	16.7	300	41.8	14.0
Autoclave Expan	prcnt	62	0.10	0.59	572	0.04	0.19	489
Autoclave Expan	prcnt	* 55	0.02	0.0094	42.2	0.01	0.0090	100.6
Air Content	prcnt	66	15.7	1.6	10.34	15.4	1.5	9.58
Air Content	prcnt	* 62	15.6	0.88	5.68	15.1	0.81	5.37
AC Mix Water	prcnt	66	46.7	4.4	9.37	45.2	4.6	10.17
AC Mix Water	prcnt	* 63	45.8	1.4	2.95	44.2	1.2	2.72
AC Flow	prcnt	67	109	4.4	3.98	111	4.1	3.73
AC Flow	prcnt	* 65	110	2.8	2.56	111	2.8	2.48
Comp Str 7 day	psi	66	2180	212.8	9.76	2910	263.6	9.06
Comp Str 7 day	psi	* 64	2194	196.6	8.96	2928	243.1	8.30
Comp Str 28 day	psi	60	2830	269.4	9.52	3444	280.0	8.13
Comp Str 28 day	psi	* 58	2857	227.1	7.95	3461	267.3	7.72

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

N.C. Water	54 687
Gillmore TS Intial	90 93 690 1853
Gillmore TS Final	2464
Autoclave Expansion	93 354 201 407 605 690 2464
Air Content	440 1853 2464 2964
AC Mix Water	159 2464 2964
AC Flow	74 2964
Comp Strength 7 day	9 1196
Comp Strength 28 day	9 1196

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 55 and No. 56
Final Report - January 9 2006

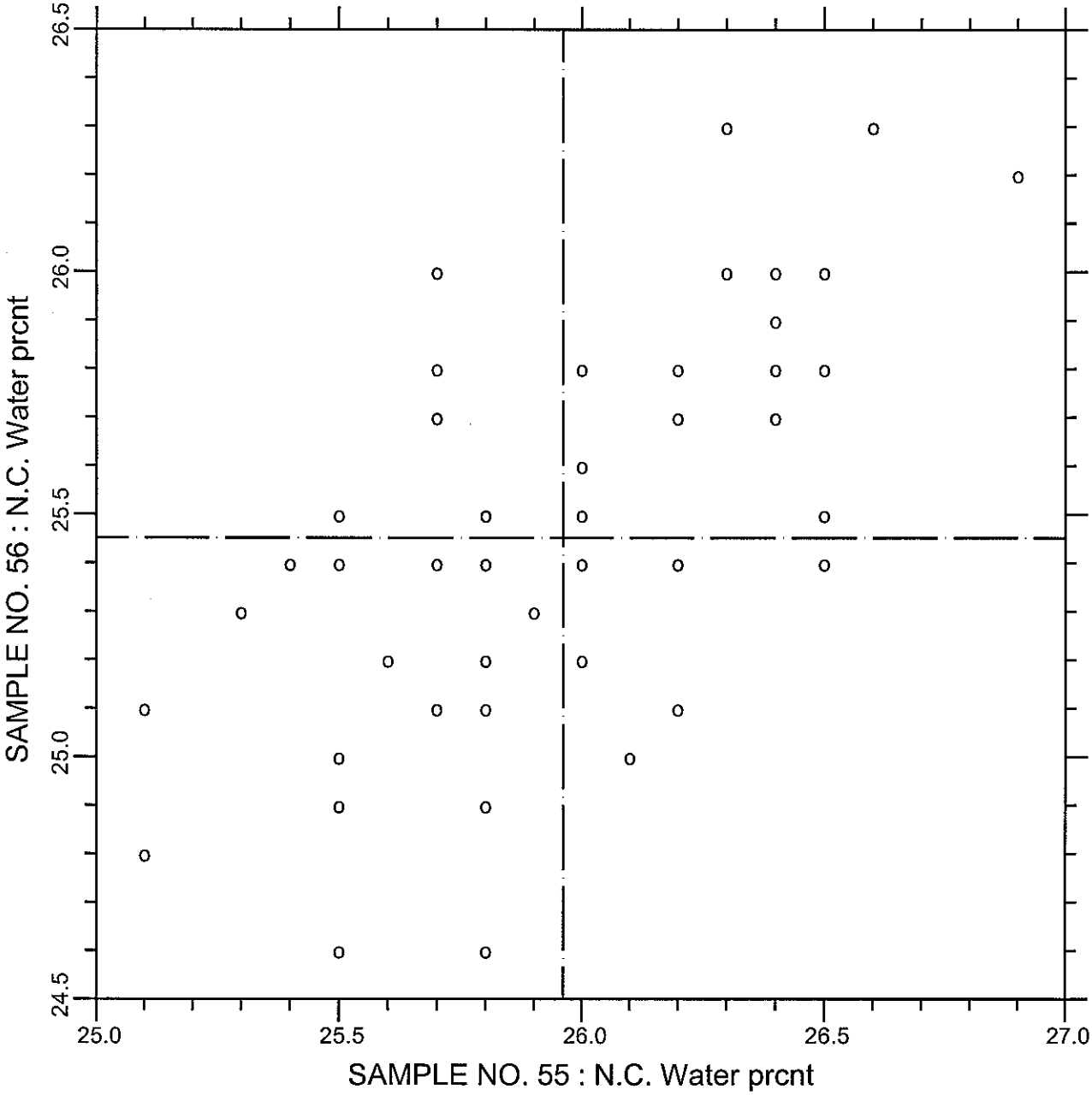
SUMMARY OF RESULTS

Test			#Labs	Sample No. 55 Average	S.D.	C.V.	Sample No. 56 Average	S.D.	C.V.
45µm Sieve	prcnt		66	2.83	0.50	17.6	3.07	0.37	11.9
45µm Sieve	prcnt	*	63	2.78	0.38	13.9	3.04	0.33	10.9
Density	g/cm3		56	2.97	0.13	4.27	2.99	0.12	4.12
Density	g/cm3	*	52	2.96	0.053	1.79	3.01	0.053	1.77
WATER RETENTION									
WR Mix Water	prcnt		59	46.4	3.1	6.77	44.8	3.2	7.23
WR Mix Water	prcnt	*	55	45.9	1.1	2.40	44.2	1.0	2.34
WR Initial Flow	prcnt		60	110	2.8	2.54	111	2.8	2.52
WR Final Flow	prcnt		60	93	6.3	6.75	91	7.5	8.27
Water Retention	prcnt		61	84	5.3	6.27	95	102.6	107.88
Water Retention	prcnt	*	58	85	5.2	6.20	83	5.6	6.80

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

45µm Sieve	90 284 441
Density	142 157 438 2964
WATER RETENTION	
WR Mix Water	159 309 694 1373
Water Retention	90 93 98

CCRL PROFICIENCY SAMPLE PROGRAM
Normal Consistency - Water
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



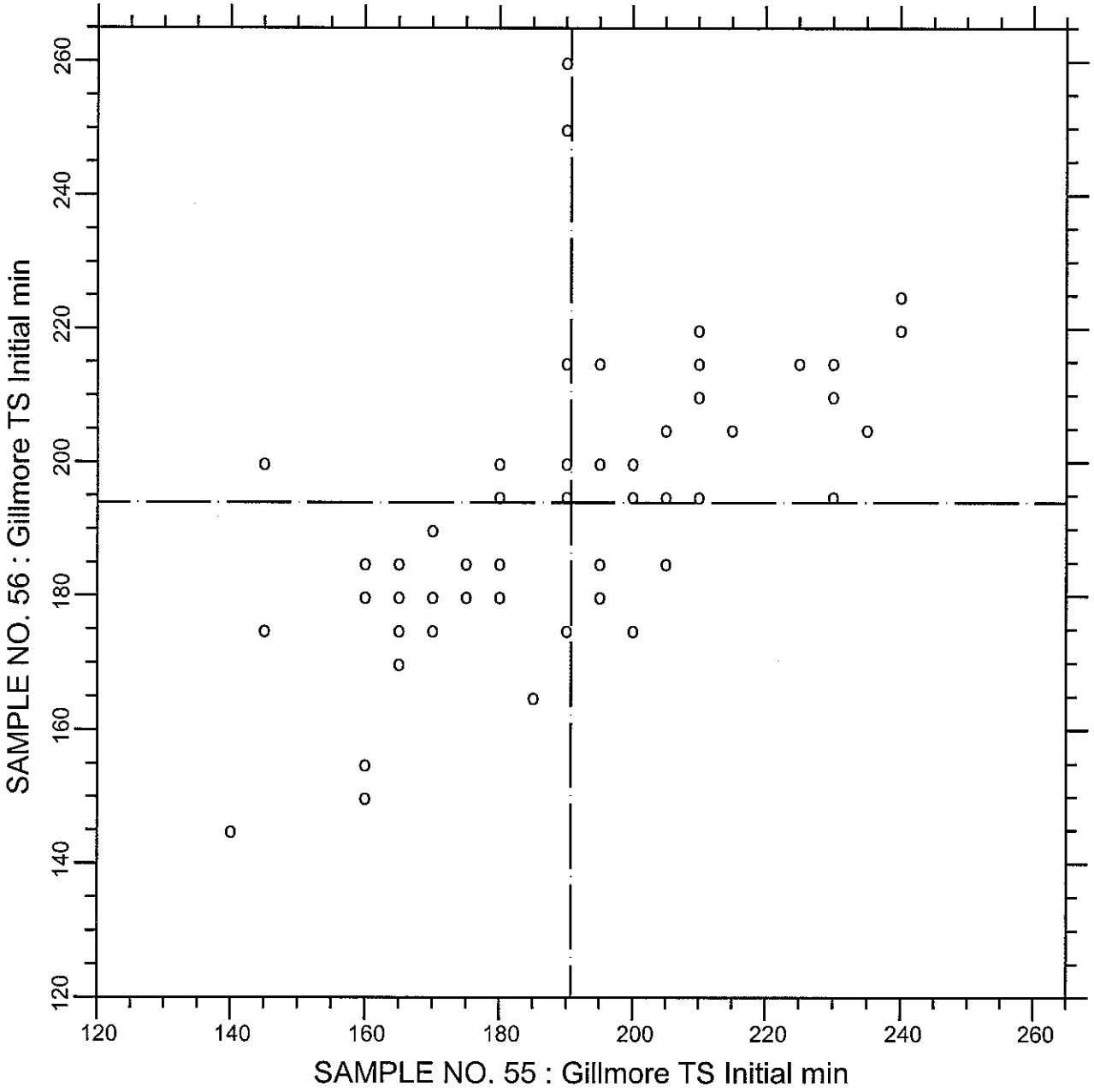
TEST NO.110 N.C. Water 64 POINTS

SAMPLE NO. 55 AVE 25.961 S.D. 0.38 C.V. 1.44

SAMPLE NO. 56 AVE 25.452 S.D. 0.38 C.V. 1.50

LABS ELIMINATED 54 687

CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Initial
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



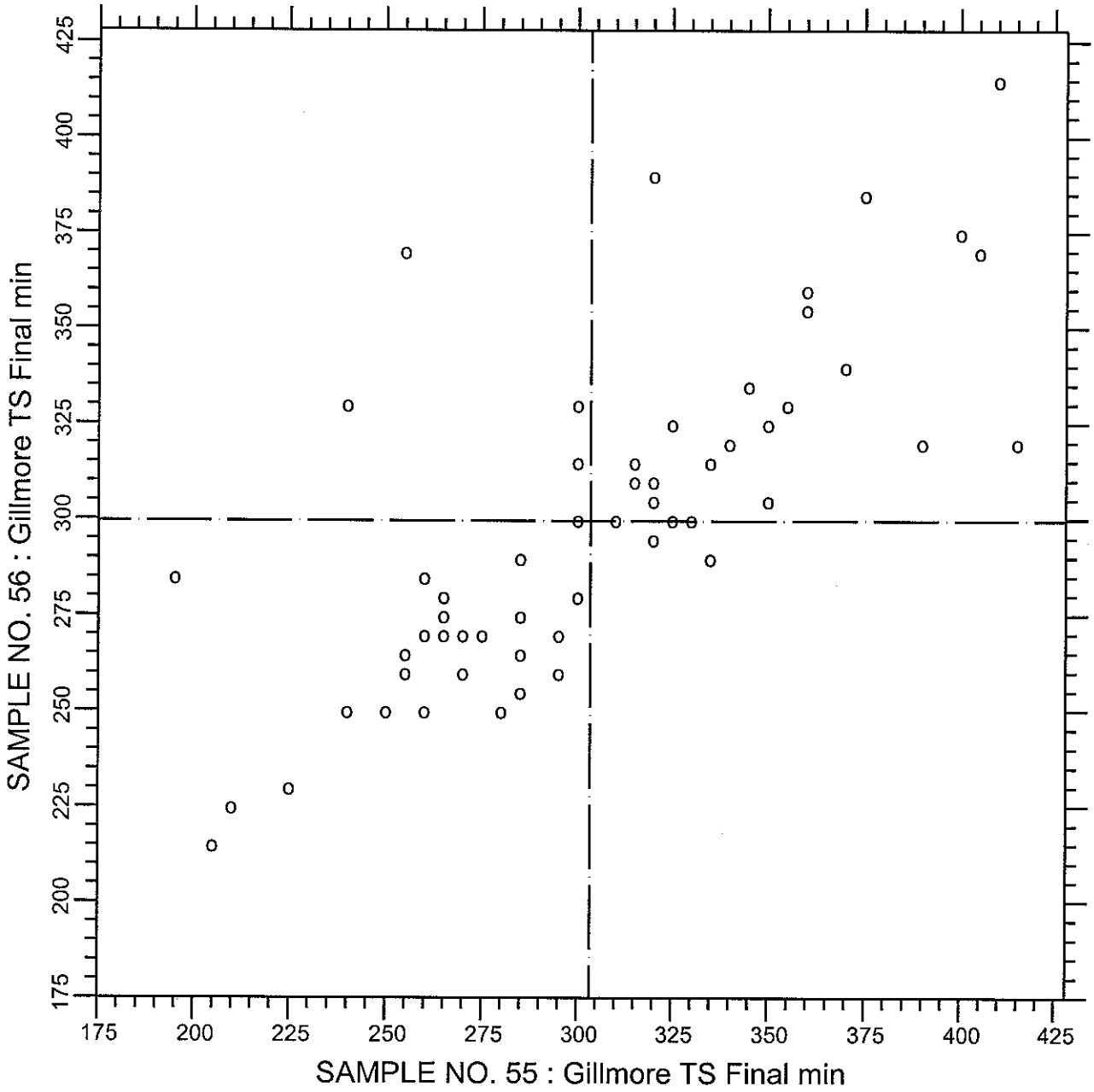
TEST NO.130 Gillmore TS Initial 58 POINTS

SAMPLE NO. 55 AVE 190.7 S.D. 24.8 C.V. 13.0

SAMPLE NO. 56 AVE 194.0 S.D. 21.0 C.V. 10.8

LABS ELIMINATED 90 93 690 1853

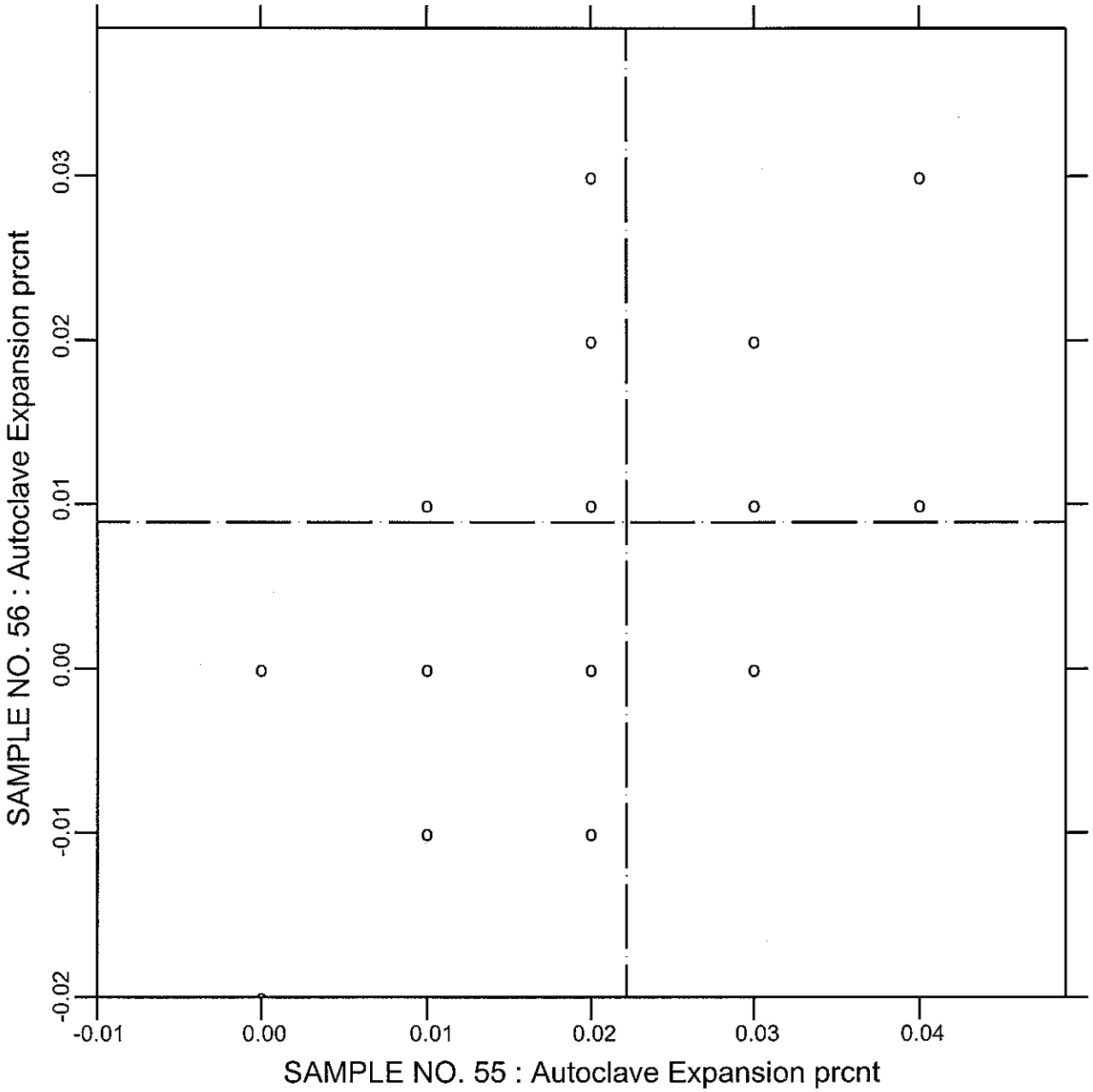
CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Final
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.140 Gillmore TS Final 61 POINTS

SAMPLE NO. 55 AVE 303.4 S.D. 50.8 C.V. 16.7
SAMPLE NO. 56 AVE 299.6 S.D. 41.8 C.V. 14.0
LABS ELIMINATED 2464

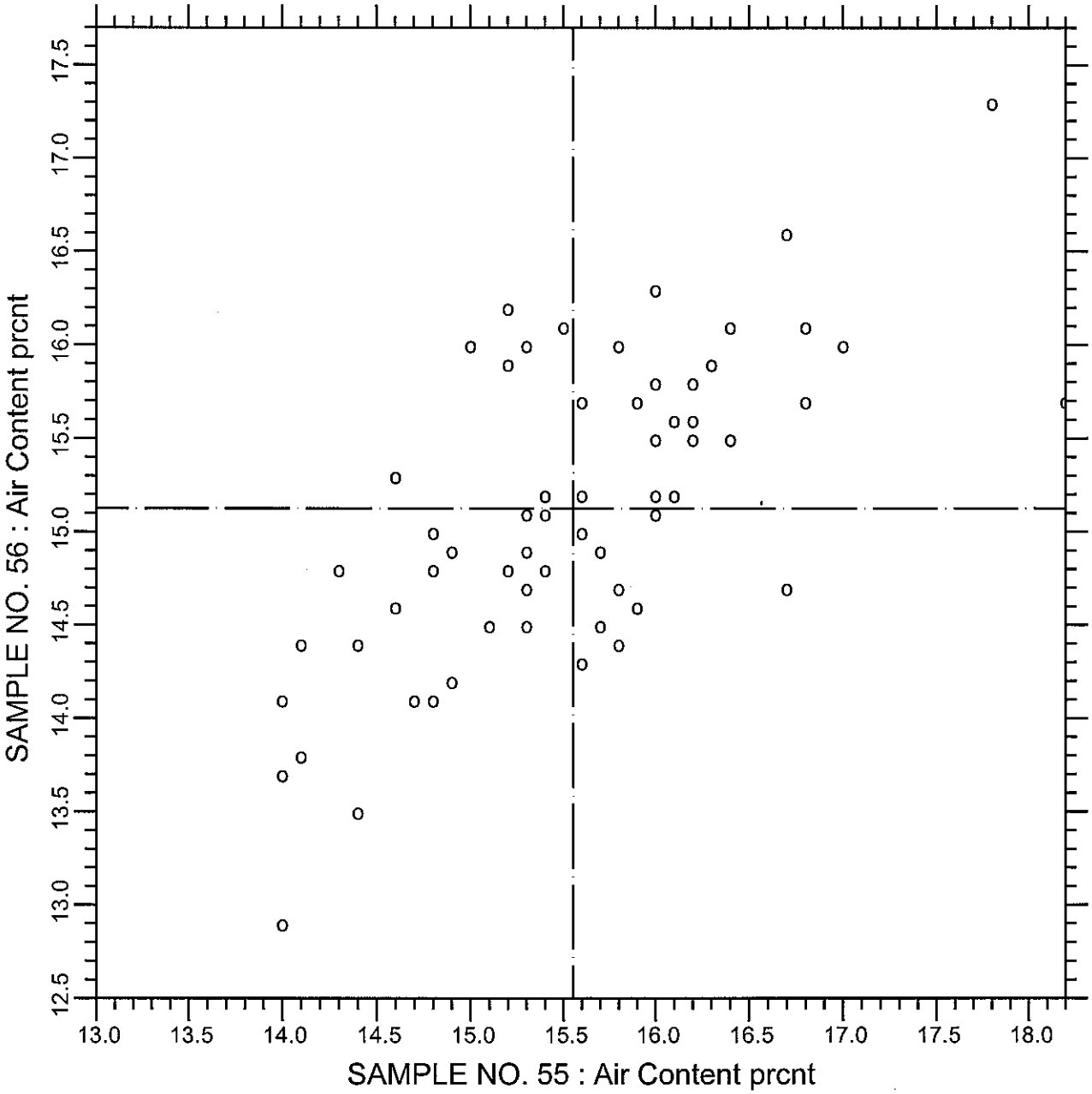
CCRL PROFICIENCY SAMPLE PROGRAM
Autoclave Expansion
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.160 Autoclave Expansion 54 POINTS

SAMPLE NO. 55 AVE 0.0222 S.D. 0.0094 C.V. 42.2
SAMPLE NO. 56 AVE 0.0089 S.D. 0.0090 C.V. 100.6
LABS ELIMINATED 93 354 201 407 605 690 2464

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



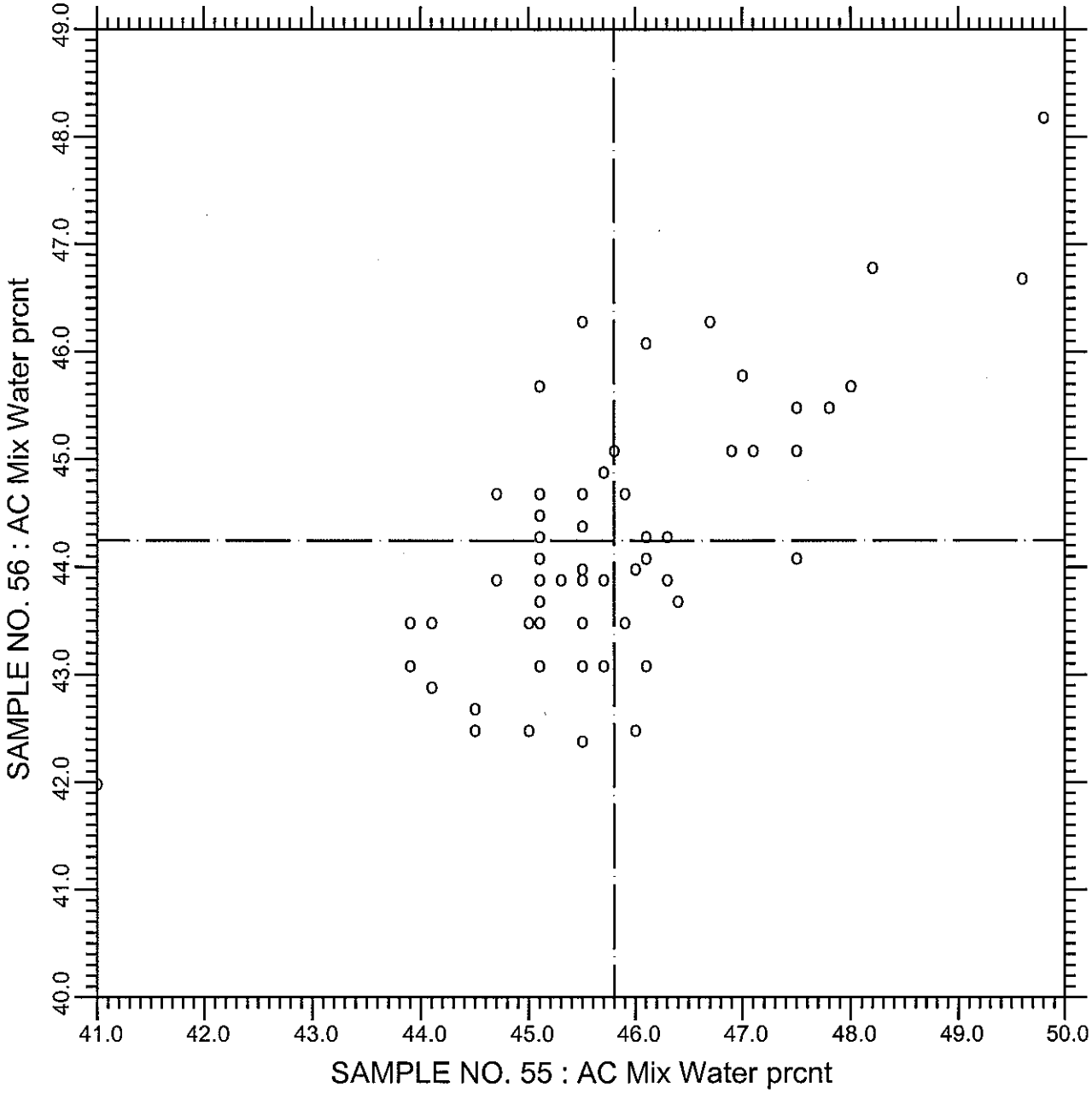
TEST NO.170 Air Content 62 POINTS

SAMPLE NO. 55 AVE 15.55 S.D. 0.88 C.V. 5.68

SAMPLE NO. 56 AVE 15.12 S.D. 0.81 C.V. 5.37

LABS ELIMINATED 440 1853 2464 2964

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Water
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



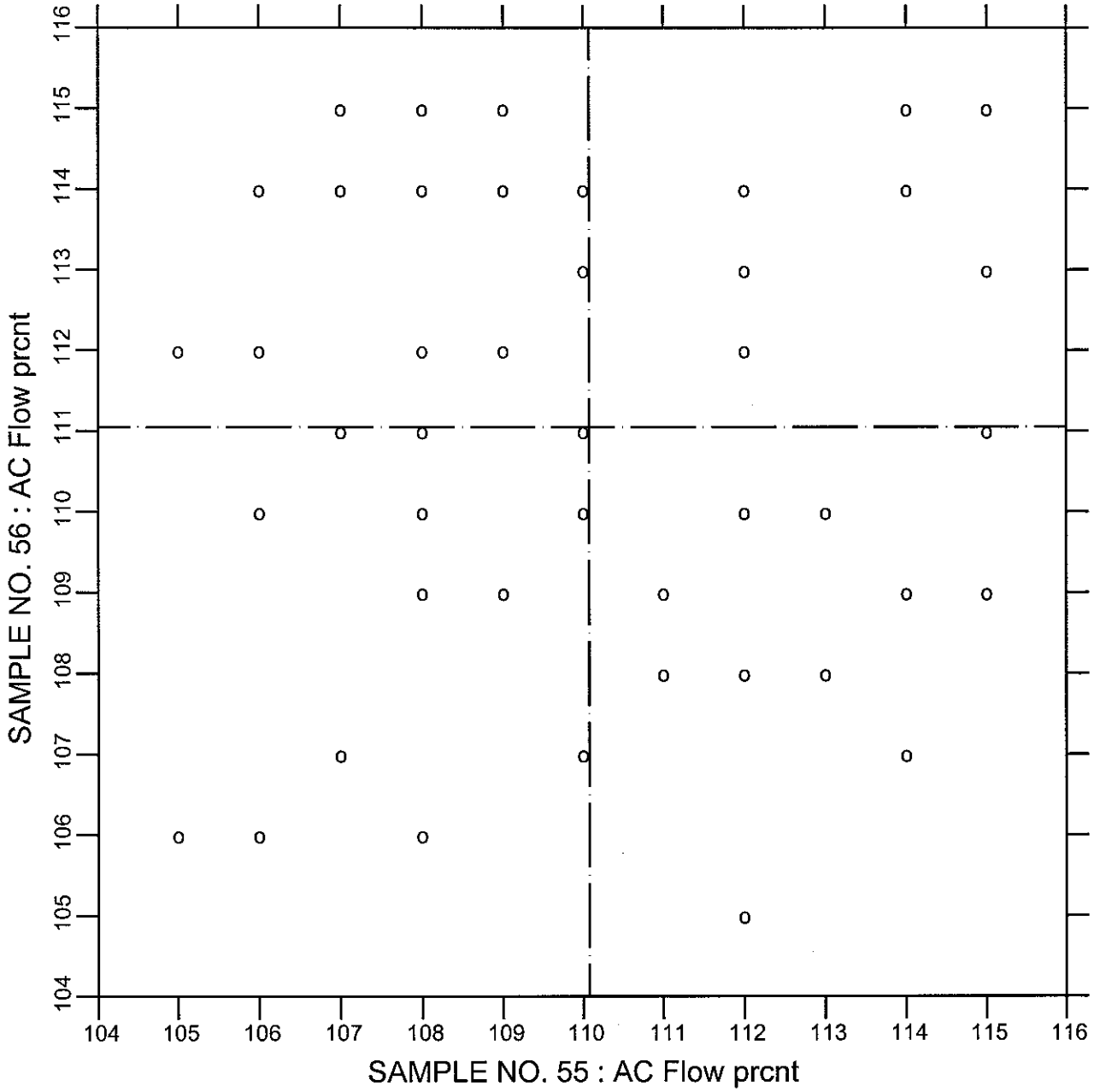
TEST NO.180 AC Mix Water 63 POINTS

SAMPLE NO. 55 AVE 45.80 S.D. 1.4 C.V. 2.95

SAMPLE NO. 56 AVE 44.25 S.D. 1.2 C.V. 2.72

LABS ELIMINATED 159 2464 2964

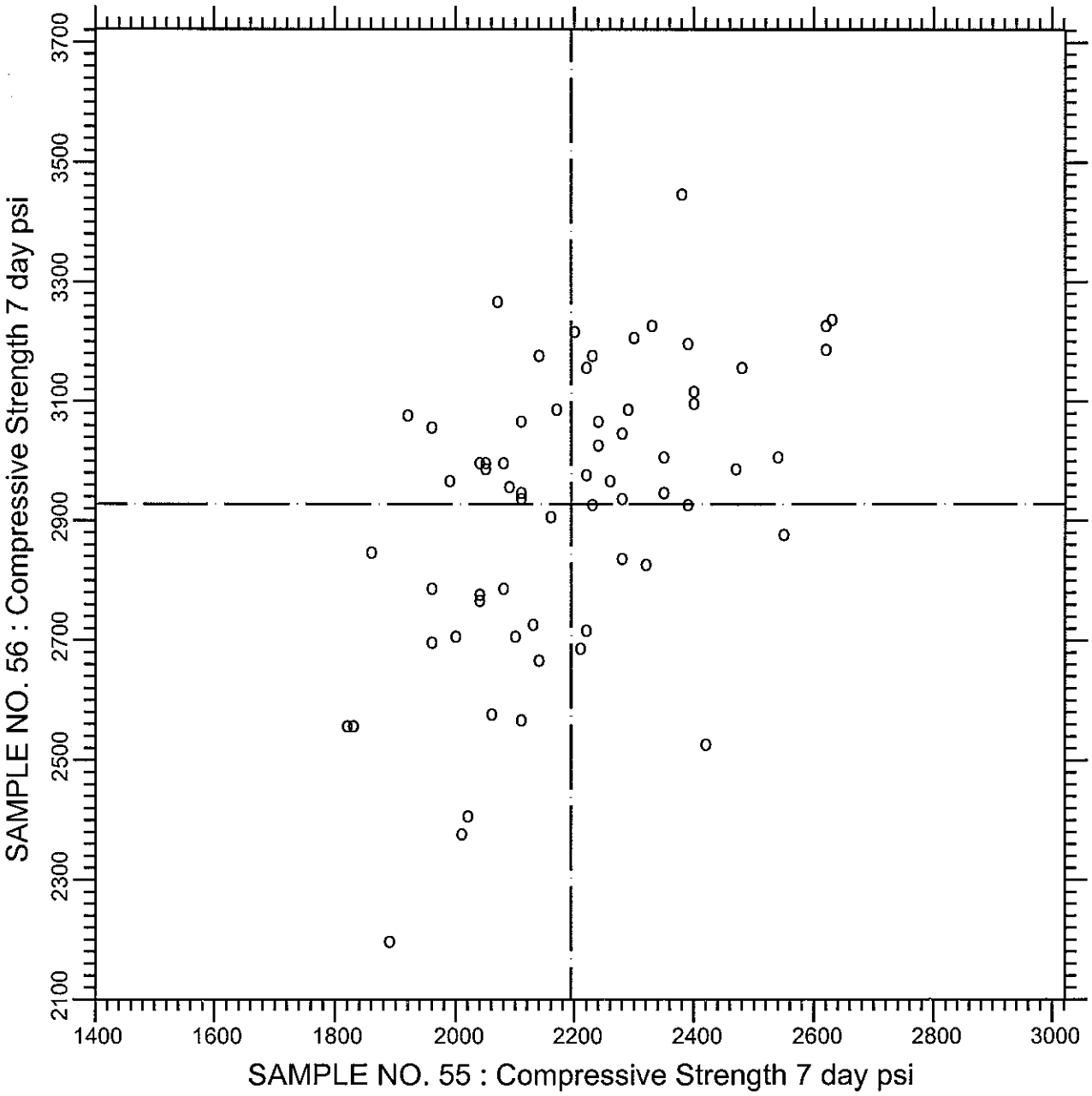
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Flow
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.190 AC Flow 65 POINTS

SAMPLE NO. 55 AVE 110.08 S.D. 2.8 C.V. 2.56
SAMPLE NO. 56 AVE 111.05 S.D. 2.8 C.V. 2.48
LABS ELIMINATED 74 2964

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7 day
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



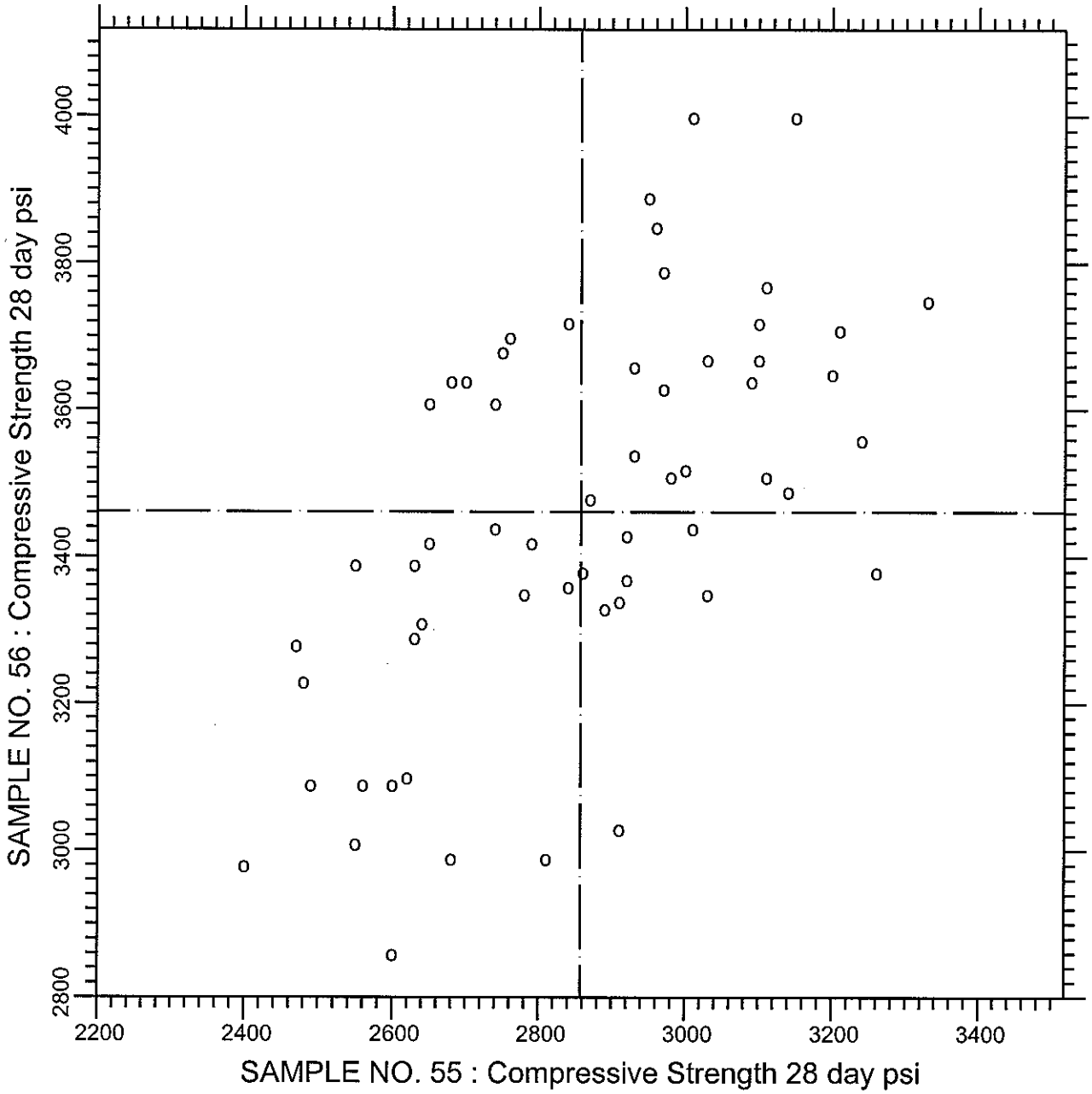
TEST NO.210 Compressive Strength 7 day 64 POINTS

SAMPLE NO. 55 AVE 2194.4 S.D. 196.6 C.V. 8.96

SAMPLE NO. 56 AVE 2927.5 S.D. 243.1 C.V. 8.30

LABS ELIMINATED 9 1196

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28 day
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



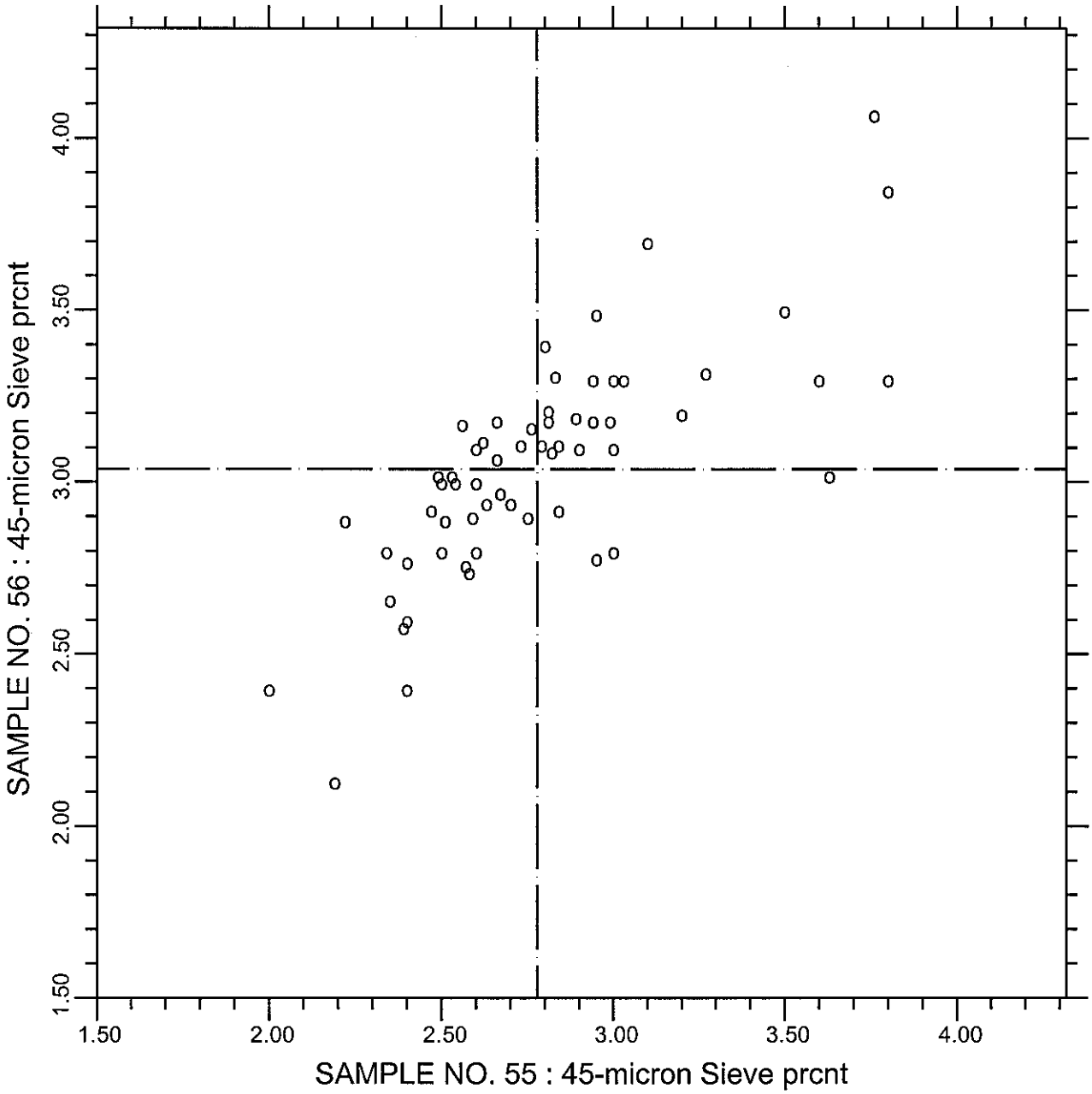
TEST NO.211 Compressive Strength 28 day 58 POINTS

SAMPLE NO. 55 AVE 2857.2 S.D. 227.1 C.V. 7.95

SAMPLE NO. 56 AVE 3461.0 S.D. 267.3 C.V. 7.72

LABS ELIMINATED 9 1196

CCRL PROFICIENCY SAMPLE PROGRAM
Fineness - 45 micron Sieve Retained
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



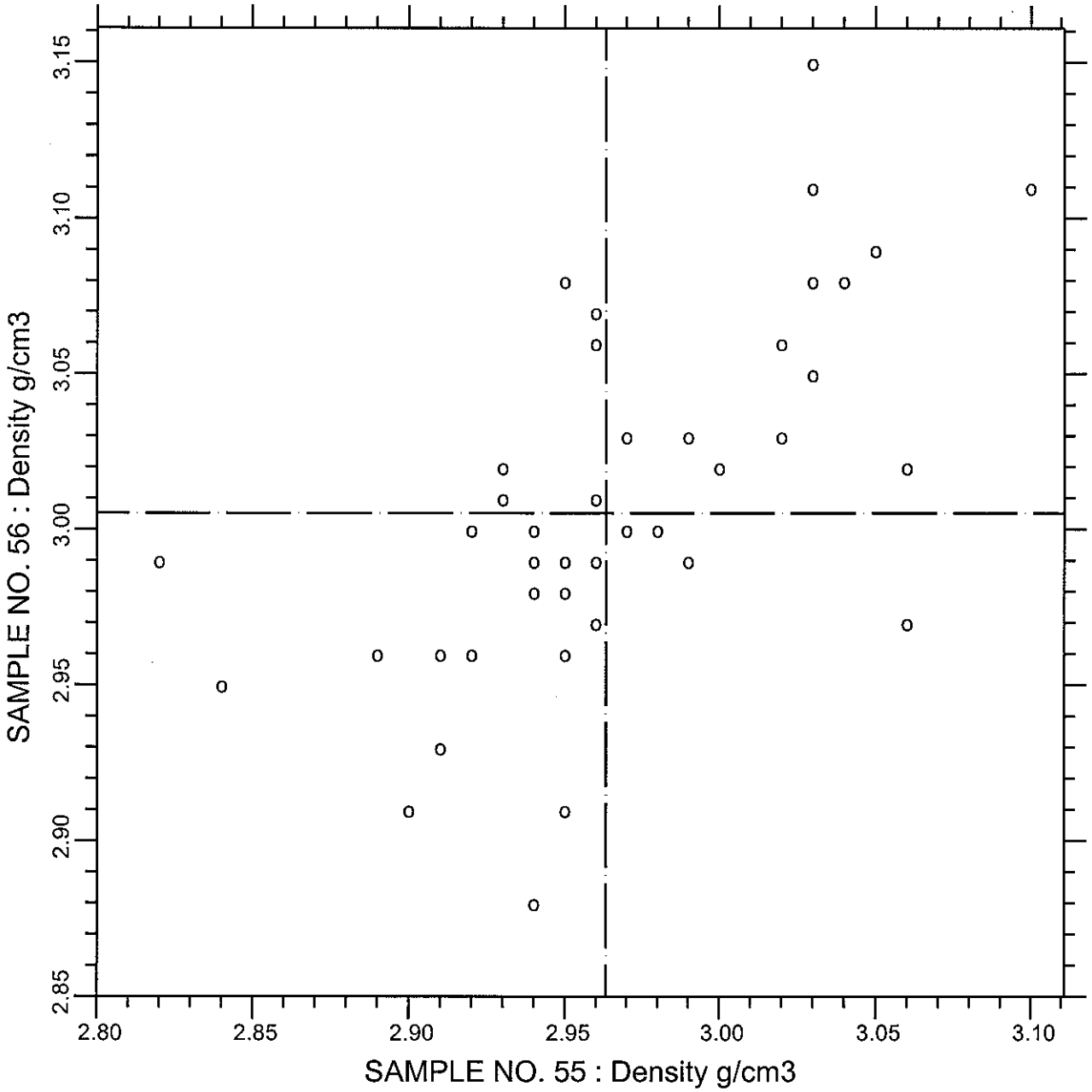
TEST NO.281 45-micron Sieve 63 POINTS

SAMPLE NO. 55 AVE 2.777 S.D. 0.38 C.V. 13.9

SAMPLE NO. 56 AVE 3.037 S.D. 0.33 C.V. 10.9

LABS ELIMINATED 90 284 441

CCRL PROFICIENCY SAMPLE PROGRAM
Density
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



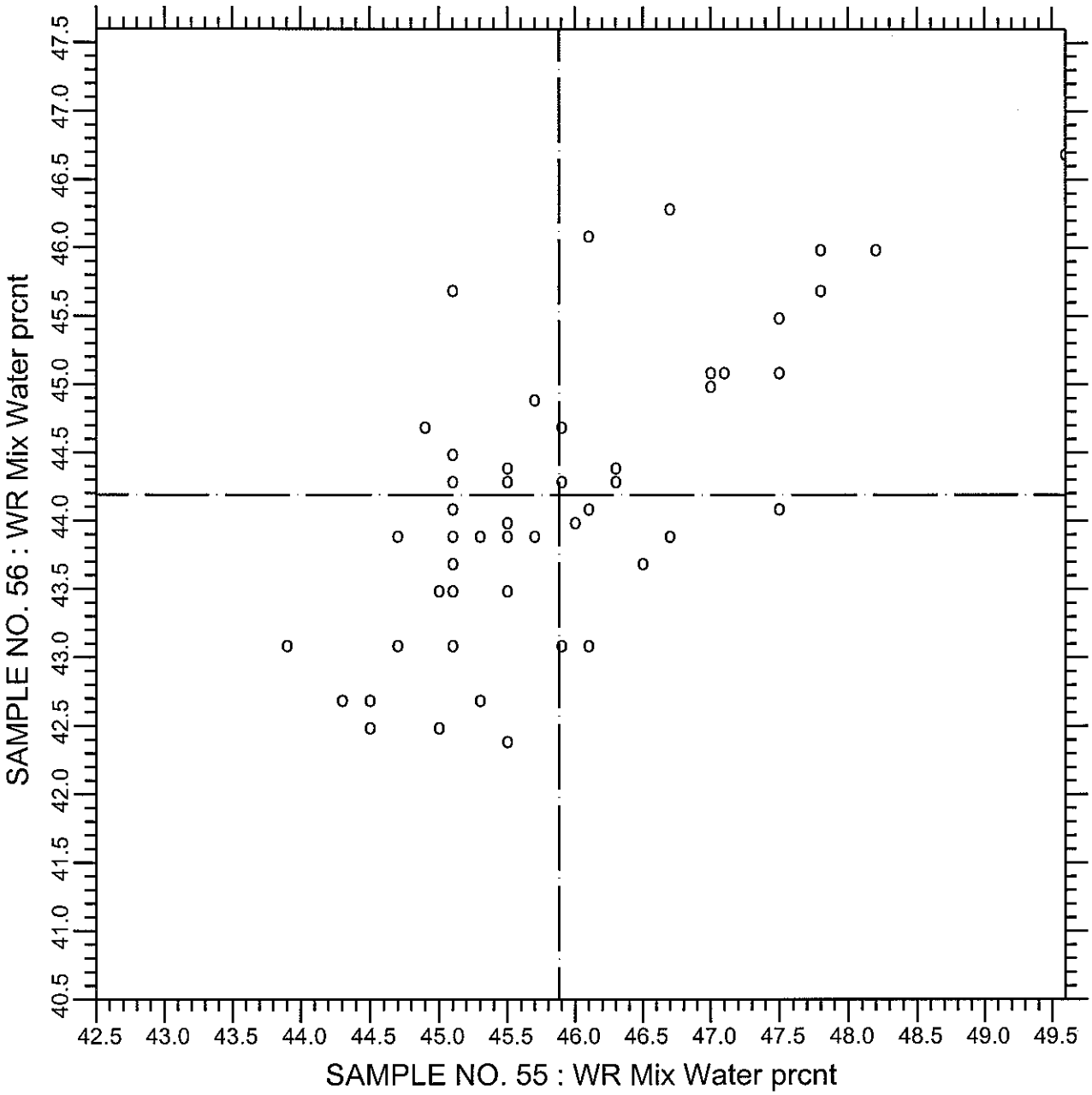
TEST NO.310 Density 52 POINTS

SAMPLE NO. 55 AVE 2.9633 S.D. 0.053 C.V. 1.79

SAMPLE NO. 56 AVE 3.0052 S.D. 0.053 C.V. 1.77

LABS ELIMINATED 142 157 438 2964

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Water
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



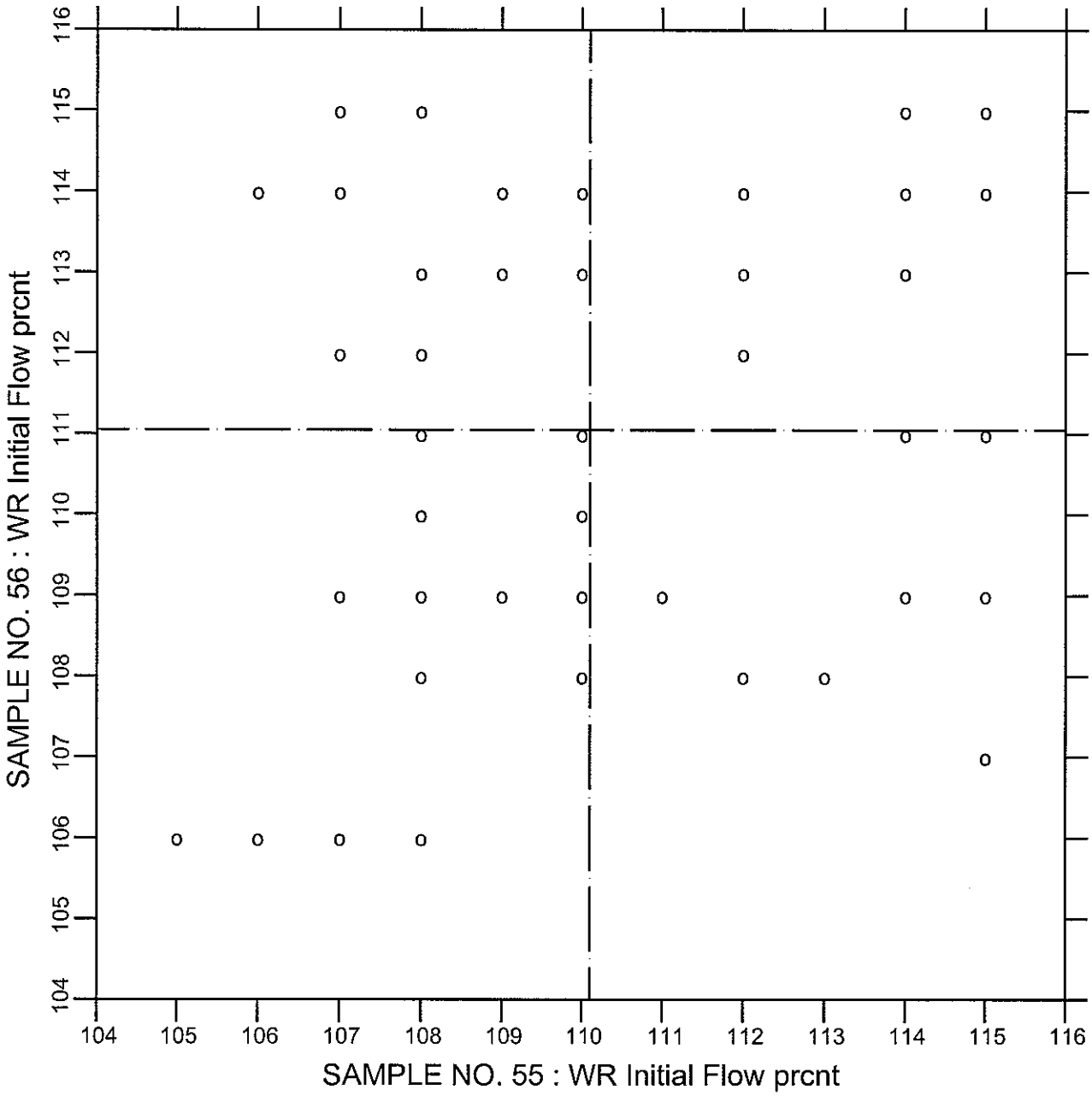
TEST NO.330 WR Mix Water 55 POINTS

SAMPLE NO. 55 AVE 45.88 S.D. 1.1 C.V. 2.40

SAMPLE NO. 56 AVE 44.19 S.D. 1.0 C.V. 2.34

LABS ELIMINATED 159 309 694 1373

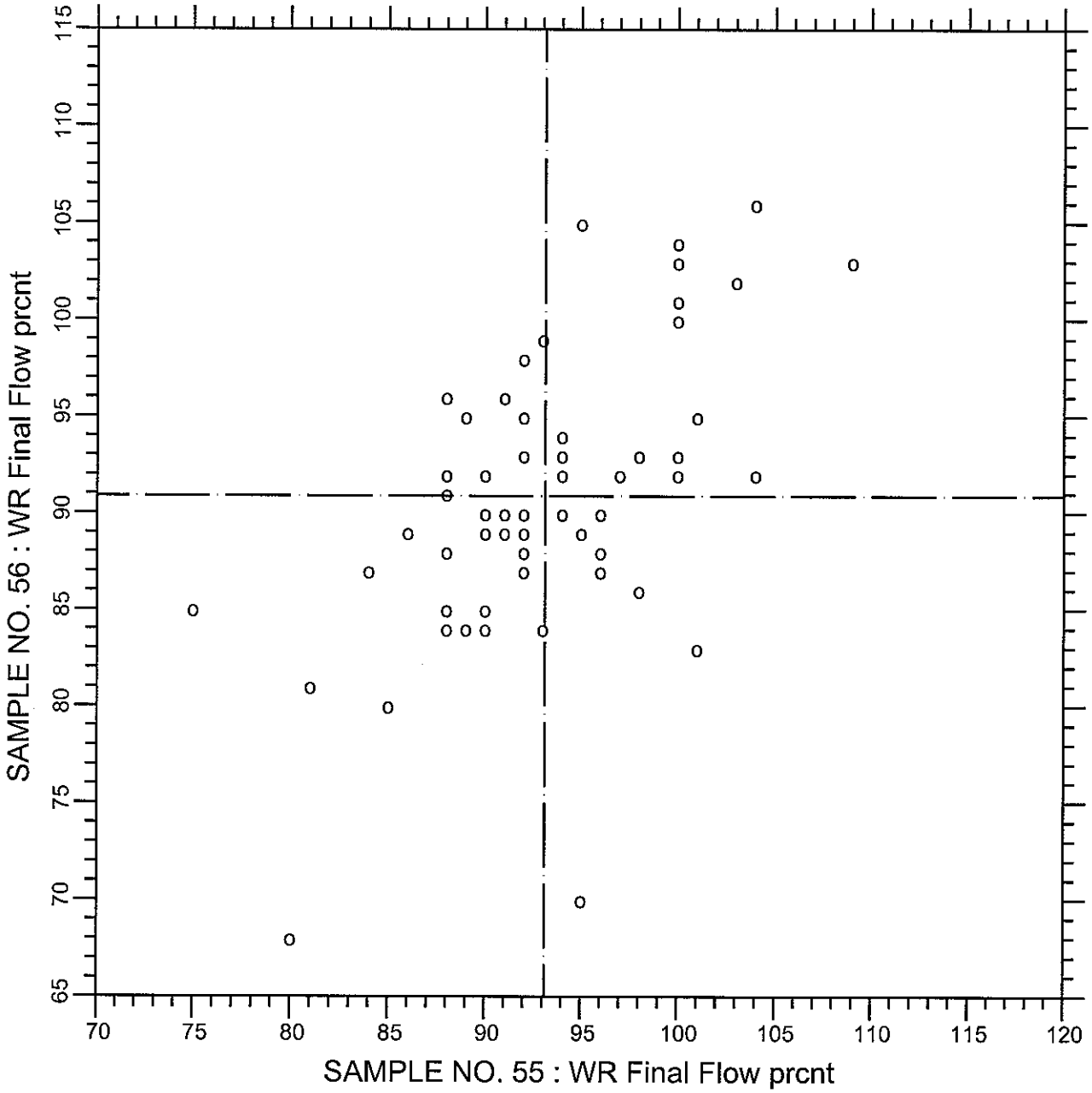
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Initial Flow
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.331 WR Initial Flow 60 POINTS

SAMPLE NO. 55	AVE	110.10	S.D.	2.8	C.V. 2.54
SAMPLE NO. 56	AVE	111.05	S.D.	2.8	C.V. 2.52

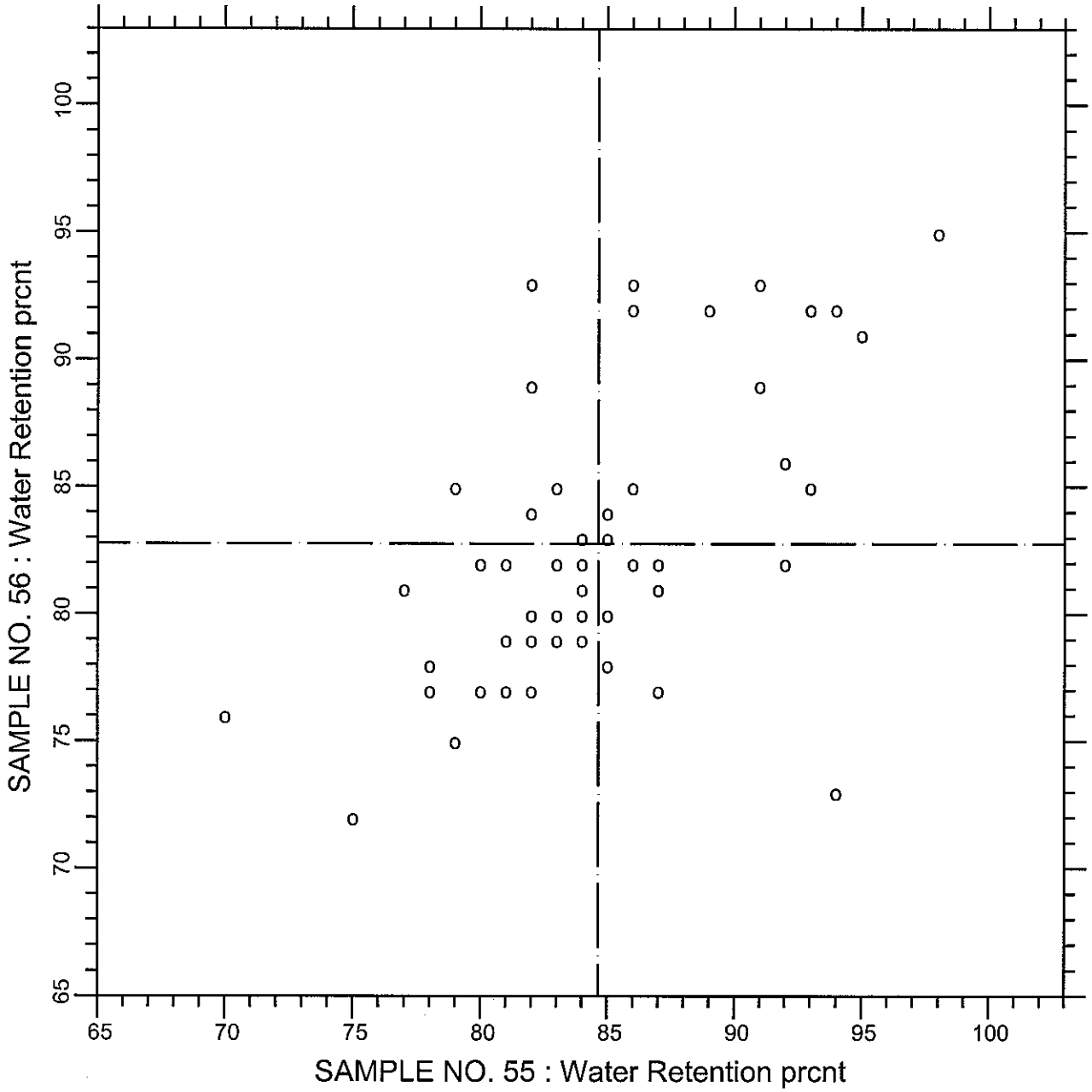
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Final Flow
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.332 WR Final Flow 60 POINTS

SAMPLE NO. 55	AVE	93.12	S.D.	6.3	C.V.	6.75
SAMPLE NO. 56	AVE	90.88	S.D.	7.5	C.V.	8.27

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention Value
MASONRY CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.333 Water Retention 58 POINTS

SAMPLE NO. 55 AVE 84.66 S.D. 5.2 C.V. 6.20

SAMPLE NO. 56 AVE 82.76 S.D. 5.6 C.V. 6.80

LABS ELIMINATED 90 93 98