

CEMENT AND CONCRETE REFERENCE LABORATORY
PROFICIENCY SAMPLE PROGRAM

Final Report
Blended Cement Proficiency Samples
Number 55 and Number 56

May 2005

CEMENT AND CONCRETE REFERENCE LABORATORY

AT THE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
GAITHERSBURG, MARYLAND 20899
(301) 975-6704

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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May 13, 2005

To: Participants in the CCRL Blended Cement Proficiency Sample Program

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

Following is the final report for the current pair of CCRL **Blended Cement** Proficiency Samples which were distributed in February 2005. Both cements were an ASTM C595 Blended Hydraulic Cement. Sample No 55 was a Type ISM and No. 56 was a Type IS.

This report consists of a statistical Summary of Results, a set of general Scatter Diagrams, and associated detailed information. The Table of Results with individualized information for participating laboratories can be downloaded at our website located at: <http://ccrl.us/>.

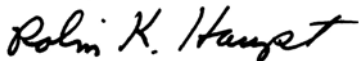
Sulfur Trioxide (SO₃) determination - Results from sulfur trioxide determination for Sample No. 56 exhibited two distinct groups of data when plotted (see scatter diagram "Sulfur Trioxide - All Results"). Sixty-five percent (65%) of the results in the "low range" group was determined using the C114 Reference method. Eighty percent (80%) of the results in the "high range" group was determined using various instrumental test methods. As described in section 4.1.2 of C114 most instrumental methods determine total sulfur which includes SO₃ and sulfide sulfur. Sample No. 56 with a 50% slag content may have a significant amount of sulfide and might be reflected in the "high" group of data. Statistics for "low range", "high range", and all results have been included. Individual laboratory ratings for sulfur trioxide have been suppressed for this pair of samples.

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 use.

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 Blended Cement Proficiency Samples will be distributed in February 2006.

Sincerely,



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

Enclosure

TO: Participants in the CCRL Blended Cement Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests for Blended Cement Proficiency Samples No. 55 and No. 56

This letter, and the material included with it, constitute a portion of the final report for the current pair of Blended Cement Proficiency Samples distributed in February 2005. This material includes a statistical Summary of Results, and a set of general Scatter Diagrams. If your laboratory was a participant in this program a Table of Laboratory Results (lab ratings) for your laboratory data can be viewed and printed on the CCRL website

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.

Table of Laboratory Results

Each laboratory receives an individualized Table of Laboratory Results. Your unique laboratory number is displayed at the top of the Table of Laboratory Results. This table shows the, test title, and the reporting unit in the first two columns. After that it lists in order, 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.

Laboratory ratings, shown in the Table of Results 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

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

¹Youden, 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.*

Participants subscribing to the chemical analysis portion of this report should note that the statistics were calculated using data obtained by wet methods, and rapid methods of chemical analysis.

Please note that individual laboratory ratings were not given for the flow of air content mortar (test no. 190) and compressive strength mortar (test no. 230). Air content flows in the range of 87.5 ± 7.5 are satisfactory. Similarly, the compressive strength flows in the range of 110 ± 5 are satisfactory. Labs with flow values outside these ranges will be flagged as a "Labs Eliminated" 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. Flow values of 151 were assigned to laboratories reporting a mortar flow off the flow table top.

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, 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 - General

The Summary of Results provide the statistical summary for each test. Each line lists the test, the number of participants represented, the averages, standard deviations and coefficients of variations. When necessary the data from the test is represented in two lines, one line with all results reported, and then a second line with outlying results omitted. Sometimes two or more recalculations are required to eliminate all outliers from the 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. 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 ± 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 indicates strong evidence of bias on many tests.

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 55 and No. 56
Final Report - May 13, 2005
Chemical Results

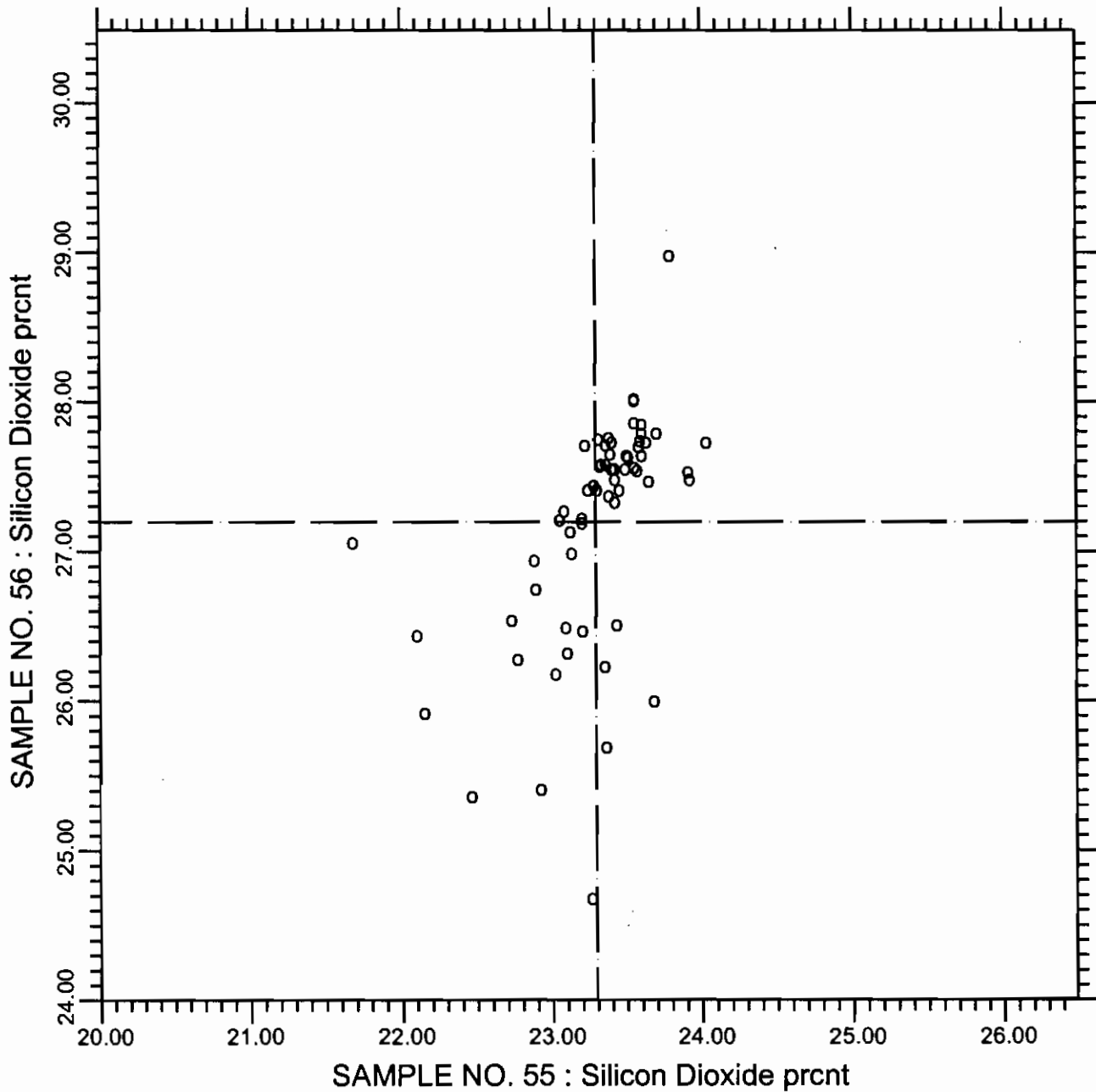
SUMMARY OF RESULTS

Test		#Labs	Sample No. 55			Sample No. 56		
			Average	S.D.	C.V.	Average	S.D.	C.V.
Silicon Dioxide	prcnt	64	23.41	0.78	3.33	27.33	1.06	3.88
Silicon Dioxide	prcnt	* 62	23.29	0.42	1.79	27.20	0.76	2.81
Aluminum Oxide	prcnt	61	6.50	0.21	3.22	7.93	0.44	5.61
Aluminum Oxide	prcnt	* 59	6.49	0.18	2.79	7.93	0.30	3.74
Ferric Oxide	prcnt	63	2.58	0.085	3.31	2.15	0.147	6.82
Ferric Oxide	prcnt	* 60	2.58	0.068	2.64	2.14	0.115	5.38
Calcium Oxide	prcnt	63	60.44	0.81	1.34	52.91	1.00	1.90
Calcium Oxide	prcnt	* 62	60.50	0.65	1.08	52.97	0.88	1.67
Magnesium Oxide	prcnt	63	1.83	0.12	6.71	5.40	0.39	7.30
Magnesium Oxide	prcnt	* 60	1.81	0.086	4.77	5.36	0.294	5.49
Sulfur Trioxide	prcnt	65	2.99	0.21	6.95	2.04	0.52	25.29
SO ₃ Low Range	prcnt	22	2.81	0.12	4.34	1.40	0.16	11.33
SO ₃ High Range	prcnt	43	3.09	0.18	5.74	2.37	0.27	11.24
Loss on Ignition	prcnt	64	1.08	0.17	15.5	0.73	0.30	41.0
Loss on Ignition	prcnt	* 62	1.08	0.15	13.9	0.72	0.28	38.8
Phosphorus Pent	prcnt	44	0.068	0.033	49.4	0.048	0.031	66.0
Phosphorus Pent	prcnt	* 43	0.064	0.020	32.3	0.044	0.017	38.5
Titanium Dioxide	prcnt	45	0.34	0.023	6.89	0.36	0.027	7.34
Titanium Dioxide	prcnt	* 42	0.34	0.015	4.30	0.37	0.017	4.55

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

Silicon Dioxide	50 303
Aluminum Oxide	303 309
Ferric Oxide	51 1715 2116
Calcium Oxide	50
Magnesium Oxide	1 42 2295
Loss on Ignition	92 2465
Phosphorus Pentoxide	1940
Titanium Dioxide	50 207 975

CCRL PROFICIENCY SAMPLE PROGRAM
Silicon Dioxide
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.10

Silicon Dioxide

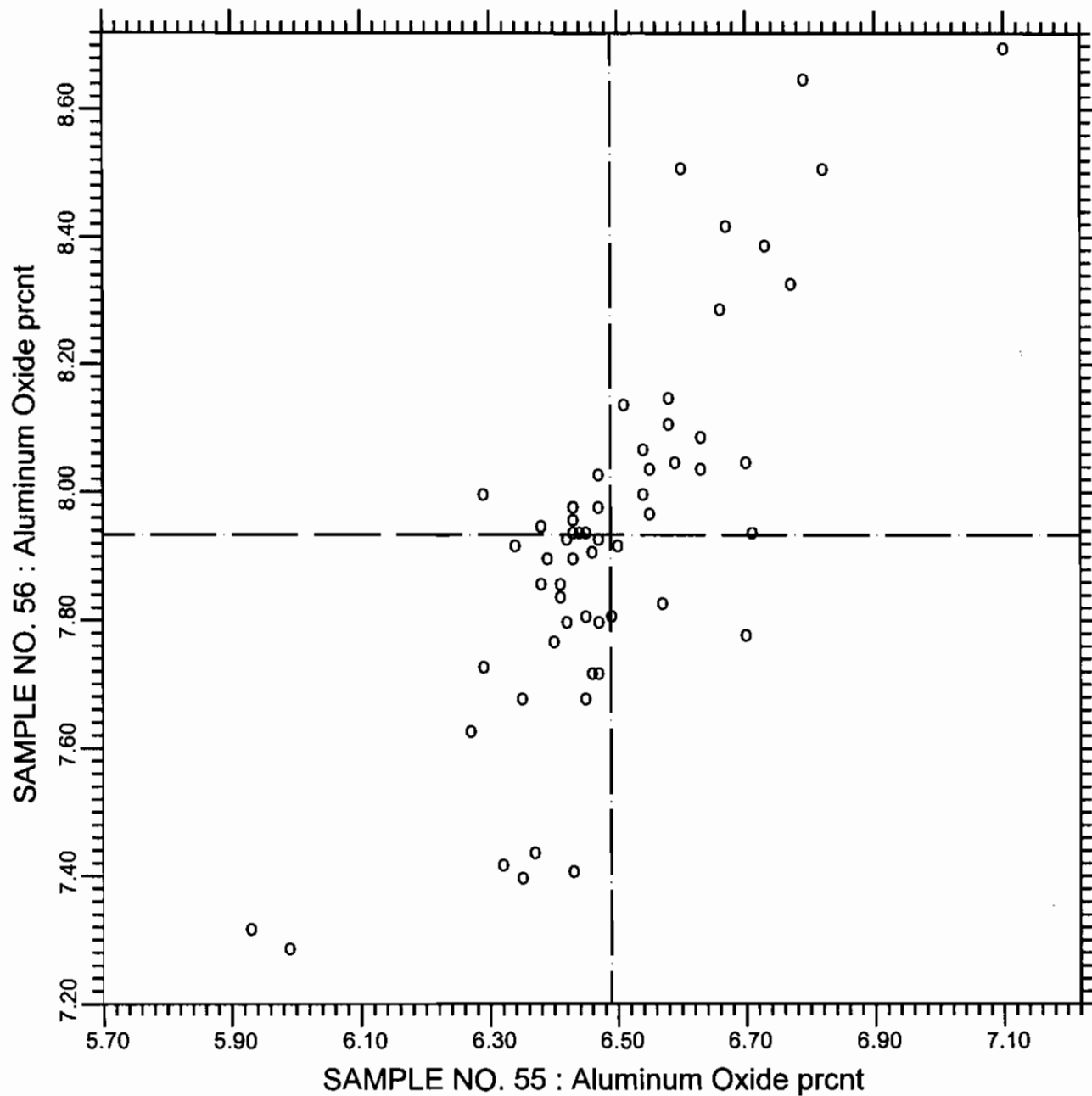
62 POINTS

SAMPLE NO. 55 AVE 23.292 S.D. 0.42 C.V. 1.79

SAMPLE NO. 56 AVE 27.196 S.D. 0.76 C.V. 2.81

LABS ELIMINATED 50 303

CCRL PROFICIENCY SAMPLE PROGRAM
 Aluminum Oxide - wo/minor oxides
 BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.21

Aluminum Oxide

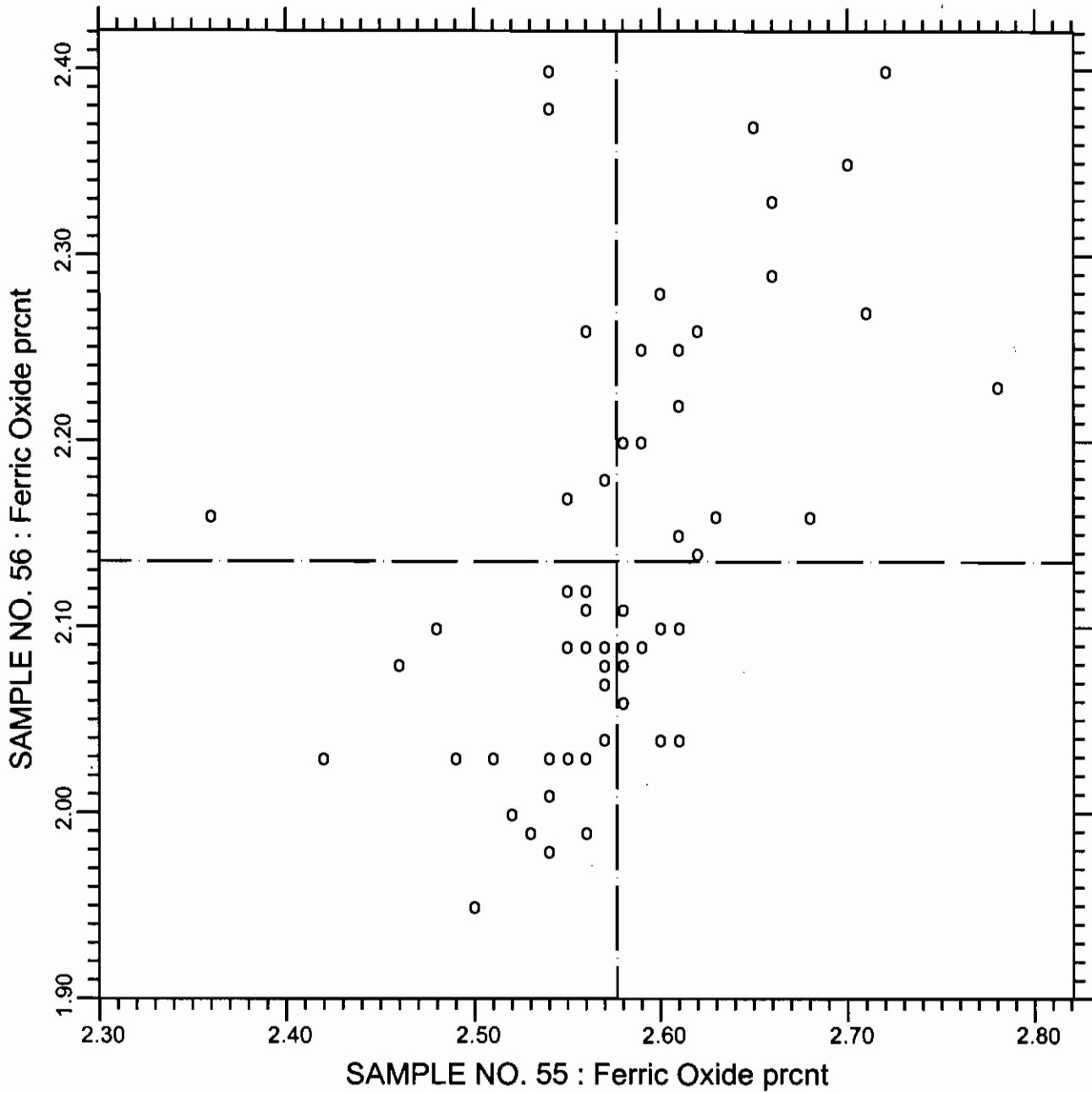
59 POINTS

SAMPLE NO. 55 AVE 6.489 S.D. 0.18 C.V. 2.79

SAMPLE NO. 56 AVE 7.934 S.D. 0.30 C.V. 3.74

LABS ELIMINATED 303 309

CCRL PROFICIENCY SAMPLE PROGRAM
 Ferric Oxide
 BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.30

Ferric Oxide

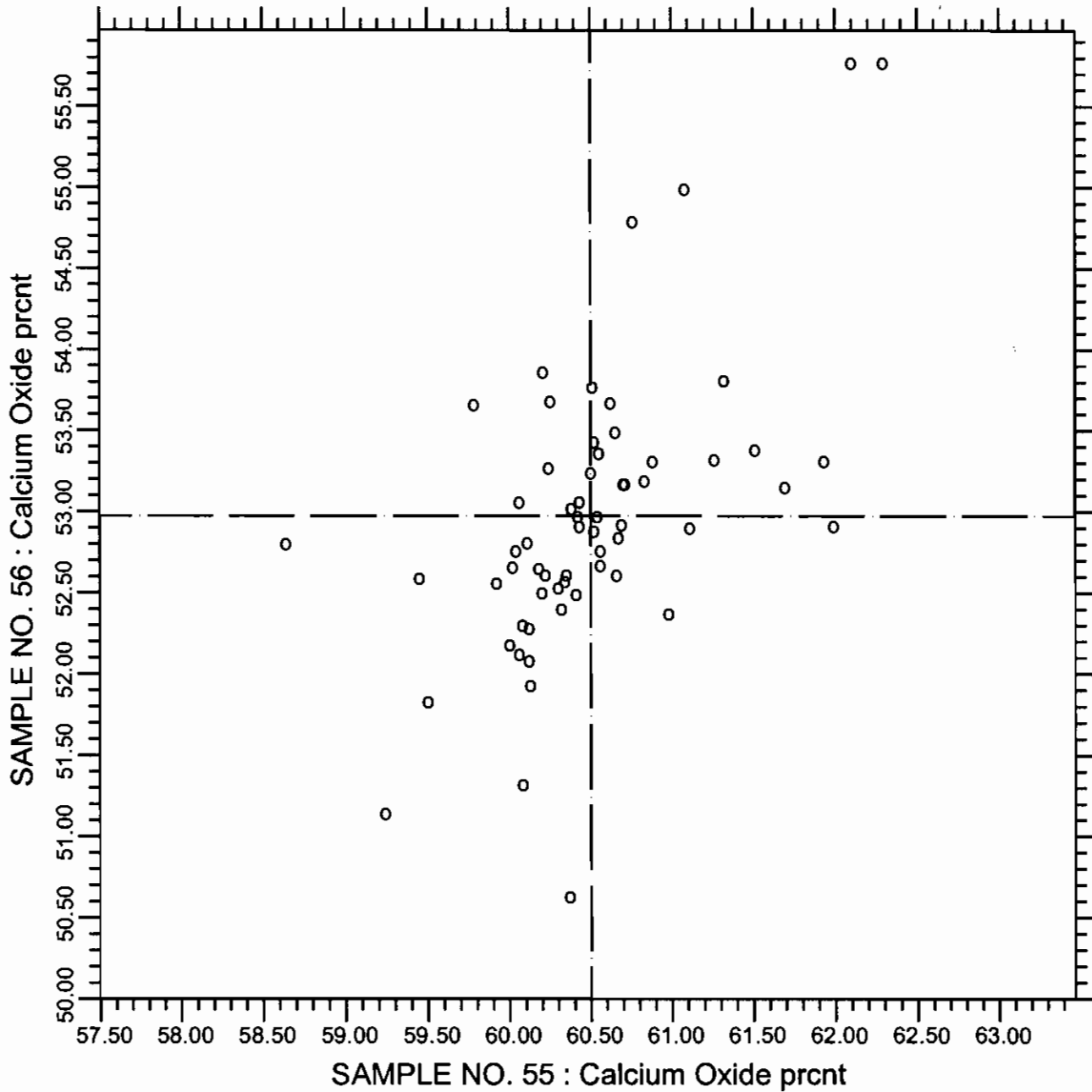
60 POINTS

SAMPLE NO. 55 AVE 2.5767 S.D. 0.068 C.V. 2.64

SAMPLE NO. 56 AVE 2.1352 S.D. 0.115 C.V. 5.38

LABS ELIMINATED 51 1715 2116

CCRL PROFICIENCY SAMPLE PROGRAM
 Calcium Oxide
 BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.40

Calcium Oxide

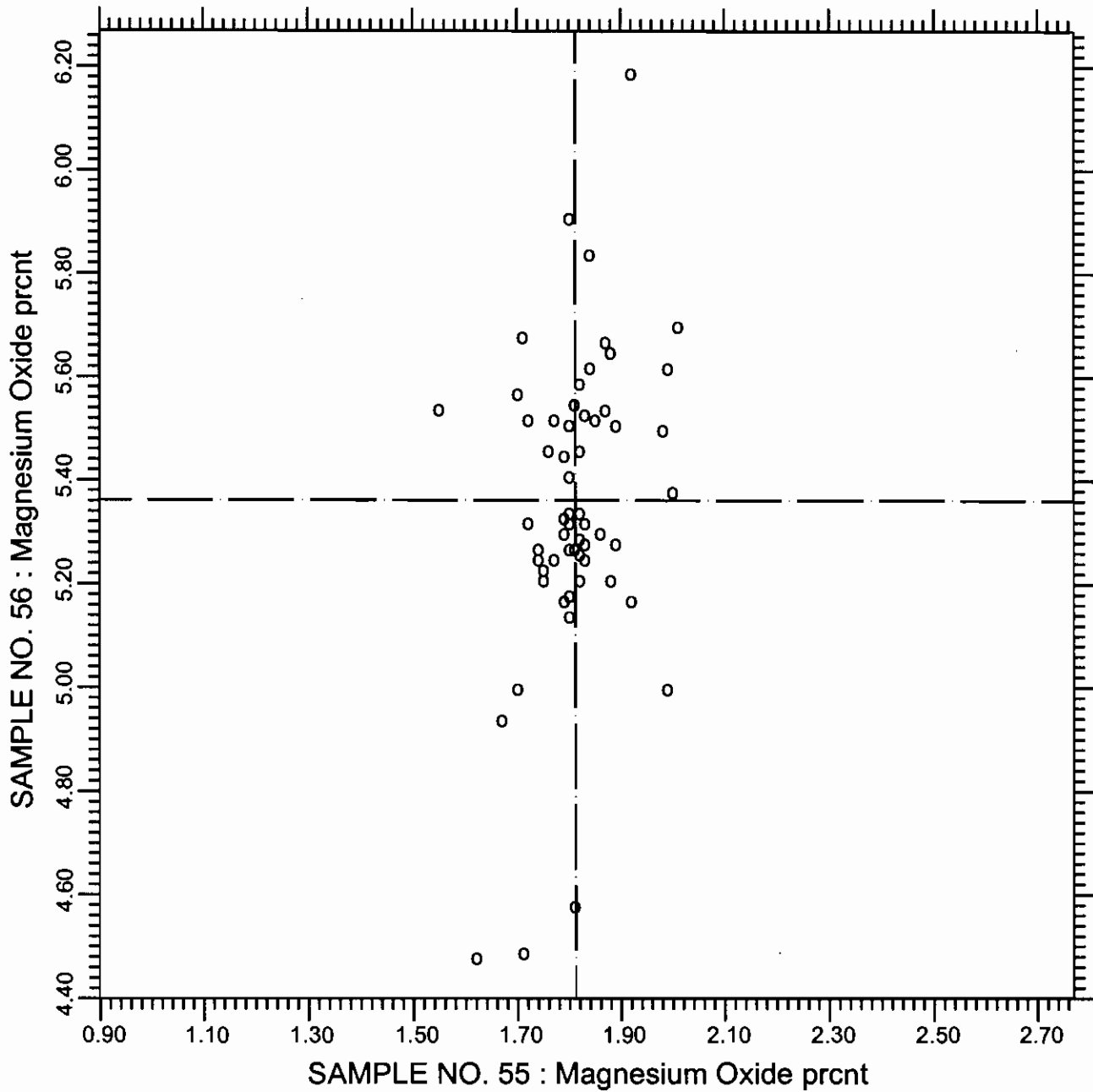
62 POINTS

SAMPLE NO. 55 AVE 60.501 S.D. 0.65 C.V. 1.08

SAMPLE NO. 56 AVE 52.974 S.D. 0.88 C.V. 1.67

LABS ELIMINATED 50

CCRL PROFICIENCY SAMPLE PROGRAM
Magnesium Oxide
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.50

Magnesium Oxide

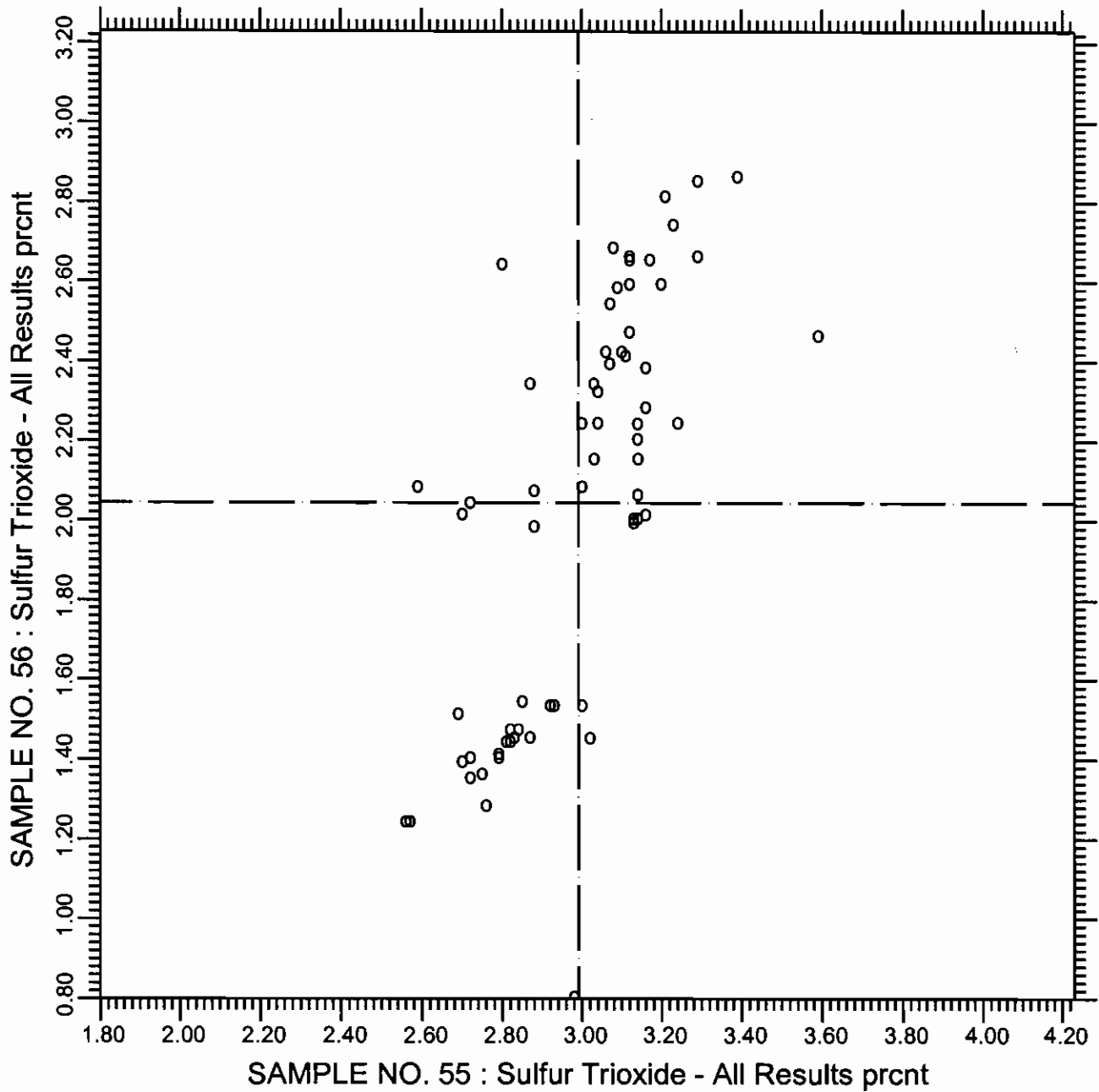
60 POINTS

SAMPLE NO. 55 AVE 1.812 S.D. 0.086 C.V. 4.77

SAMPLE NO. 56 AVE 5.361 S.D. 0.294 C.V. 5.49

LABS ELIMINATED 1 42 2295

CCRL PROFICIENCY SAMPLE PROGRAM
Sulfur Trioxide
BLENDED CEMENT SAMPLES NO. 55 & NO. 56

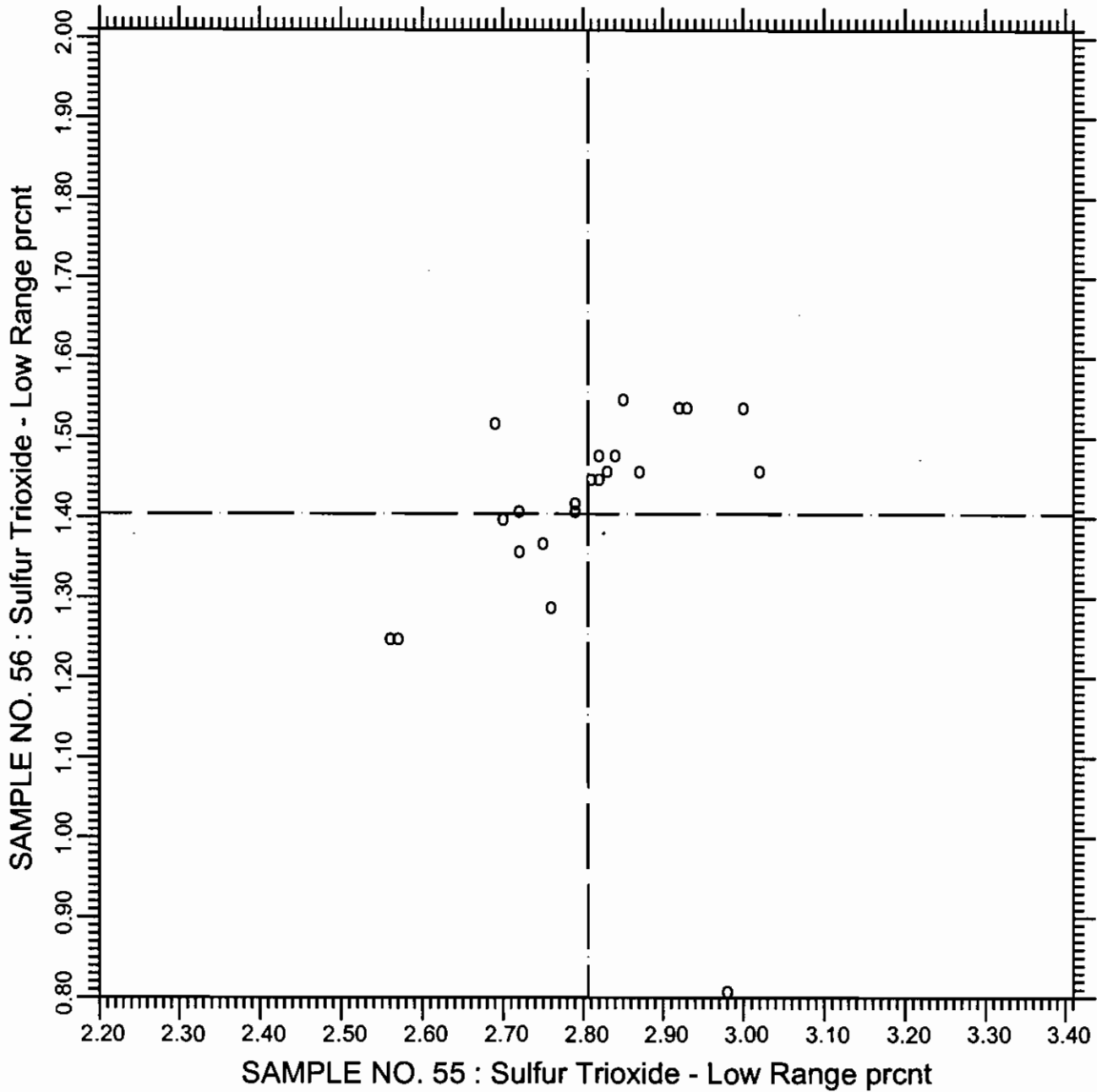


TEST NO.60 Sulfur Trioxide - All Results 65 POINTS

SAMPLE NO. 55 AVE 2.991 S.D. 0.21 C.V. 6.95

SAMPLE NO. 56 AVE 2.044 S.D. 0.52 C.V. 25.29

CCRL PROFICIENCY SAMPLE PROGRAM
 Sulfur Trioxide - Low Range
 BLENDED CEMENT SAMPLES NO. 55 & NO. 56

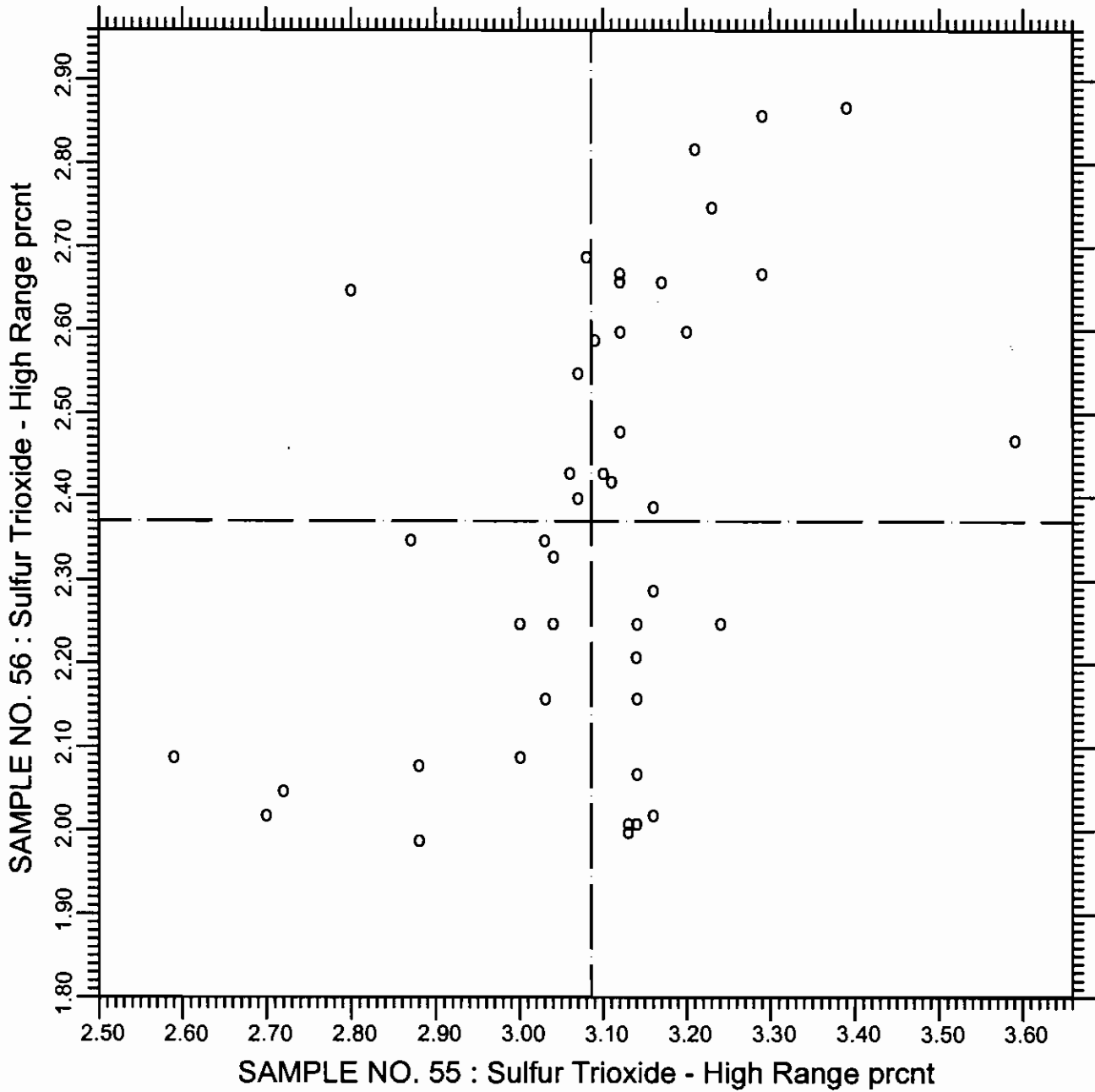


TEST NO.61 Sulfur Trioxide - Low Range 22 POINTS

SAMPLE NO. 55 AVE 2.806 S.D. 0.12 C.V. 4.34

SAMPLE NO. 56 AVE 1.404 S.D. 0.16 C.V. 11.33

CCRL PROFICIENCY SAMPLE PROGRAM
Sulfur Trioxide - High Range
BLENDED CEMENT SAMPLES NO. 55 & NO. 56

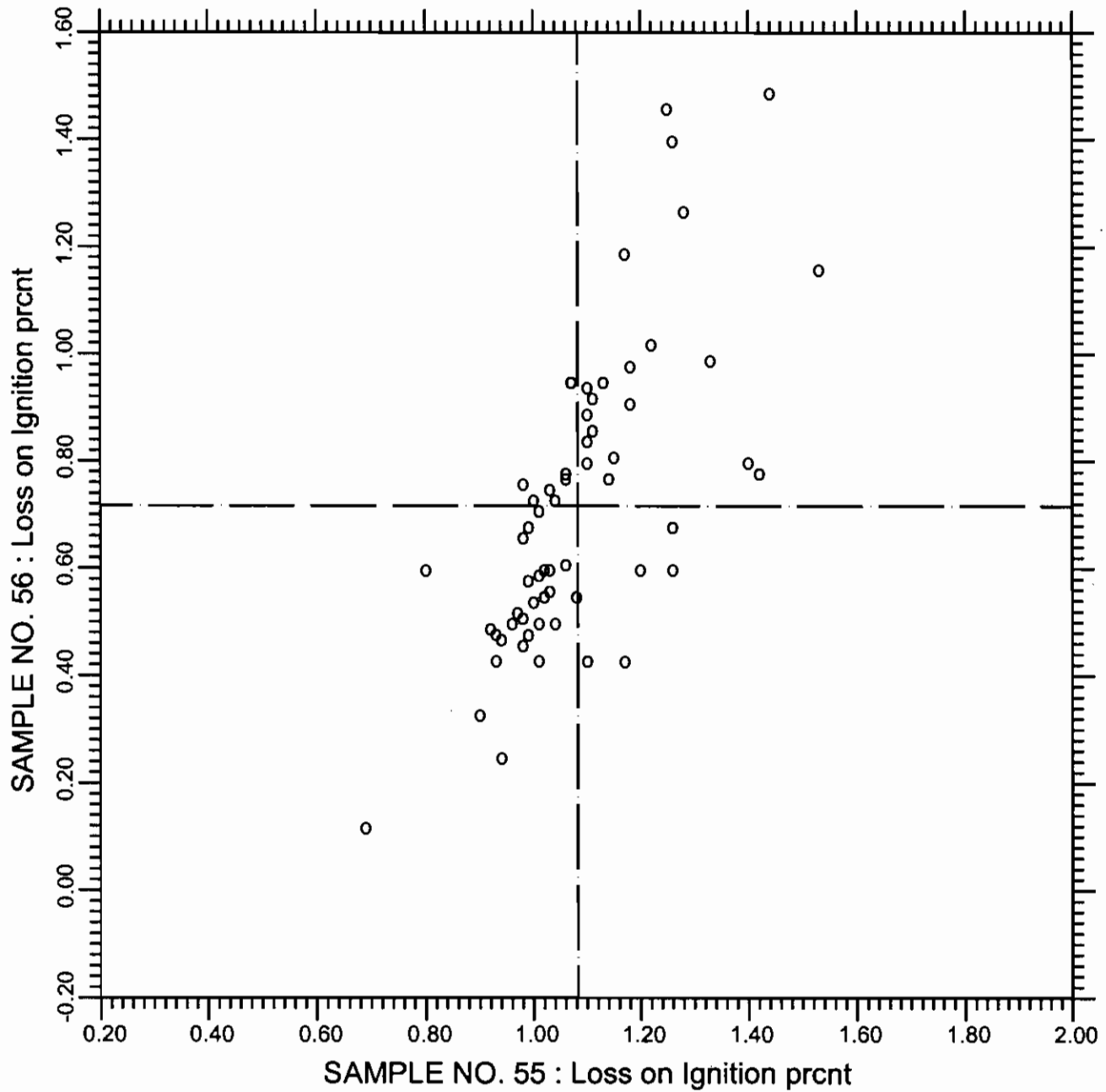


TEST NO.62 Sulfur Trioxide - High Range 43 POINTS

SAMPLE NO. 55 AVE 3.086 S.D. 0.18 C.V. 5.74

SAMPLE NO. 56 AVE 2.371 S.D. 0.27 C.V. 11.24

CCRL PROFICIENCY SAMPLE PROGRAM
Loss on Ignition
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.70

Loss on Ignition

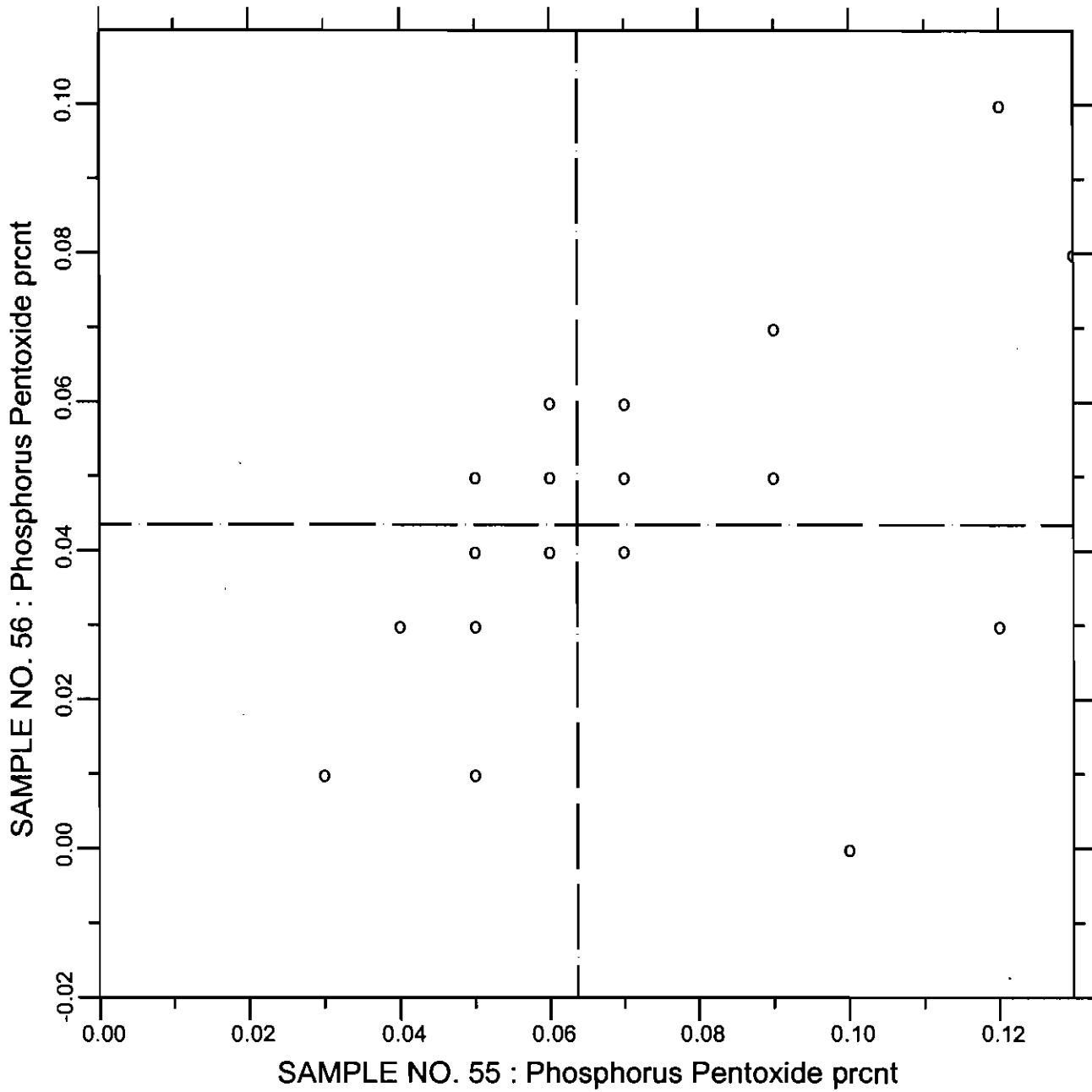
62 POINTS

SAMPLE NO. 55 AVE 1.083 S.D. 0.15 C.V. 13.9

SAMPLE NO. 56 AVE 0.716 S.D. 0.28 C.V. 38.8

LABS ELIMINATED 92 2465

CCRL PROFICIENCY SAMPLE PROGRAM
Phosphorus Pentoxide
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



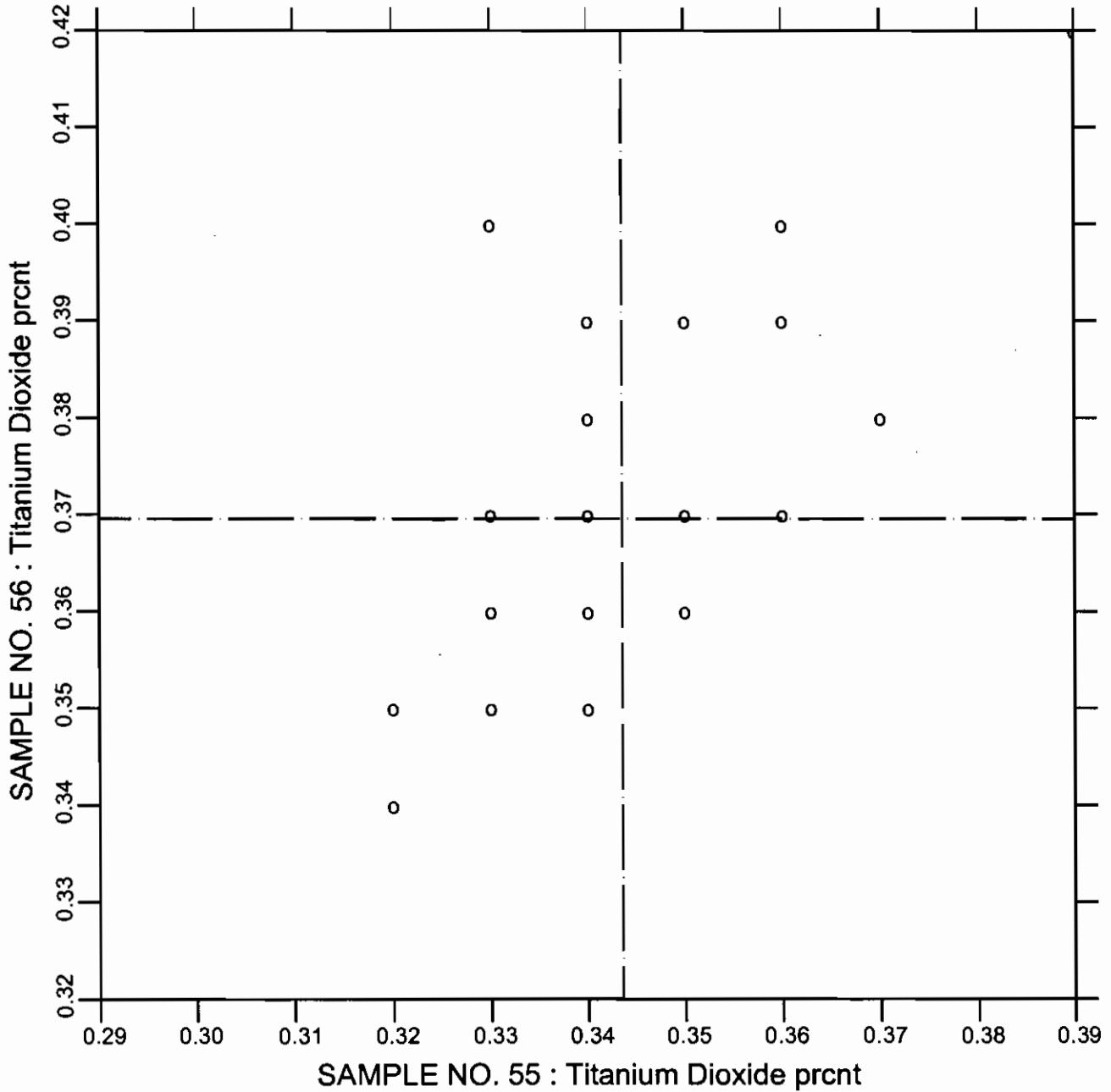
TEST NO.102 Phosphorus Pentoxide 43 POINTS

SAMPLE NO. 55 AVE 0.0637 S.D. 0.020 C.V. 32.3

SAMPLE NO. 56 AVE 0.0435 S.D. 0.017 C.V. 38.5

LABS ELIMINATED 1940

CCRL PROFICIENCY SAMPLE PROGRAM
Titanium Dioxide
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.103

Titanium Dioxide

42 POINTS

SAMPLE NO. 55 AVE 0.3436 S.D. 0.015 C.V. 4.30

SAMPLE NO. 56 AVE 0.3695 S.D. 0.017 C.V. 4.55

LABS ELIMINATED 50 207 975

CCRL PROFICIENCY SAMPLE PROGRAM
 Blended Cement Proficiency Samples No. 55 and No. 56
 Final Report - May 6, 2005
 Physical Results

SUMMARY OF RESULTS

Test		#Labs	Sample No. 55			Sample No. 56		
			Average	S.D.	C.V.	Average	S.D.	C.V.
N.C. Water	prcnt	72	27.3	0.54	1.99	28.4	0.66	2.32
N.C. Water	prcnt	* 69	27.2	0.48	1.78	28.3	0.56	1.97
Vicat TS Initial	min	71	156	18.6	11.9	142	20.7	14.6
Vicat TS Initial	min	* 68	157	15.0	9.57	140	12.2	8.71
Vicat TS Final	min	69	268	40.0	14.9	258	39.3	15.2
Vicat TS Final	min	* 66	267	30.2	11.3	254	34.5	13.6
Autoclave Expan	prcnt	68	-0.011	0.047	-411.6	-0.009	0.030	-344.3
Autoclave Expan	prcnt	* 64	-0.008	0.013	-169.6	-0.008	0.015	-204.4
Air Content	prcnt	59	8.4	1.11	13.2	8.3	0.91	11.0
AC Mix Water	prcnt	59	69.2	2.4	3.47	68.3	2.5	3.62
AC Mix Water	prcnt	* 57	68.9	1.9	2.71	68.1	2.2	3.20
AC Flow	prcnt	59	89	3.8	4.24	90	4.0	4.45
AC Flow	prcnt	* 58	88	2.8	3.16	90	3.2	3.55
Specific Gravity		54	3.07	0.055	1.78	3.01	0.049	1.62
Specific Gravity		* 52	3.06	0.042	1.37	3.00	0.038	1.26

CONTINUED ON NEXT PAGE

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

N.C. Water	24 25 205
Vicat TS Intial	36 207 497
Vicat TS Final	207 497 1251
Autoclave Expansion	2 25 181 309
Air Content Mix Water	918 2462
Air Content Flow	30
Specific Gravity	24 51

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 55 and No. 56
Final Report - May 6, 2005
Physical Results

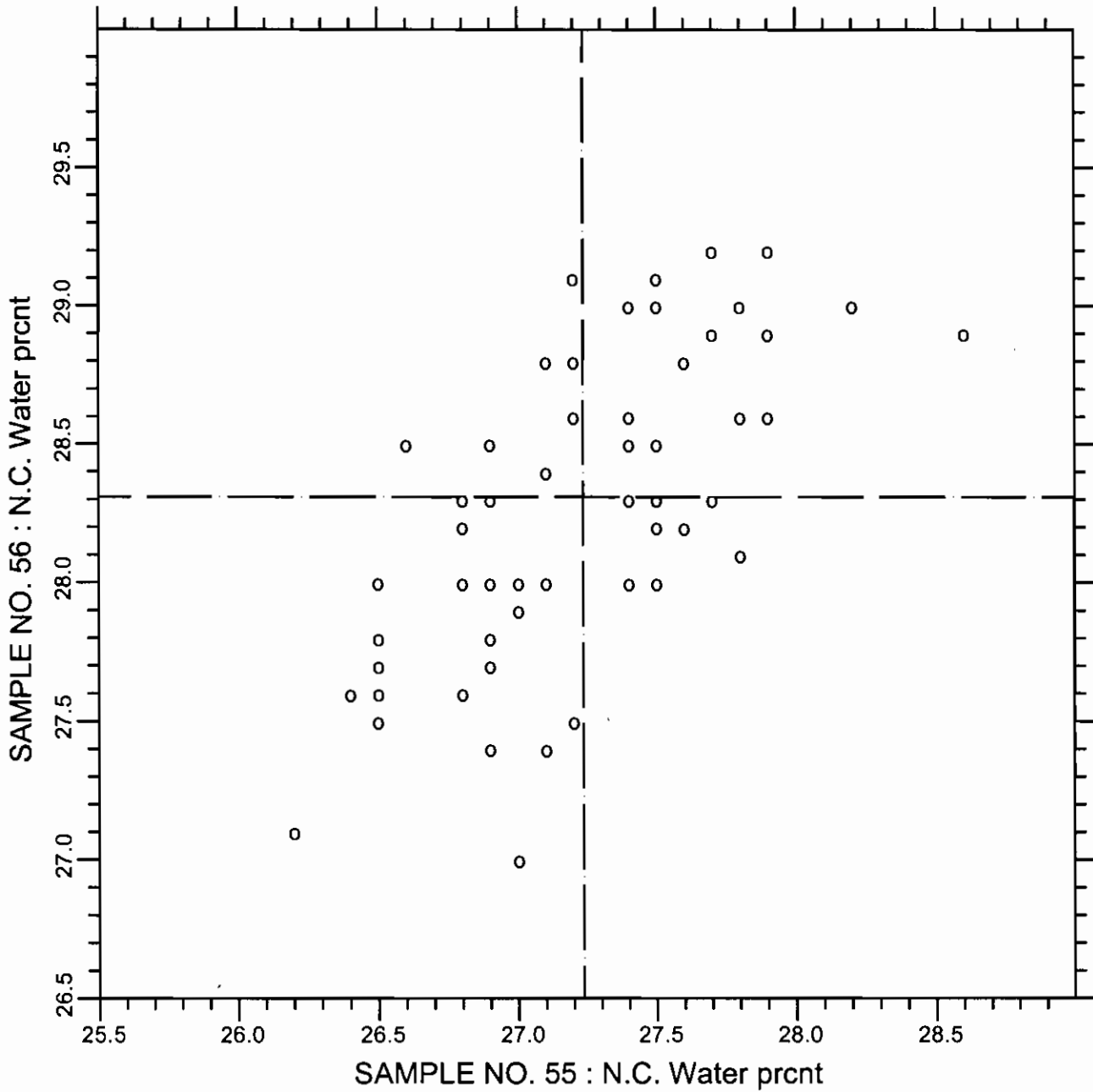
SUMMARY OF RESULTS

Test	#Labs	Sample No. 55				Sample No. 56		
		Average	S.D.	C.V.	Average	S.D.	C.V.	
Comp Str, 3 day	psi	74	3038	276.3	9.10	2157	243.0	11.27
Comp Str, 3 day	psi *	69	3070	206.4	6.72	2152	159.4	7.41
Comp Str, 7 day	psi	73	4354	357.6	8.21	3221	285.3	8.86
Comp Str, 7 day	psi *	70	4370	299.1	6.85	3213	241.2	7.51
Comp Str, 28 day	psi	66	6040	551.1	9.12	6207	617.6	9.95
Comp Str, 28 day	psi *	65	6075	479.1	7.89	6248	524.8	8.40
CS Mix Water	prcnt	74	48.1	4.0	8.36	47.5	3.9	8.17
CS Mix Water	prcnt *	72	48.7	1.3	2.71	48.1	1.4	2.84
Comp Str Flow	prcnt	74	110	4.2	3.79	111	3.7	3.33
Comp Str Flow	prcnt *	68	110	2.9	2.62	111	2.5	2.27
Fineness AP	cm ² /g	67	4286	467.1	10.9	4287	498.1	11.6
Fineness AP	cm ² /g *	63	4252	243.3	5.72	4251	293.9	6.91
45µm Sieve	prcnt	67	95.44	0.89	0.935	97.85	0.47	0.484
45µm Sieve	prcnt *	64	95.39	0.60	0.624	97.87	0.27	0.274

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

Comp Strength, 3 day 2 50 51 20 1940
 Comp Strength, 7 day 2 9 2465
 Comp Strength, 28 day 36
 Comp Strength, Water 10 207
 Comp Strength, Flow 416 35 1196 22 31 33
 Fineness, Air Permeability 36 25 51 70
 45-micron Sieve 51 176 207

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



TEST NO.110

N.C. Water

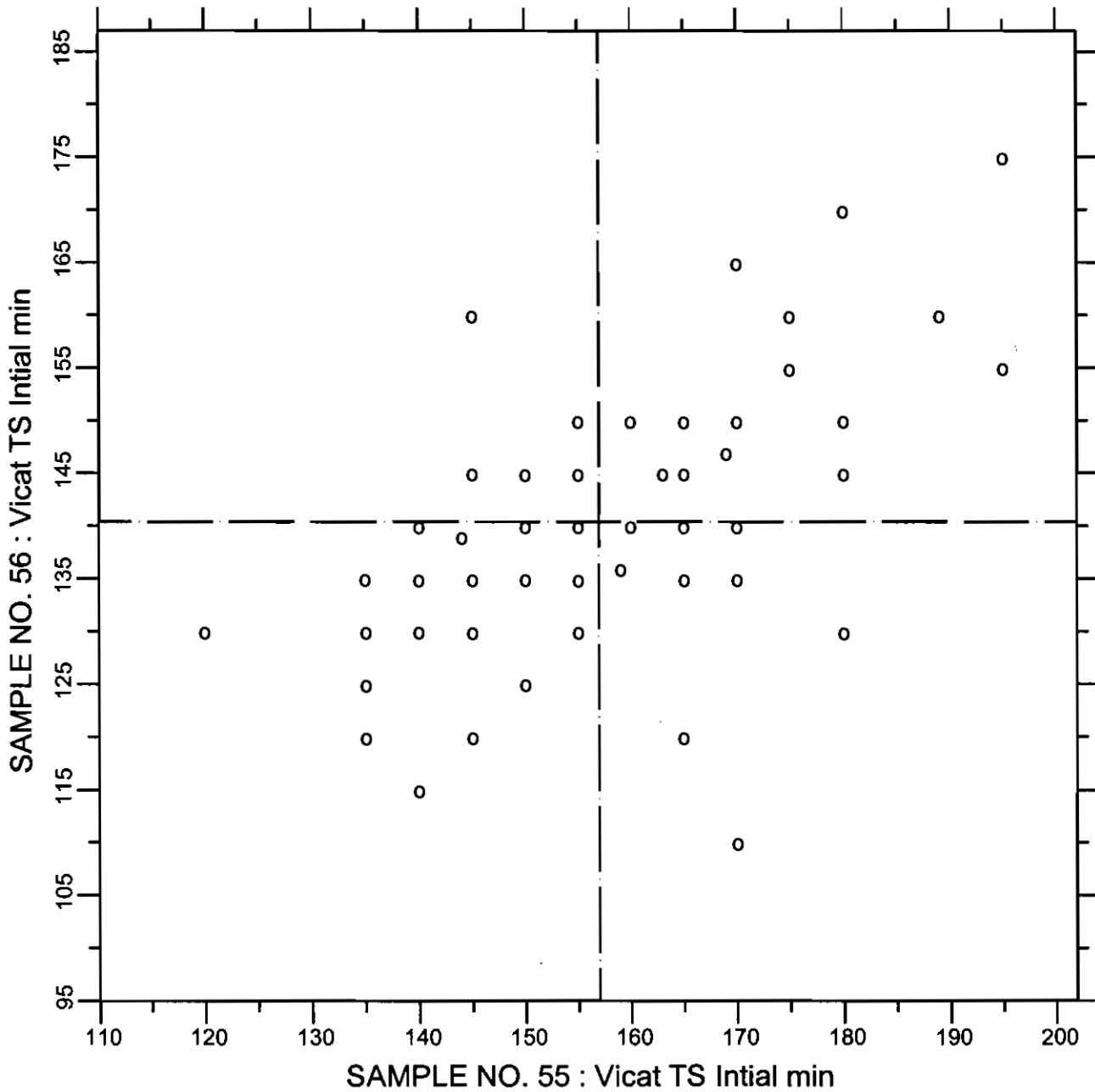
69 POINTS

SAMPLE NO. 55 AVE 27.236 S.D. 0.48 C.V. 1.78

SAMPLE NO. 56 AVE 28.309 S.D. 0.56 C.V. 1.97

LABS ELIMINATED 24 25 205

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



TEST NO.120

Vicat TS Intial

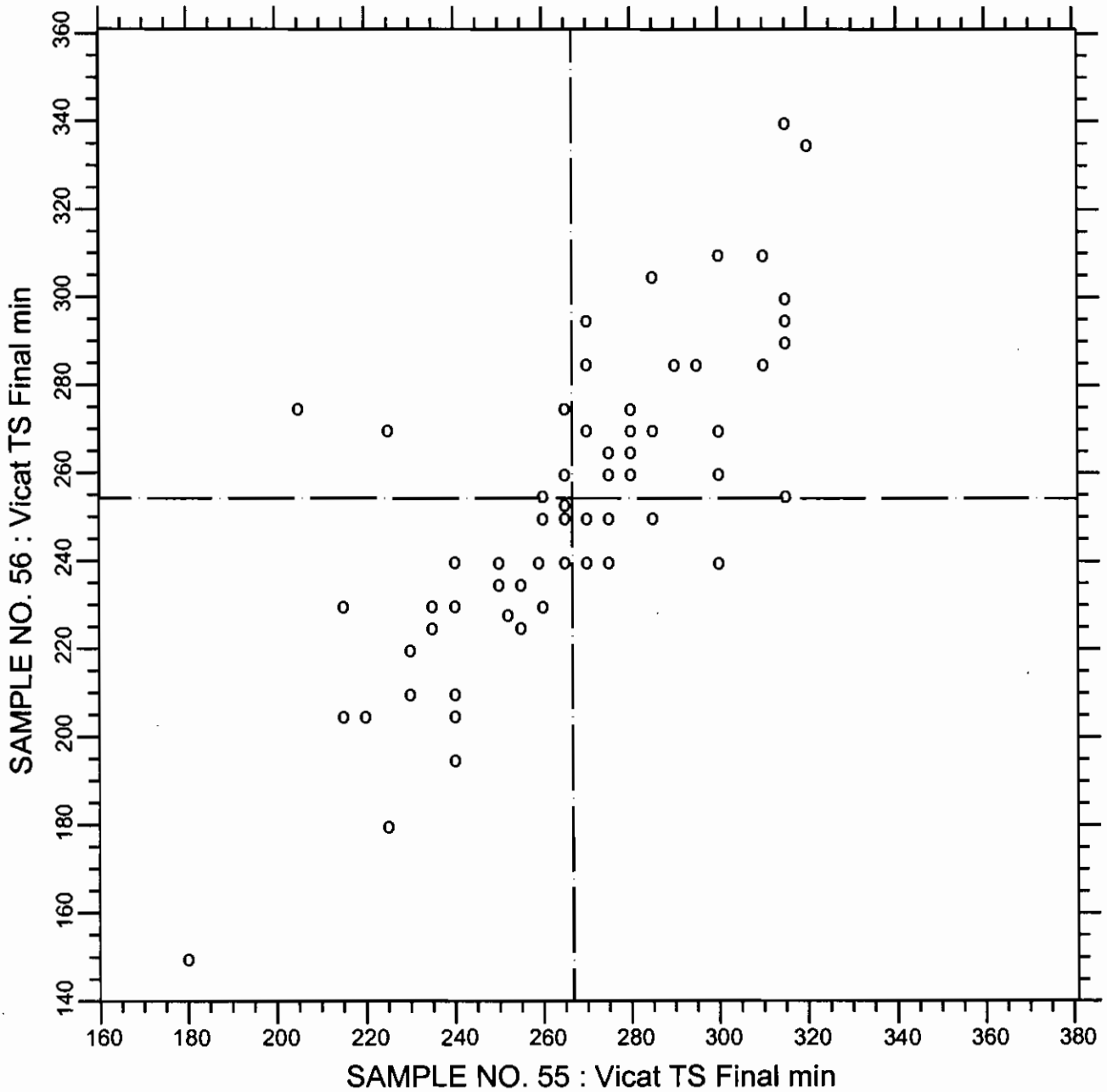
68 POINTS

SAMPLE NO. 55 AVE 157.0 S.D. 15.0 C.V. 9.57

SAMPLE NO. 56 AVE 140.4 S.D. 12.2 C.V. 8.71

LABS ELIMINATED 36 207 497

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



TEST NO.121

Vicat TS Final

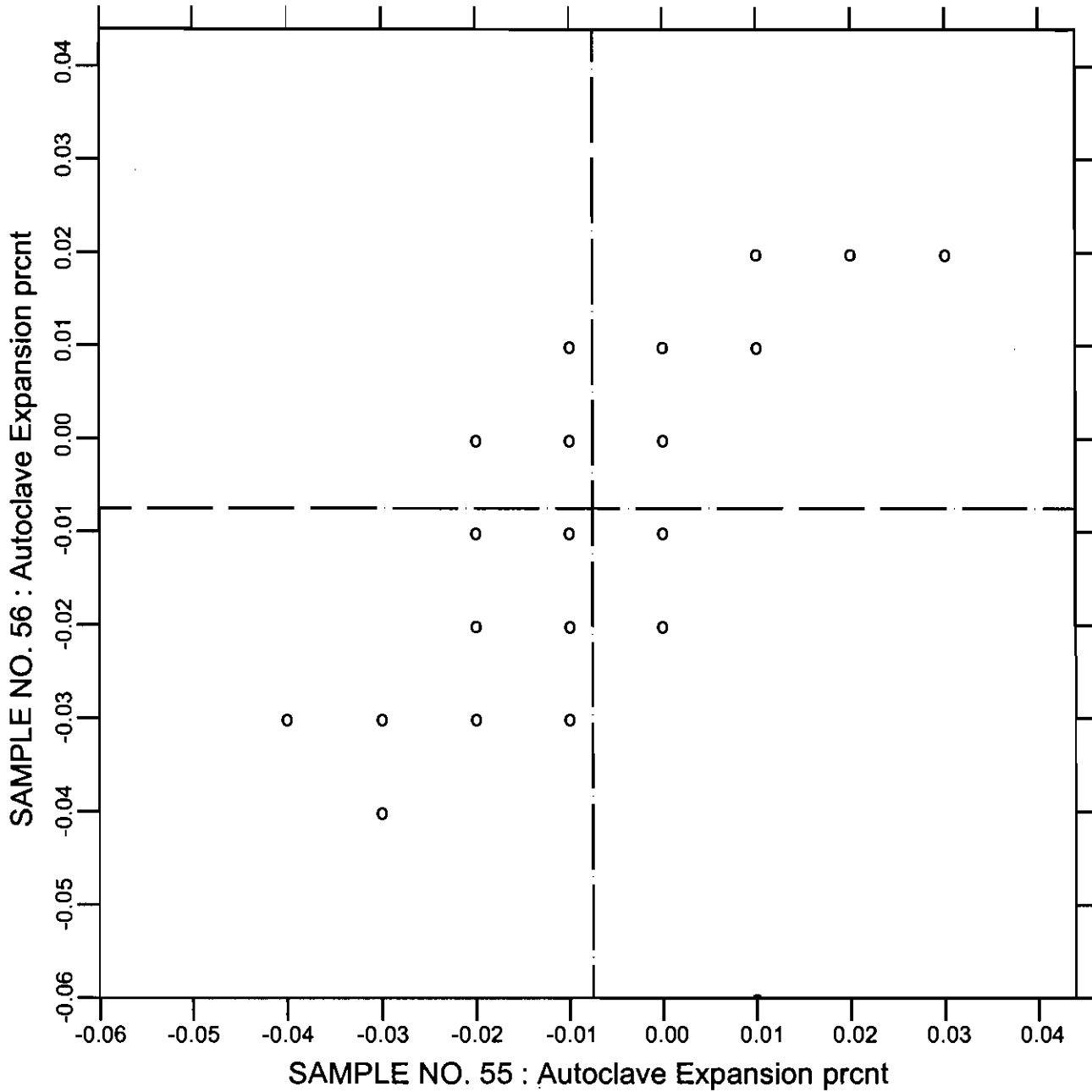
66 POINTS

SAMPLE NO. 55 AVE 266.8 S.D. 30.2 C.V. 11.3

SAMPLE NO. 56 AVE 254.2 S.D. 34.5 C.V. 13.6

LABS ELIMINATED 207 497 1251

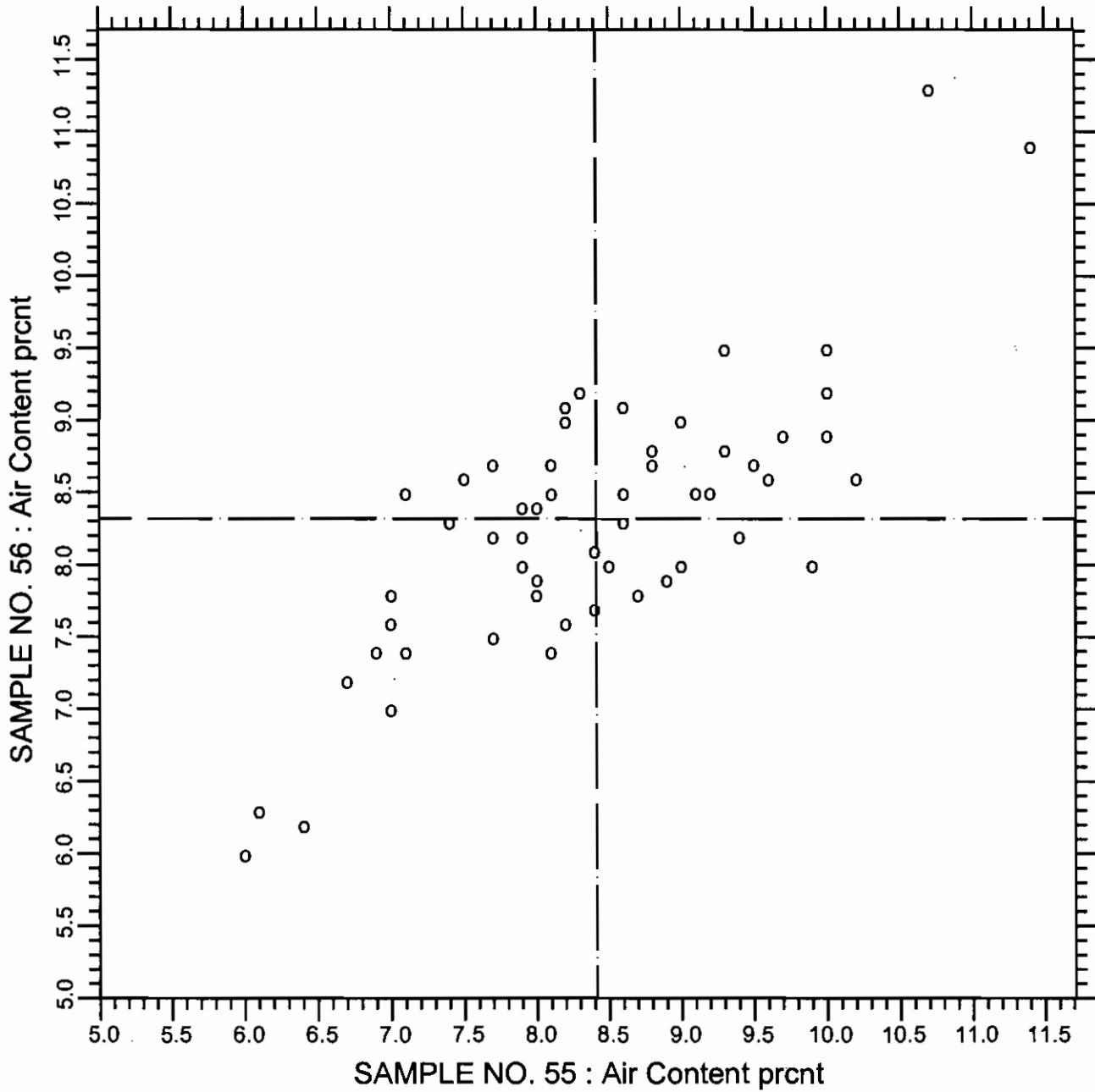
CCRL PROFICIENCY SAMPLE PROGRAM
Autoclave Expansion
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.160 Autoclave Expansion 64 POINTS

SAMPLE NO. 55 AVE -0.0075 S.D. 0.013 C.V. -169.656
 SAMPLE NO. 56 AVE -0.0075 S.D. 0.015 C.V. -204.362
 LABS ELIMINATED 2 25 181 309

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



TEST NO.170

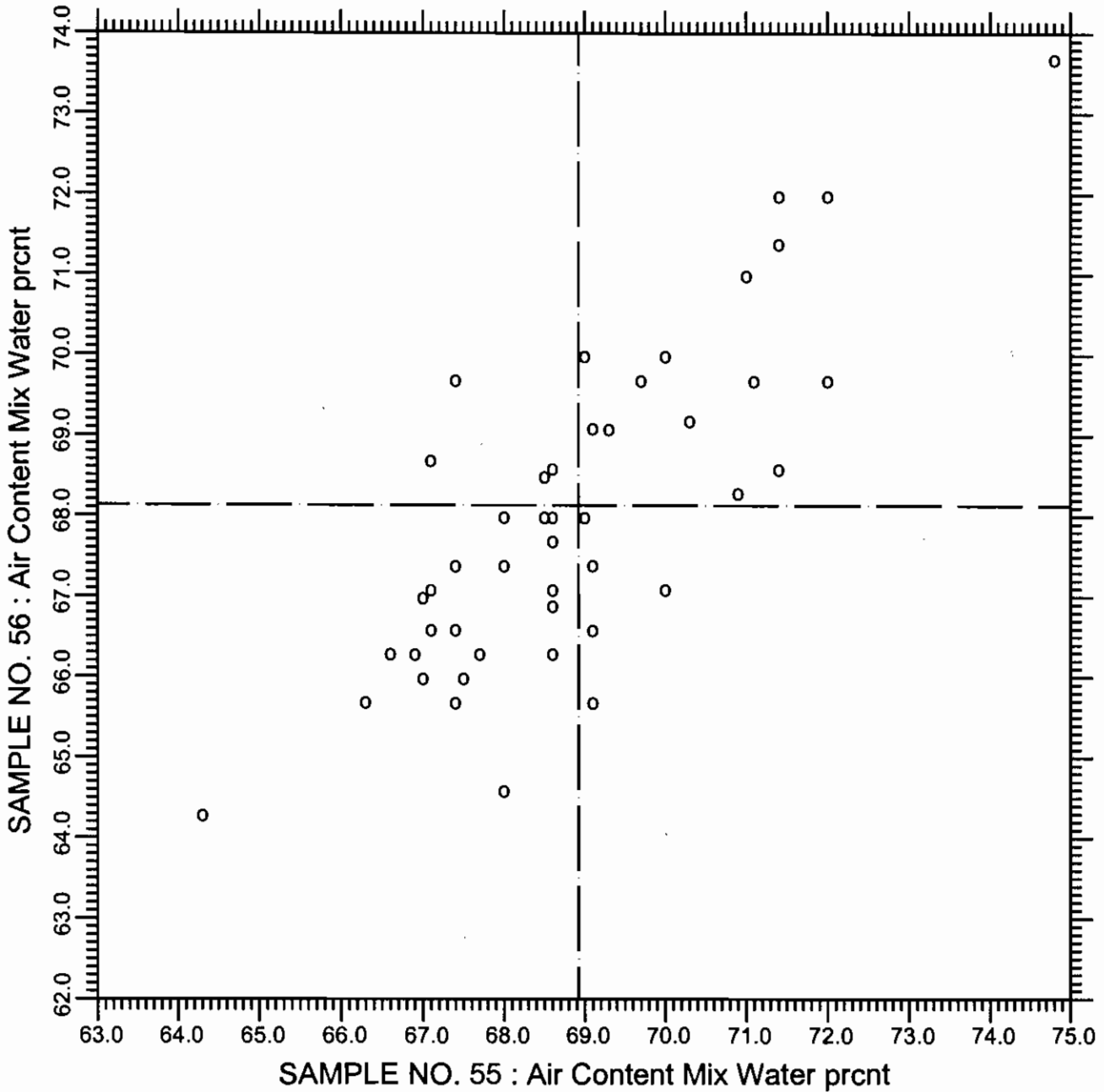
Air Content

59 POINTS

SAMPLE NO. 55 AVE 8.41 S.D. 1.11 C.V. 13.2

SAMPLE NO. 56 AVE 8.32 S.D. 0.91 C.V. 11.0

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



TEST NO.180

Air Content Mix Water

56 POINTS

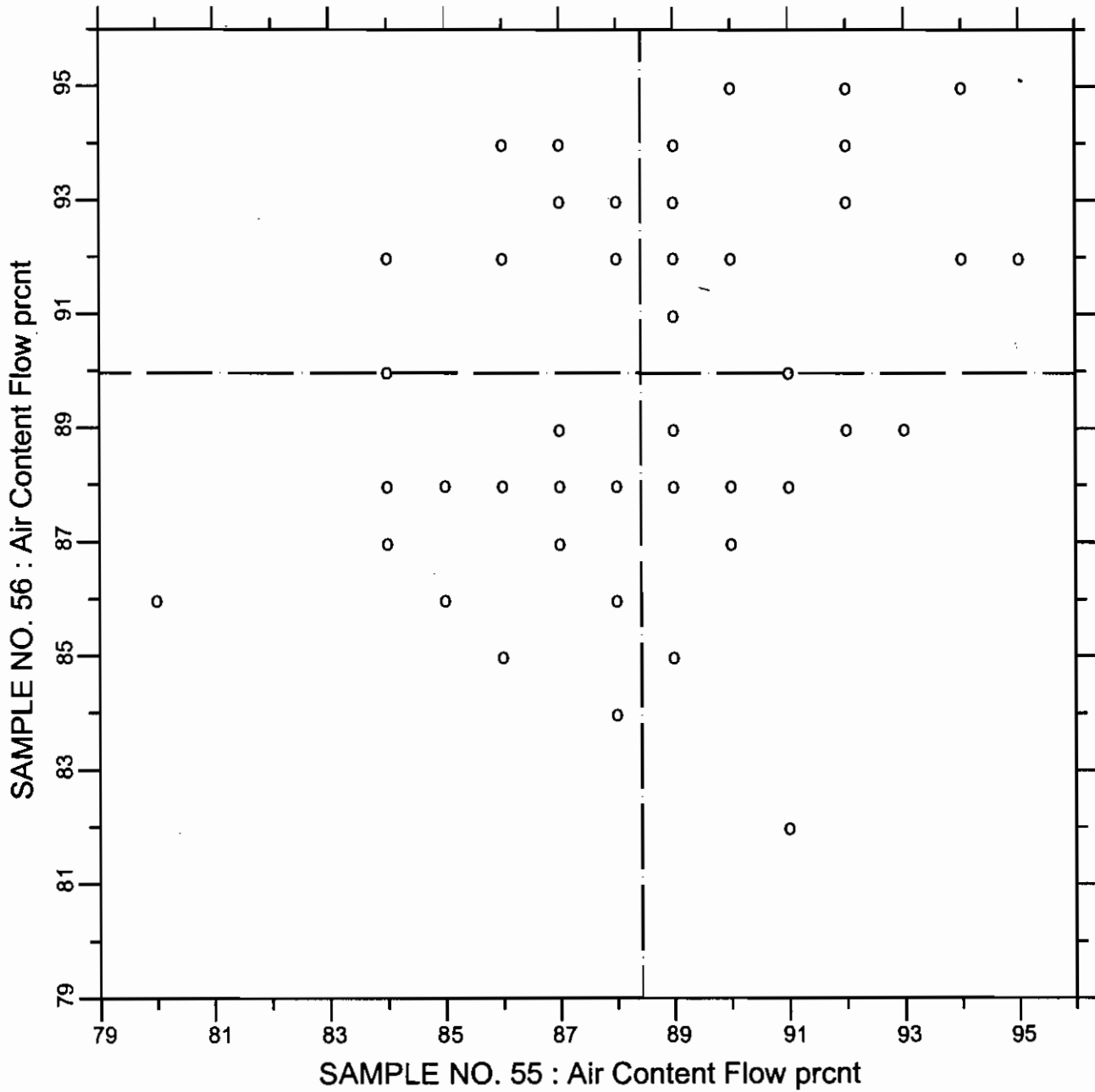
SAMPLE NO. 55 AVE 68.93 S.D. 1.9 C.V. 2.71

SAMPLE NO. 56 AVE 68.13 S.D. 2.2 C.V. 3.20

LABS ELIMINATED 918 2462

LABS OFF DIAGRAM 51

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



TEST NO.190

Air Content Flow

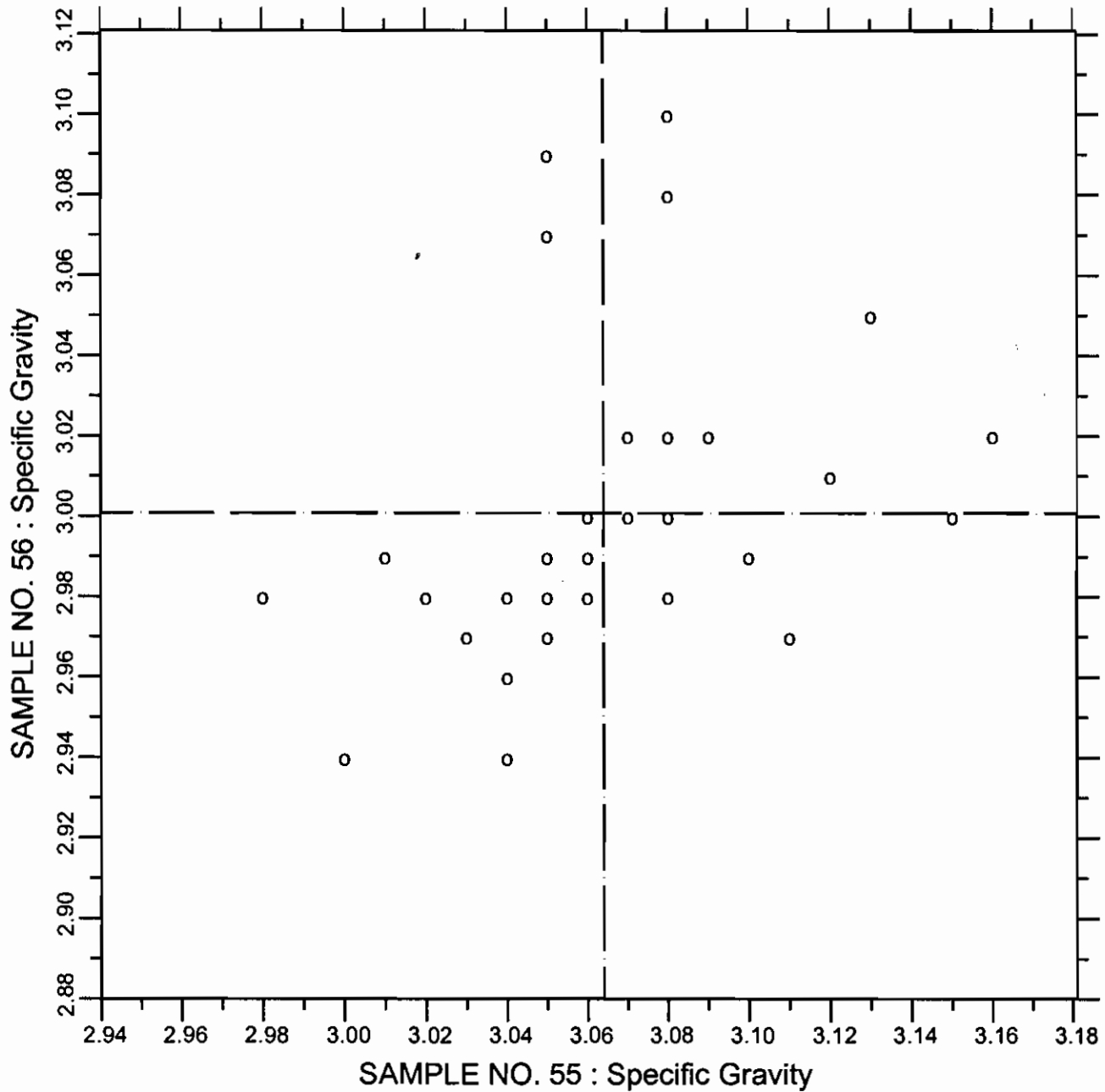
58 POINTS

SAMPLE NO. 55 AVE 88.43 S.D. 2.8 C.V. 3.16

SAMPLE NO. 56 AVE 89.96 S.D. 3.2 C.V. 3.55

LABS ELIMINATED 30

CCRL PROFICIENCY SAMPLE PROGRAM
Specific Gravity
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.310

Specific Gravity

50 POINTS

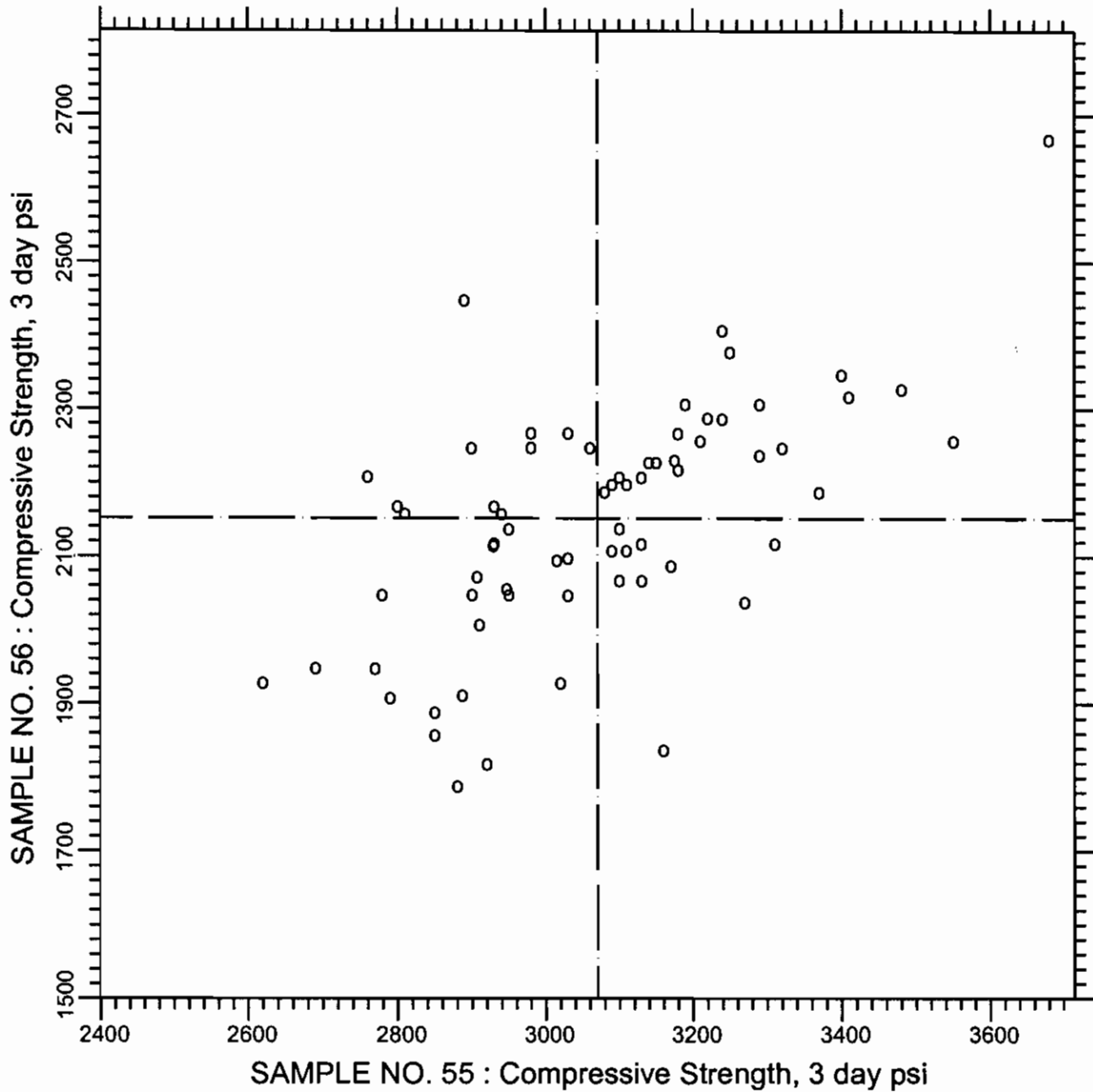
SAMPLE NO. 55 AVE 3.0640 S.D. 0.042 C.V. 1.37

SAMPLE NO. 56 AVE 3.0008 S.D. 0.038 C.V. 1.26

LABS ELIMINATED 24 51

LABS OFF DIAGRAM 43 450

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 3 day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



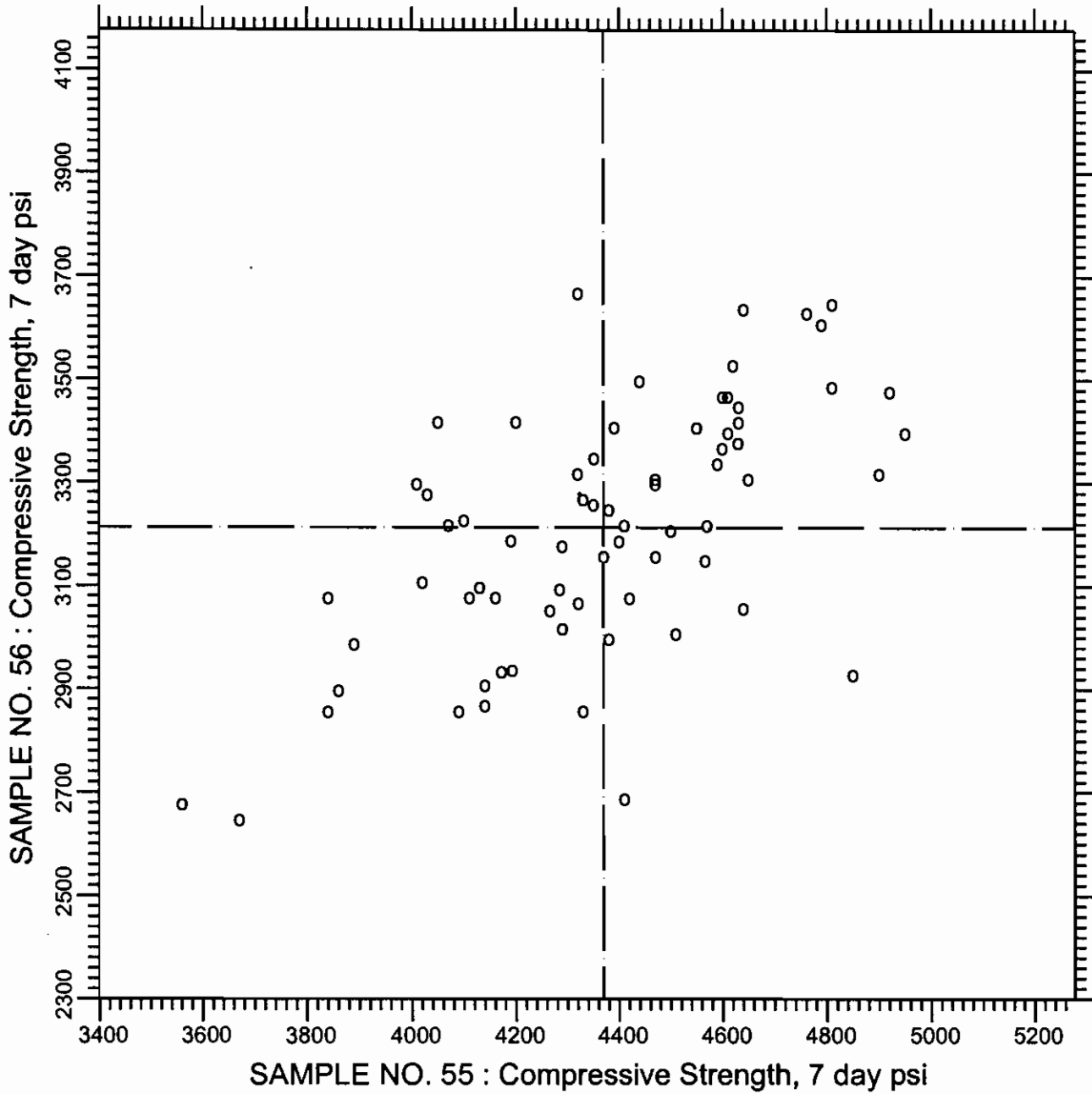
TEST NO.200 Compressive Strength, 3 day 69 POINTS

SAMPLE NO. 55 AVE 3070.4 S.D. 206.4 C.V. 6.72

SAMPLE NO. 56 AVE 2151.5 S.D. 159.4 C.V. 7.41

LABS ELIMINATED 2 50 51 20 1940

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



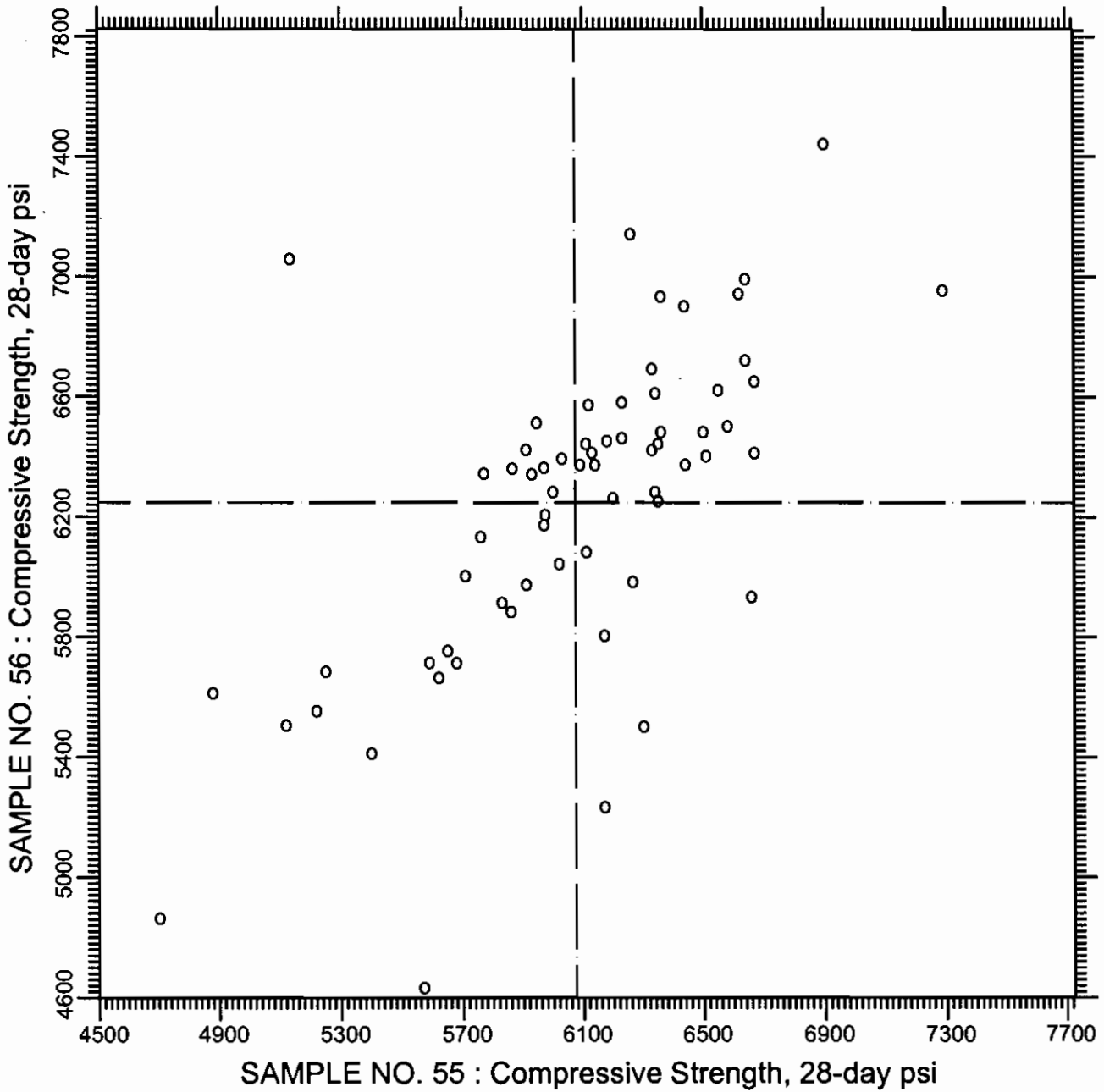
TEST NO.210 Compressive Strength, 7 day 70 POINTS

SAMPLE NO. 55 AVE 4369.5 S.D. 299.1 C.V. 6.85

SAMPLE NO. 56 AVE 3212.6 S.D. 241.2 C.V. 7.51

LABS ELIMINATED 2 9 2465

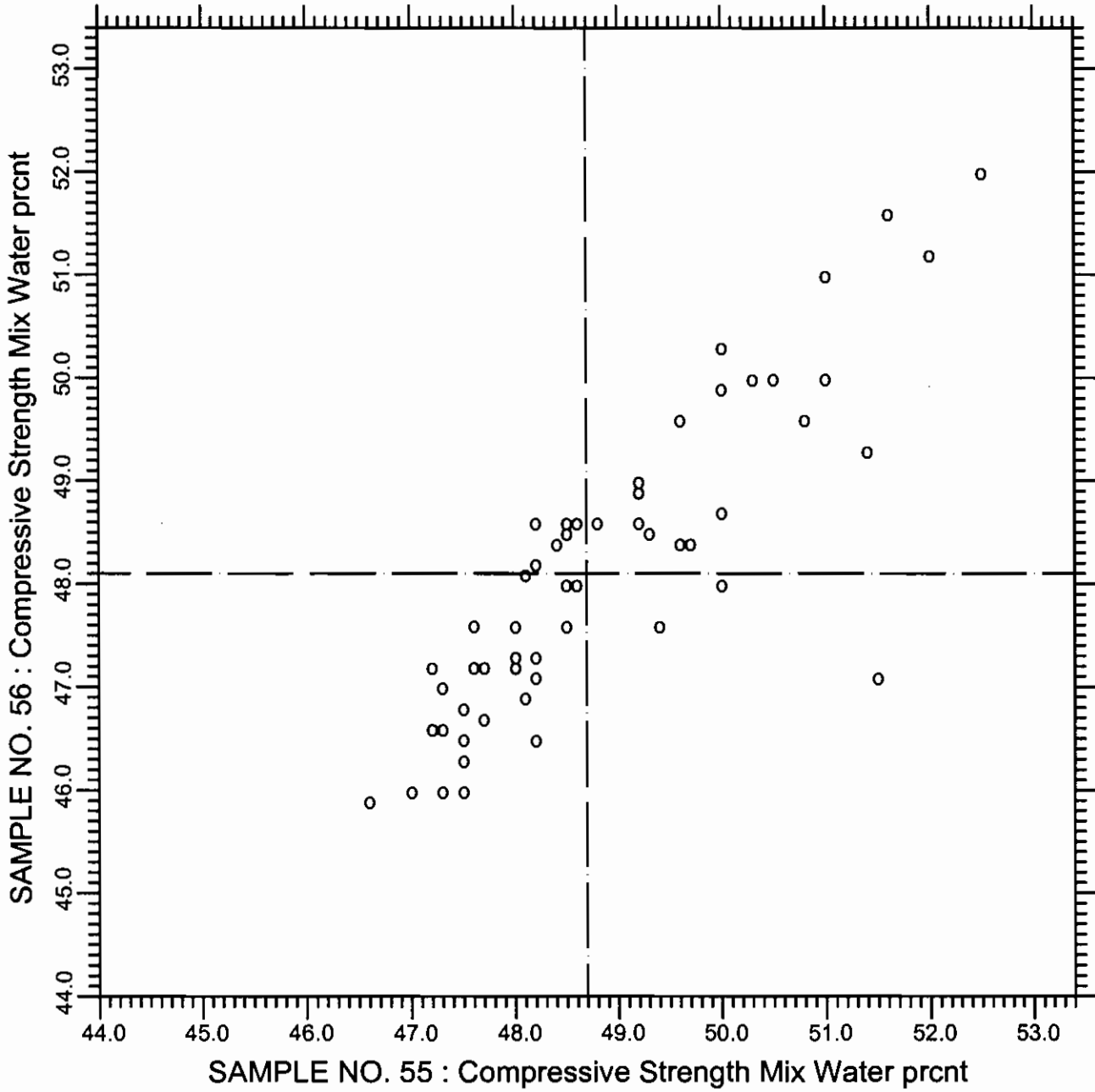
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28 day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.211 Compressive Strength, 28-day 65 POINTS

SAMPLE NO. 55	AVE	6074.6	S.D.	479.1	C.V.	7.89
SAMPLE NO. 56	AVE	6248.0	S.D.	524.8	C.V.	8.40
LABS ELIMINATED 36						

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - % Water
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



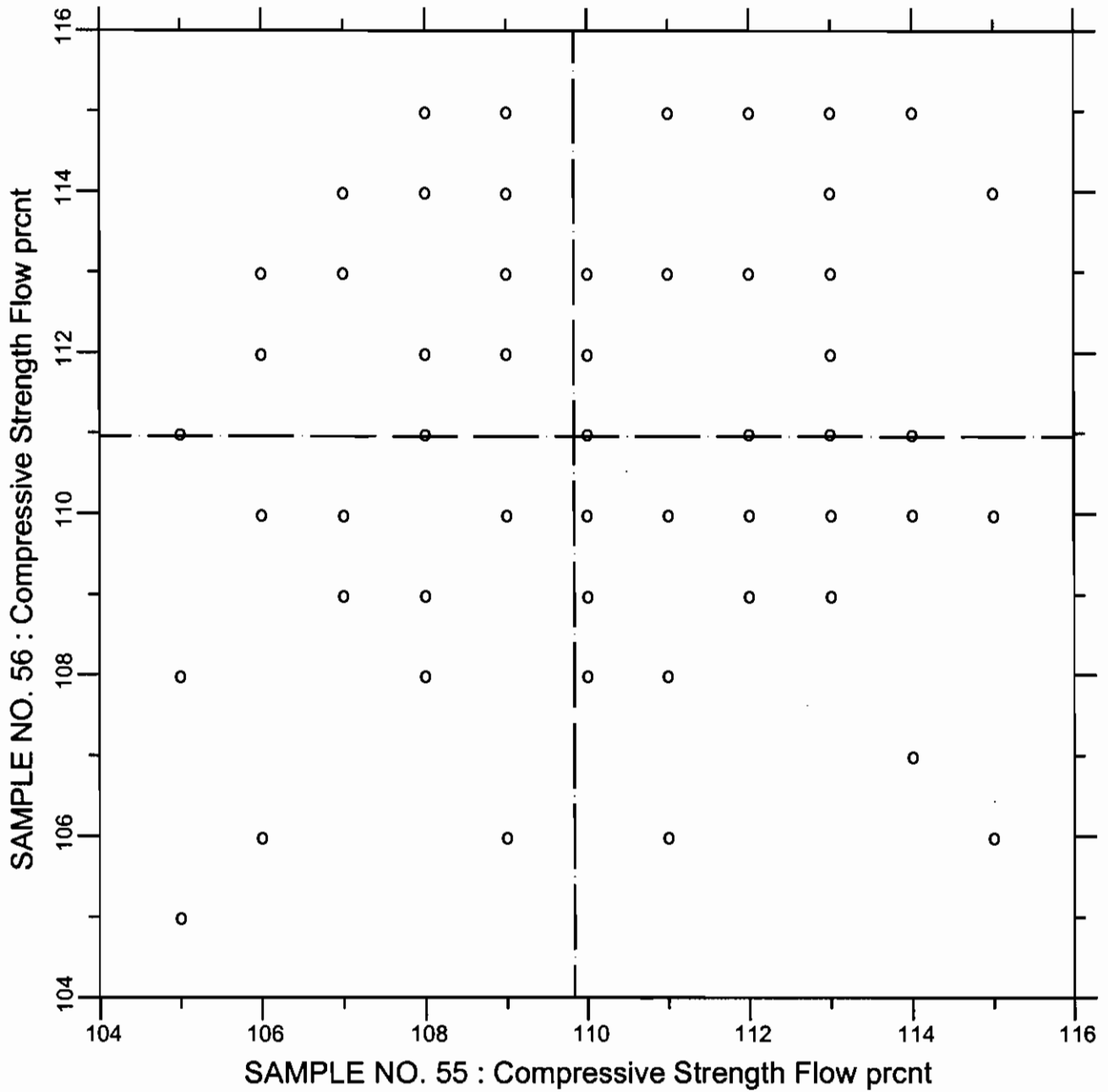
TEST NO.220 Compressive Strength Mix Water 72 POINTS

SAMPLE NO. 55 AVE 48.69 S.D. 1.3 C.V. 2.71

SAMPLE NO. 56 AVE 48.10 S.D. 1.4 C.V. 2.84

LABS ELIMINATED 10 207

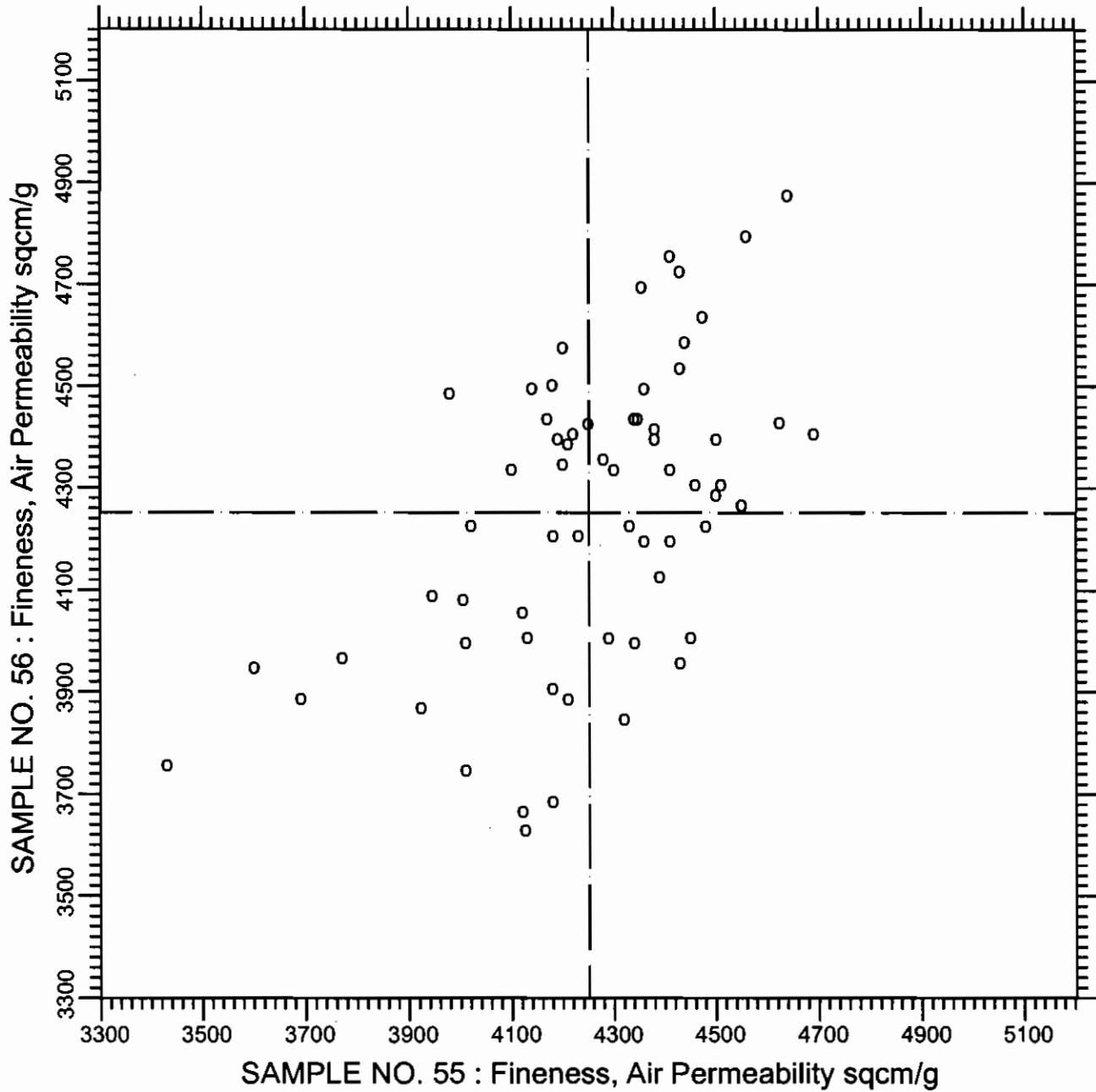
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - Flow
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.230 Compressive Strength Flow 68 POINTS

SAMPLE NO. 55 AVE 109.84 S.D. 2.9 C.V. 2.62
 SAMPLE NO. 56 AVE 110.96 S.D. 2.5 C.V. 2.27
 LABS ELIMINATED 416 35 1196 22 31 33

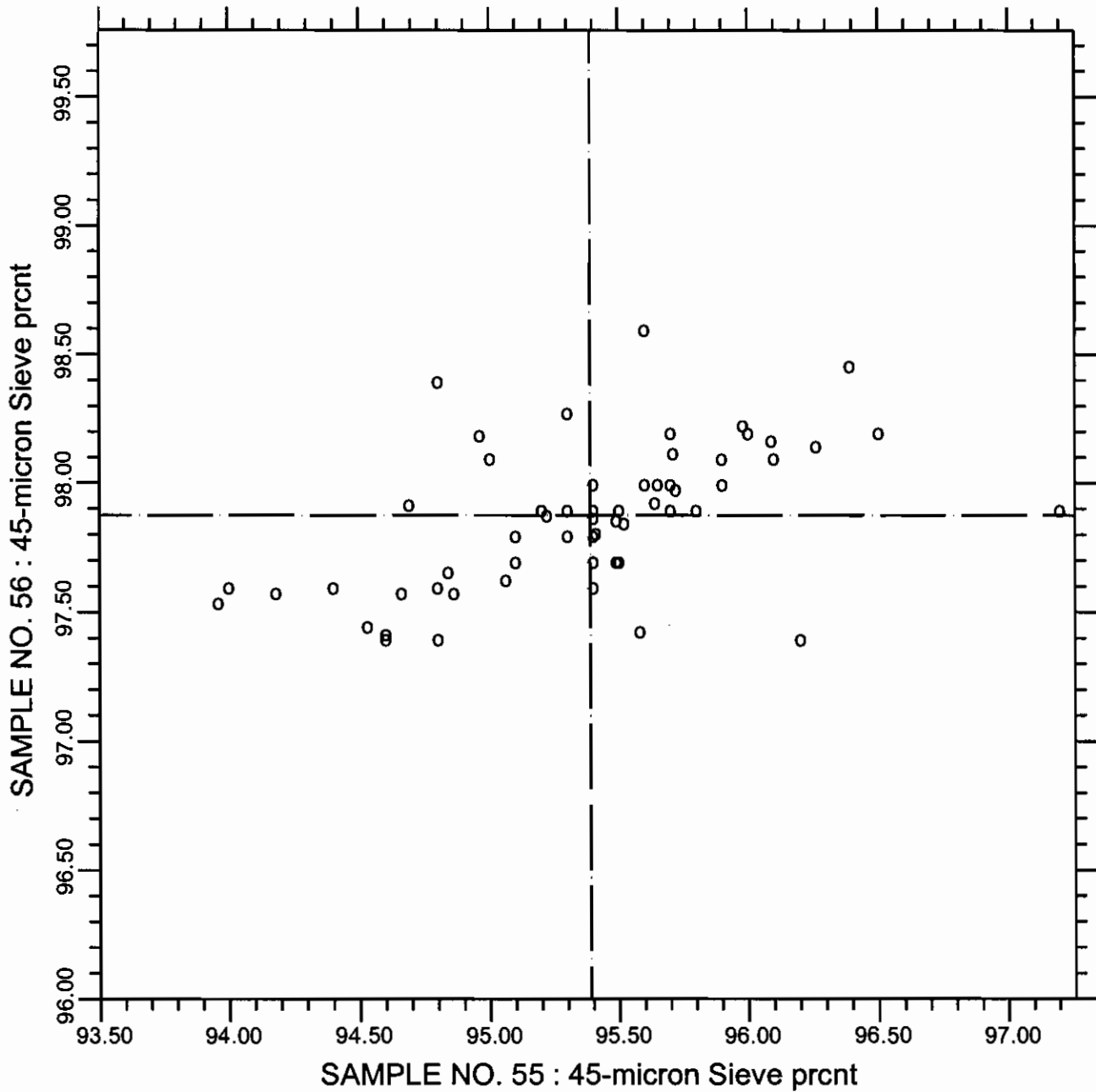
CCRL PROFICIENCY SAMPLE PROGRAM
Fineness - Air Permeability
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.270 Fineness, Air Permeability 63 POINTS

SAMPLE NO. 55	AVE	4252.2	S.D.	243.3	C.V.	5.72
SAMPLE NO. 56	AVE	4251.4	S.D.	293.9	C.V.	6.91
LABS ELIMINATED 36 25 51 70						

CCRL PROFICIENCY SAMPLE PROGRAM
 45-micron Sieve - % Passing
 BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.281

45-micron Sieve

64 POINTS

SAMPLE NO. 55 AVE 95.390 S.D. 0.60 C.V. 0.624

SAMPLE NO. 56 AVE 97.874 S.D. 0.27 C.V. 0.274

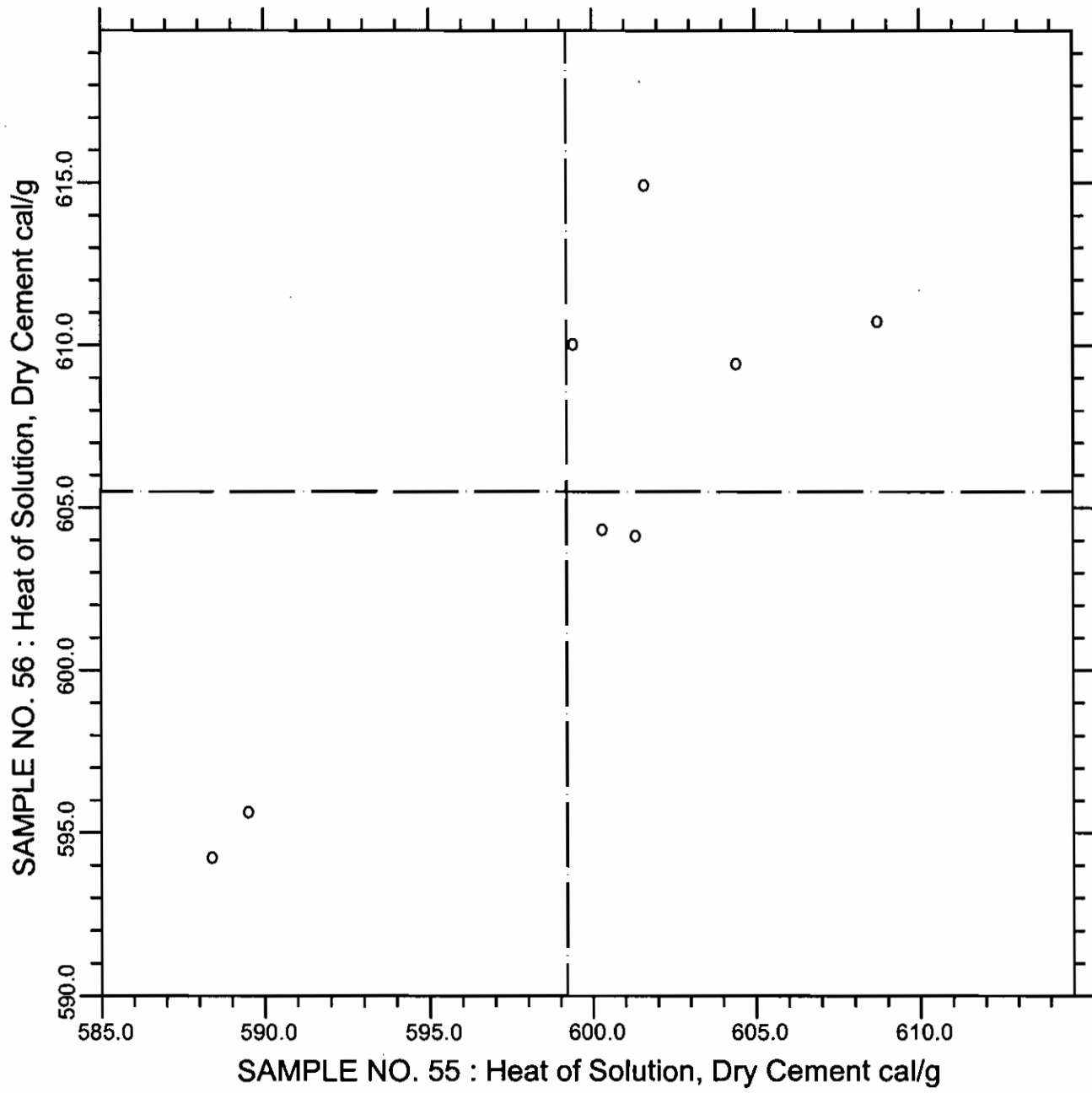
LABS ELIMINATED 51 176 207

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 55 and No. 56
Final Report - May 13, 2005
Heat of Hydration Results

SUMMARY OF RESULTS

Test	#Labs	Sample No. 55			Sample No. 56		
		Average	S.D.	C.V.	Average	S.D.	C.V.
Heat Solution Dry cal/g	8	599.2	7.0	1.16	605.5	7.4	1.22
Heat Sol, 7 day cal/g	8	516.0	6.4	1.23	539.3	11.5	2.13
Heat Sol, 28 day cal/g	6	507.2	5.6	1.10	523.4	5.4	1.04
Heat Hyd, 7 day cal/g	7	84.5	5.7	6.70	67.0	6.5	9.74
Heat Hyd, 28 day cal/g	6	94.7	3.1	3.25	84.8	2.7	3.16

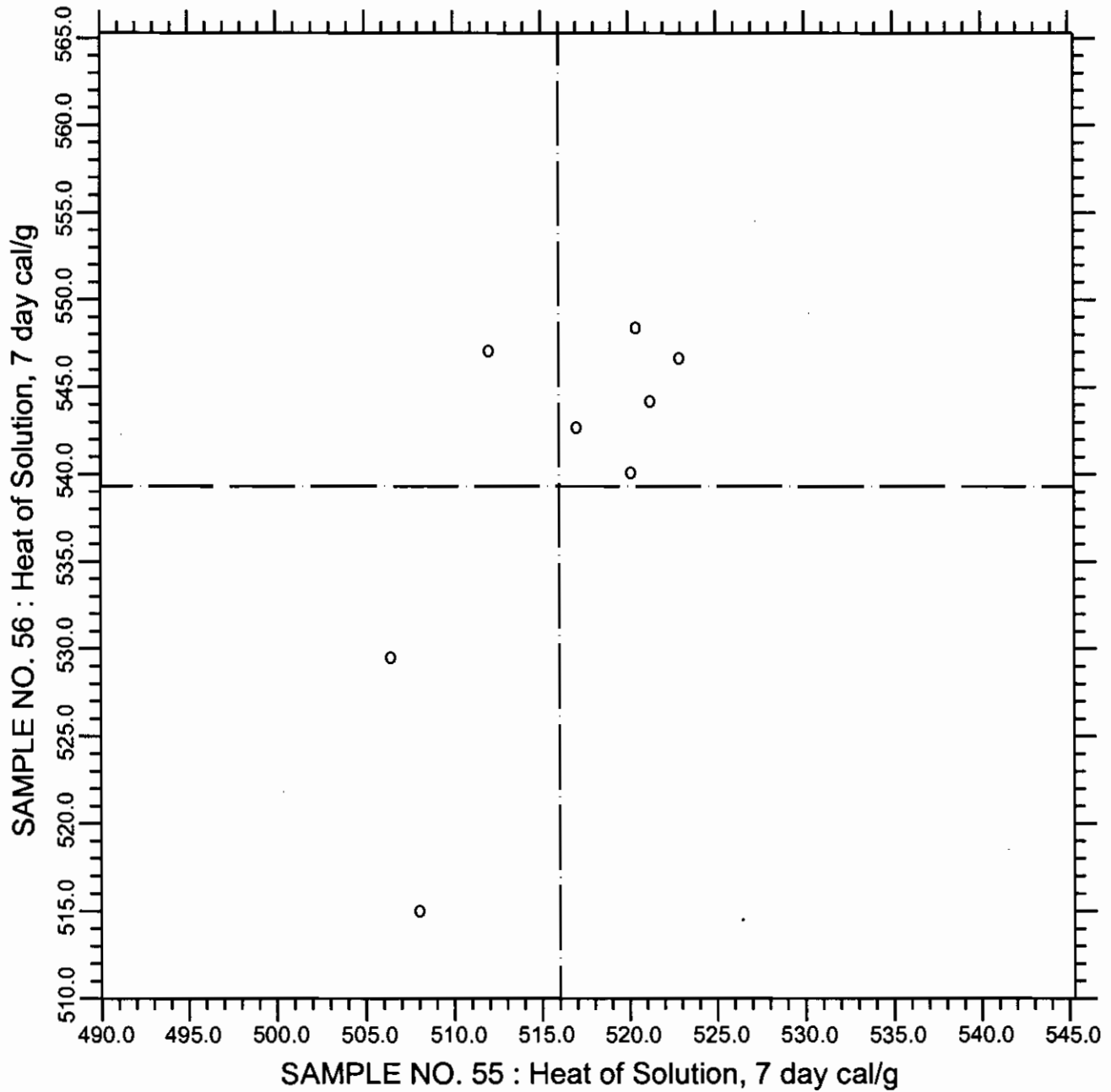
CCRL PROFICIENCY SAMPLE PROGRAM
Heat of Solution - Dry Cement
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.291 Heat of Solution, Dry Cement 8 POINTS

SAMPLE NO. 55	AVE	599.2	S.D.	7.0	C.V.	1.16
SAMPLE NO. 56	AVE	605.5	S.D.	7.4	C.V.	1.22

CCRL PROFICIENCY SAMPLE PROGRAM
Heat of Solution - 7-day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.292

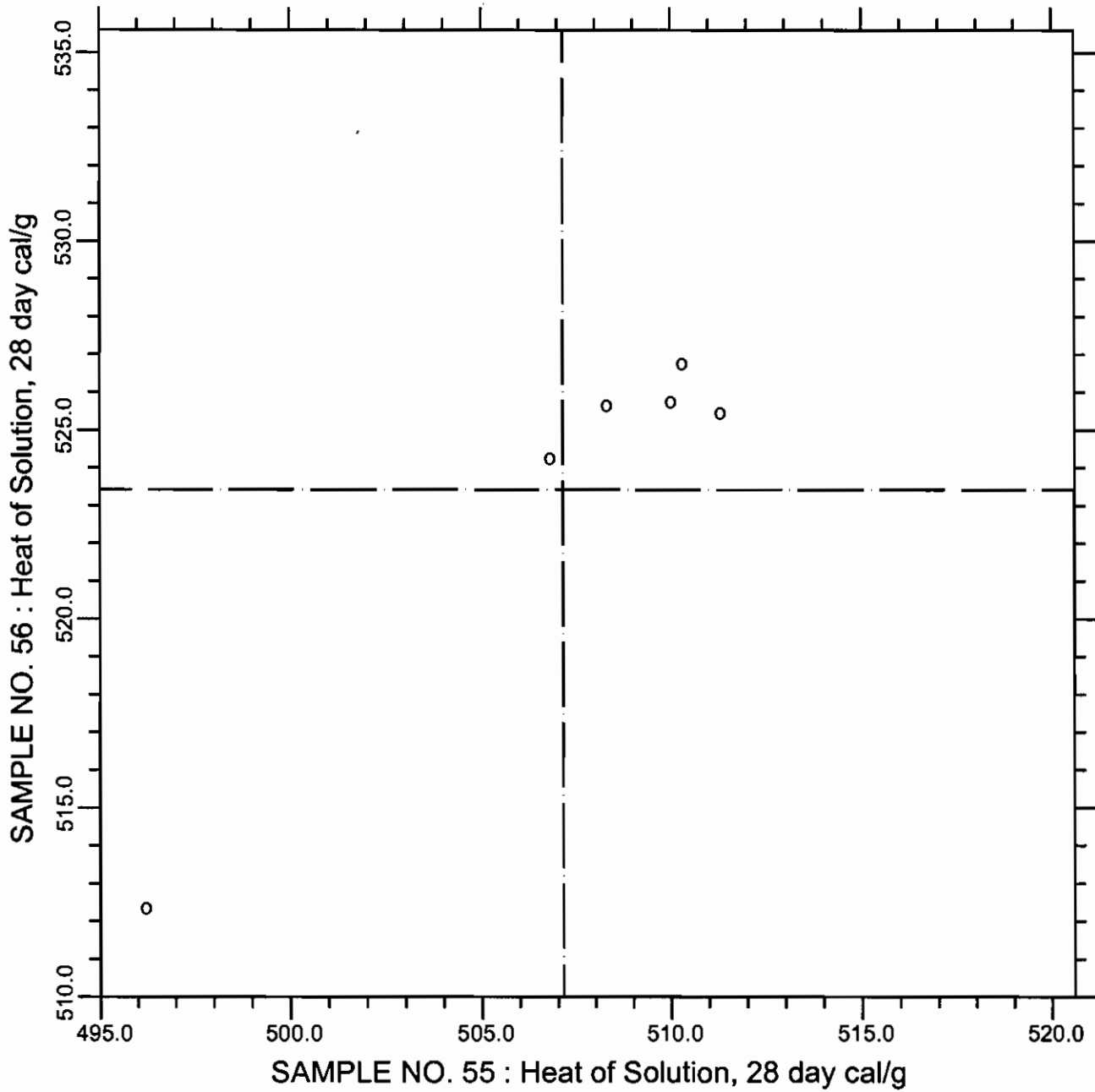
Heat of Solution, 7 day

8 POINTS

SAMPLE NO. 55 AVE 516.0 S.D. 6.4 C.V. 1.23

SAMPLE NO. 56 AVE 539.3 S.D. 11.5 C.V. 2.13

CCRL PROFICIENCY SAMPLE PROGRAM
Heat of Solution - 28-day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.301

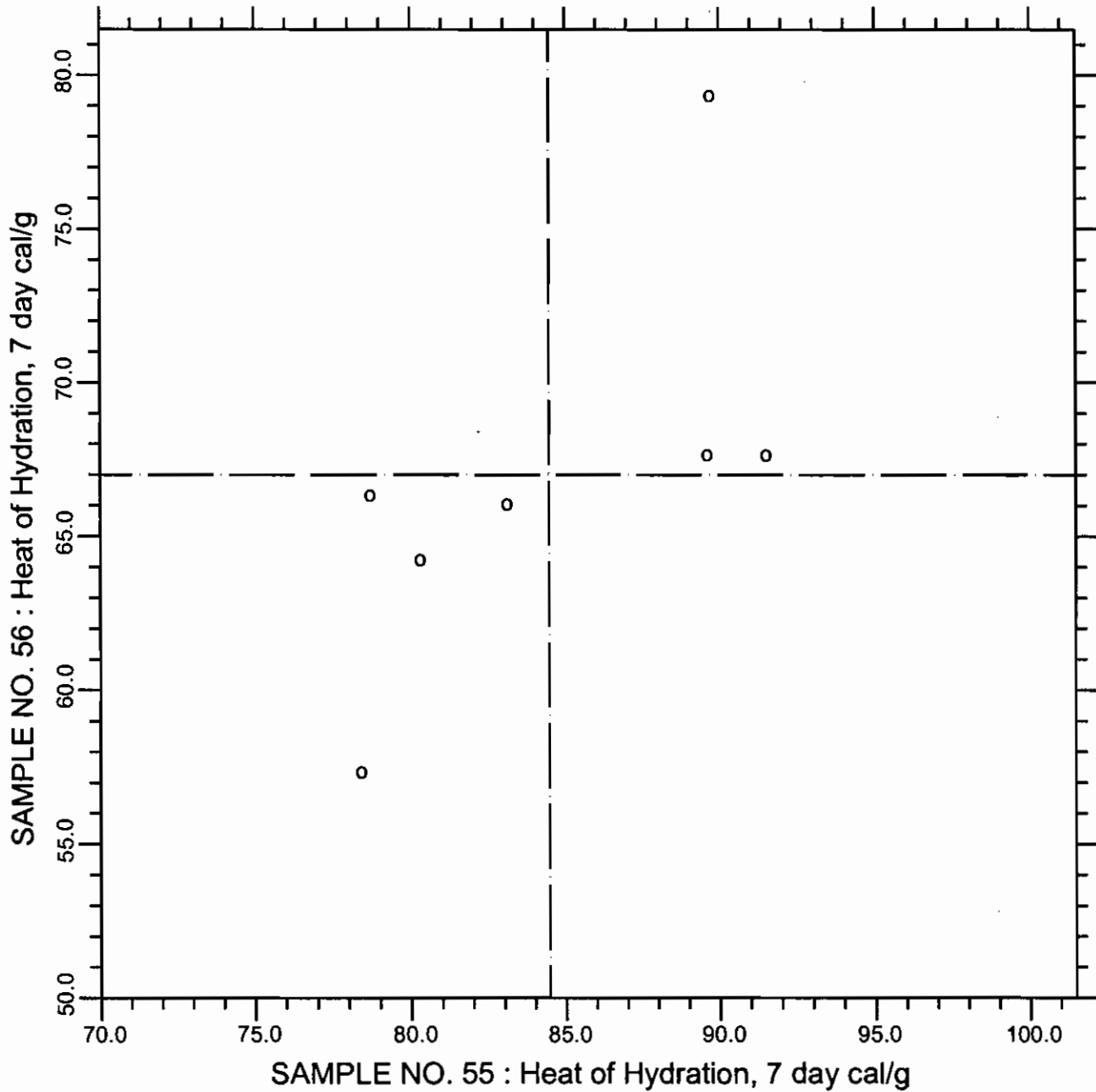
Heat of Solution, 28 day

6 POINTS

SAMPLE NO. 55 AVE 507.2 S.D. 5.6 C.V. 1.10

SAMPLE NO. 56 AVE 523.4 S.D. 5.4 C.V. 1.04

CCRL PROFICIENCY SAMPLE PROGRAM
Heat of Hydration - 7-day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.290

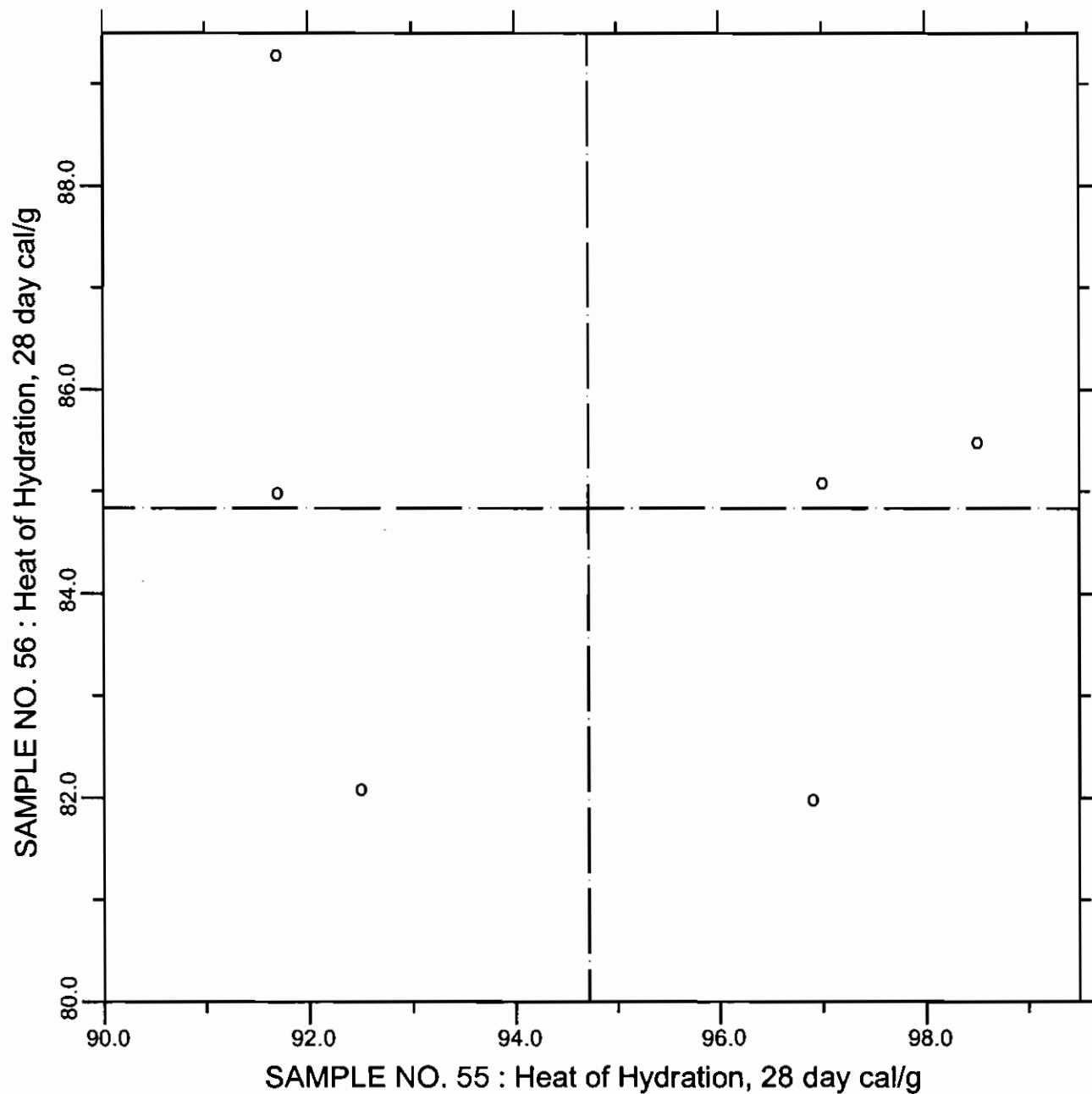
Heat of Hydration, 7 day

7 POINTS

SAMPLE NO. 55 AVE 84.5 S.D. 5.7 C.V. 6.70

SAMPLE NO. 56 AVE 67.0 S.D. 6.5 C.V. 9.74

CCRL PROFICIENCY SAMPLE PROGRAM
Heat of Hydration - 28-day
BLENDED CEMENT SAMPLES NO. 55 & NO. 56



TEST NO.300 Heat of Hydration, 28 day 6 POINTS

SAMPLE NO. 55	AVE	94.7	S.D.	3.1	C.V.	3.25
SAMPLE NO. 56	AVE	84.8	S.D.	2.7	C.V.	3.16