

CEMENT AND CONCRETE REFERENCE LABORATORY
PROFICIENCY SAMPLE PROGRAM

Final Report
Blended Cement Proficiency Samples
Number 61 and Number 62

May 2008



May 16, 2008

To: Participants in the CCRL Blended Cement Proficiency Sample Program

SUBJECT: Final Report on Blended Cement Proficiency Samples No. 61 and No. 62

Following is the final report for the current pair of CCRL **Blended Cement** Proficiency Samples which were distributed in February 2008. Both cements were an ASTM C595 Blended Hydraulic Cement. Sample No 61 was a Type IP (20) and No. 62 was a Type IP (24).

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/>.

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 Blended Cement Proficiency Samples will be distributed in February 2009.

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. 61 and No. 62

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 2008. 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. 61 and No. 62
 Final Report - Chemical Results
 May 16, 2008

SUMMARY OF RESULTS

Test		#Labs	Sample No. 61			Sample No. 62		
			Average	S.D.	C.V.	Average	S.D.	C.V.
Silicon Dioxide	prcnt	87	28.55	1.6	5.78	26.36	1.2	4.75
Silicon Dioxide	prcnt *	78	28.75	0.63	2.21	26.46	0.43	1.62
Aluminum Oxide	prcnt	84	8.29	0.78	9.44	6.18	0.70	11.31
Aluminum Oxide	prcnt *	76	8.45	0.31	3.67	6.29	0.24	3.84
Ferric Oxide	prcnt	87	3.82	0.20	5.21	3.79	0.18	4.81
Ferric Oxide	prcnt *	84	3.82	0.17	4.42	3.79	0.14	3.76
Calcium Oxide	prcnt	86	51.45	1.1	2.23	56.00	1.1	1.90
Calcium Oxide	prcnt *	81	51.31	0.90	1.76	56.09	0.70	1.24
Magnesium Oxide	prcnt	88	1.65	0.21	12.7	1.79	0.19	10.4
Magnesium Oxide	prcnt *	81	1.63	0.109	6.70	1.77	0.092	5.18
Sulfur Trioxide	prcnt	91	2.59	0.17	6.53	2.80	0.18	6.63
Sulfur Trioxide	prcnt *	85	2.56	0.12	4.72	2.79	0.11	4.04
Loss on Ignition	prcnt	92	1.42	0.22	15.6	1.56	0.16	10.6
Loss on Ignition	prcnt *	85	1.44	0.137	9.49	1.57	0.099	6.30
Sodium Oxide	prcnt	75	0.339	0.104	30.6	0.284	0.076	26.6
Sodium Oxide	prcnt *	72	0.323	0.063	19.4	0.277	0.064	23.1
Potassium Oxide	prcnt	80	0.81	0.073	9.11	0.56	0.088	15.64
Potassium Oxide	prcnt *	71	0.82	0.044	5.36	0.57	0.036	6.21

CONTINUED ON NEXT PAGE

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

Silicon Dioxide	20 51 126 691 1799 38 698 3247 3287
Aluminum Oxide	30 39 126 205 690 1799 2463 3247
Ferric Oxide	39 44 51
Calcium Oxide	126 176 698 1799 3287
Magnesium Oxide	42 413 1799 169 2251 3247 3287
Sulfur Trioxide	19 51 126 205 2462 3287
Loss on Ignition	38 3235 19 20 52 309 3247
Sodium Oxide	169 2476 2477
Potassium Oxide	176 694 30 50 126 39 1799 2295 3233

CCRL PROFICIENCY SAMPLE PROGRAM
 Blended Cement Proficiency Samples No. 61 and No. 62
 Final Report - Chemical Results
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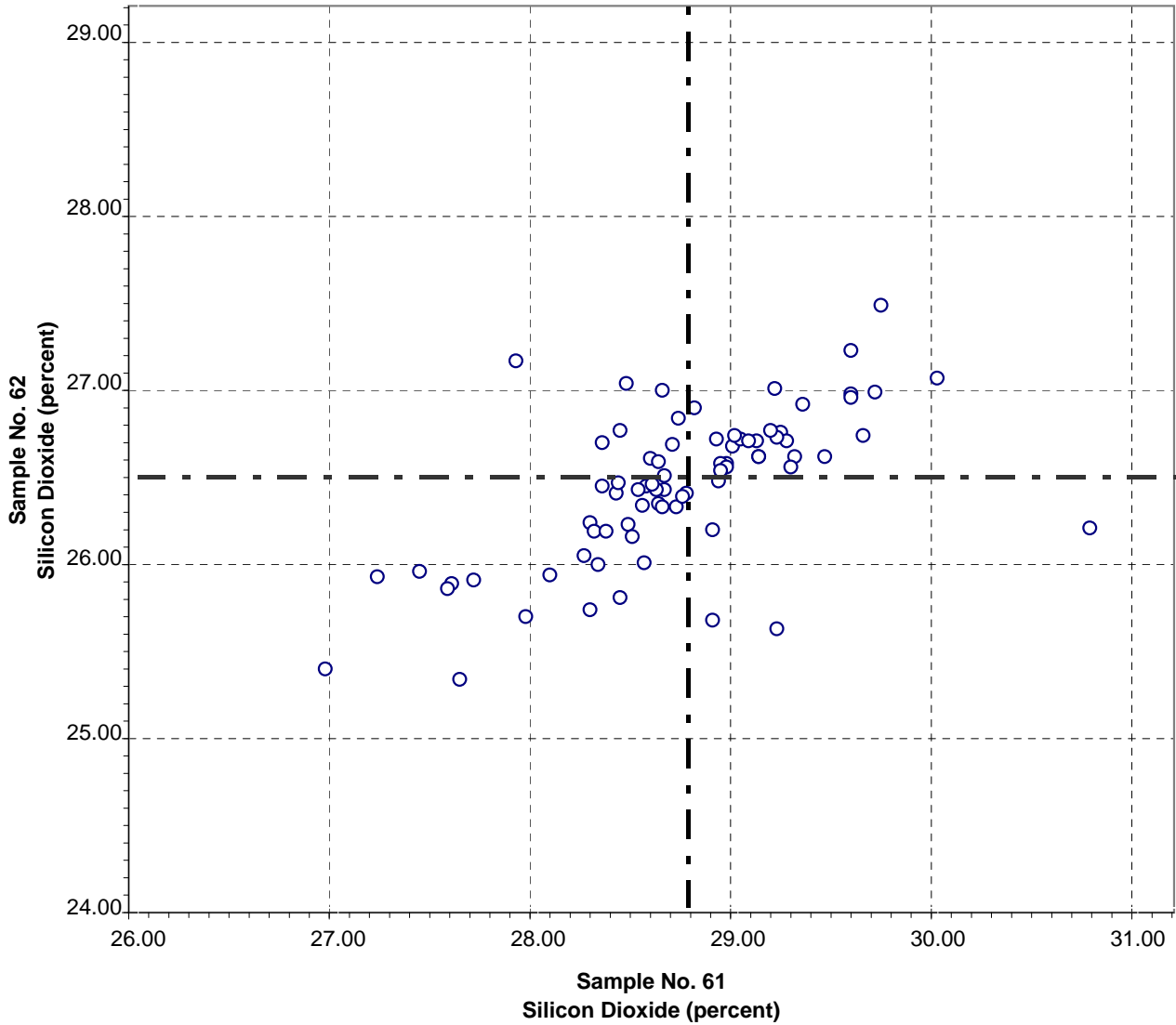
SUMMARY OF RESULTS

Test		#Labs	Sample No. 61			Sample No. 62		
			Average	S.D.	C.V.	Average	S.D.	C.V.
Titanium Dioxide	prcnt	69	0.51	0.044	8.61	0.44	0.044	10.00
Titanium Dioxide	prcnt *	64	0.51	0.027	5.41	0.44	0.025	5.75
Phosphorus Pent	prcnt	64	0.227	0.050	22.1	0.220	0.060	27.6
Phosphorus Pent	prcnt *	57	0.220	0.012	5.44	0.217	0.012	5.58
Zinc Oxide	prcnt	28	0.038	0.042	110	0.019	0.041	219
Zinc Oxide	prcnt *	23	0.031	0.0024	7.83	0.008	0.0021	26.37
Manganic Oxide	prcnt	43	0.241	0.018	7.27	0.070	0.041	58.68
Manganic Oxide	prcnt *	40	0.241	0.0172	7.11	0.059	0.0056	9.42
Chloride	prcnt	29	0.010	0.019	193	0.012	0.017	139
Chloride	prcnt *	26	0.004	0.0032	80.9	0.007	0.0050	68.3
Insoluble Residue	prcnt	75	13.01	3.4	26.4	10.44	2.8	26.4
Insoluble Residue	prcnt *	62	14.26	0.83	5.84	11.32	0.57	5.02
Chromium Oxide	prcnt	31	0.015	0.0047	30.3	0.015	0.0047	30.7

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

Titanium Dioxide 870 975 126 690 2295
 Phosph Pentoxide 413 870 2463 126 497 2295 2477
 Zinc Oxide 2295 2463 30 3247 3297
 Manganic Oxide 354 2295 2477
 Chloride 246 2476 3247
 Insoluble Residue 176 289 354 694 24 74 690 691 695 2975 47 105 3297

**CCRL Proficiency Sample Program
Silicon Dioxide
BLENDED CEMENT Samples No. 61 and No. 62**

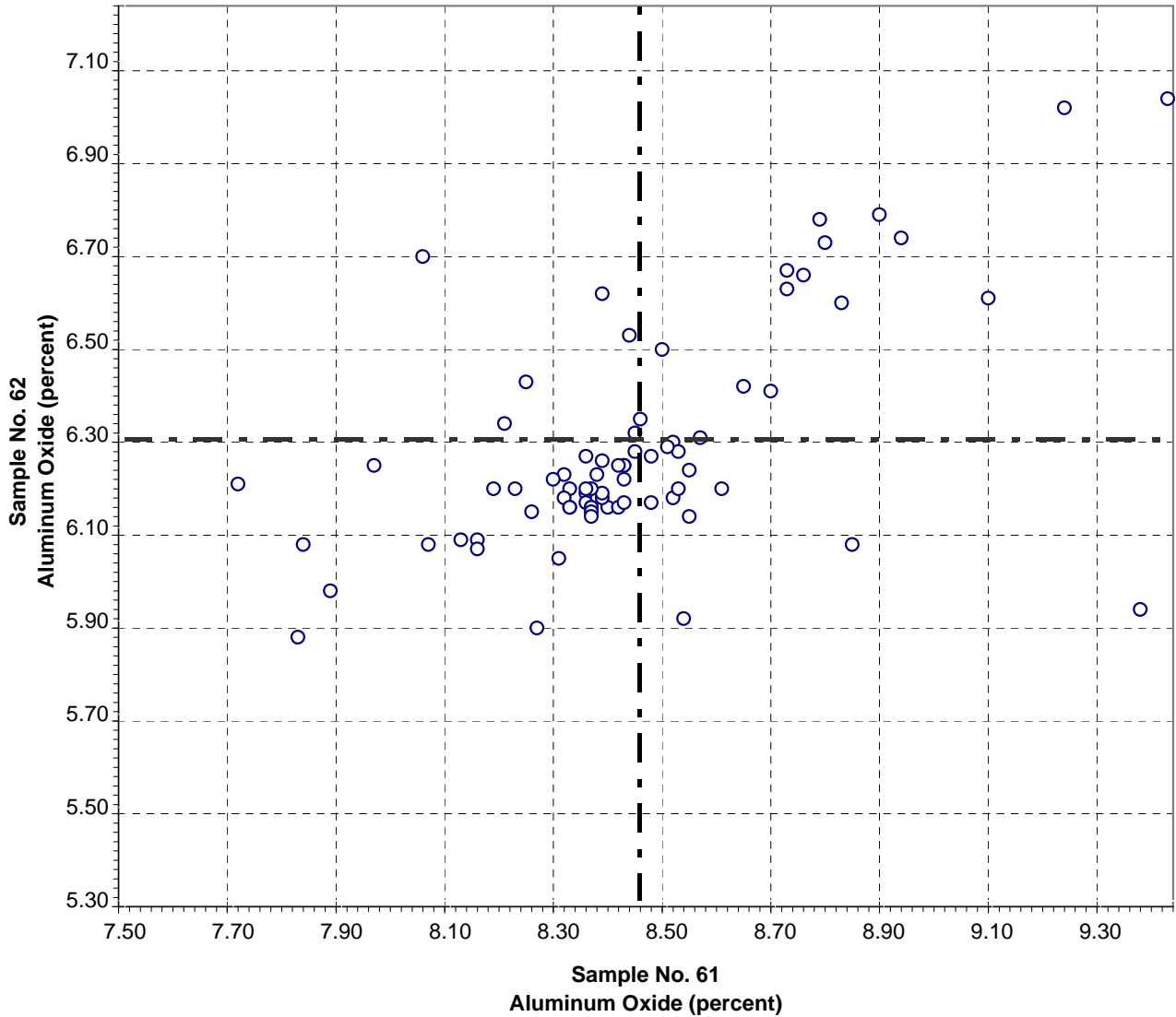


Test No. 10 Silicon Dioxide 78 Points

Sample No. 61	Ave 28.75	S.D. 0.634	C.V. 2.21
Sample No. 62	Ave 26.46	S.D. 0.429	C.V. 1.62

Labs eliminated: 20, 51, 126, 691, 1799, 38, 698, 3247, 3287

**CCRL Proficiency Sample Program
Aluminum Oxide
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 21

Aluminum Oxide

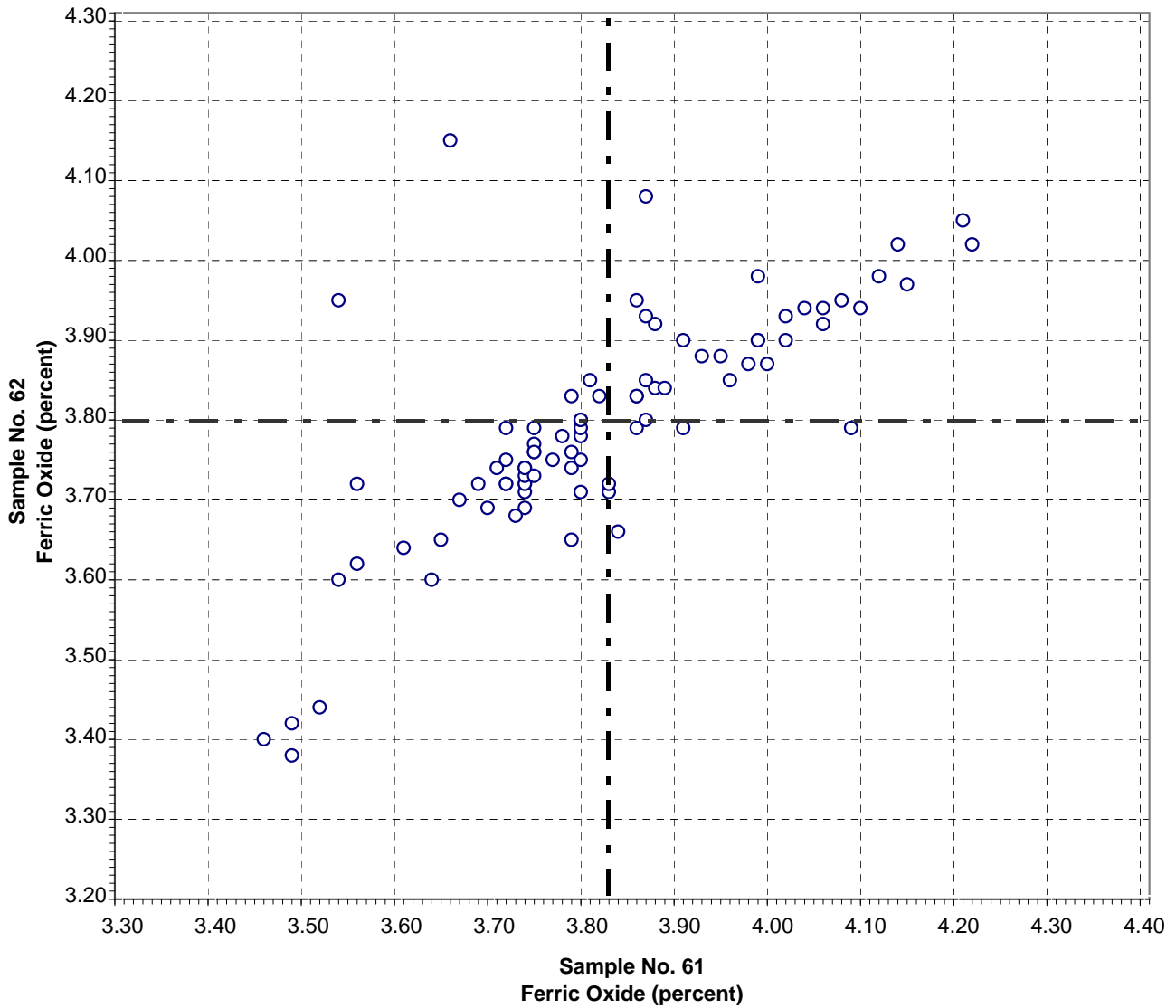
76 Points

Sample No. 61 Ave 8.45 S.D. 0.310 C.V. 3.67

Sample No. 62 Ave 6.29 S.D. 0.242 C.V. 3.84

Labs eliminated: 30, 39, 126, 205, 690, 1799, 2463, 3247

**CCRL Proficiency Sample Program
 Ferric Oxide
 BLENDED CEMENT Samples No. 61 and No. 62**

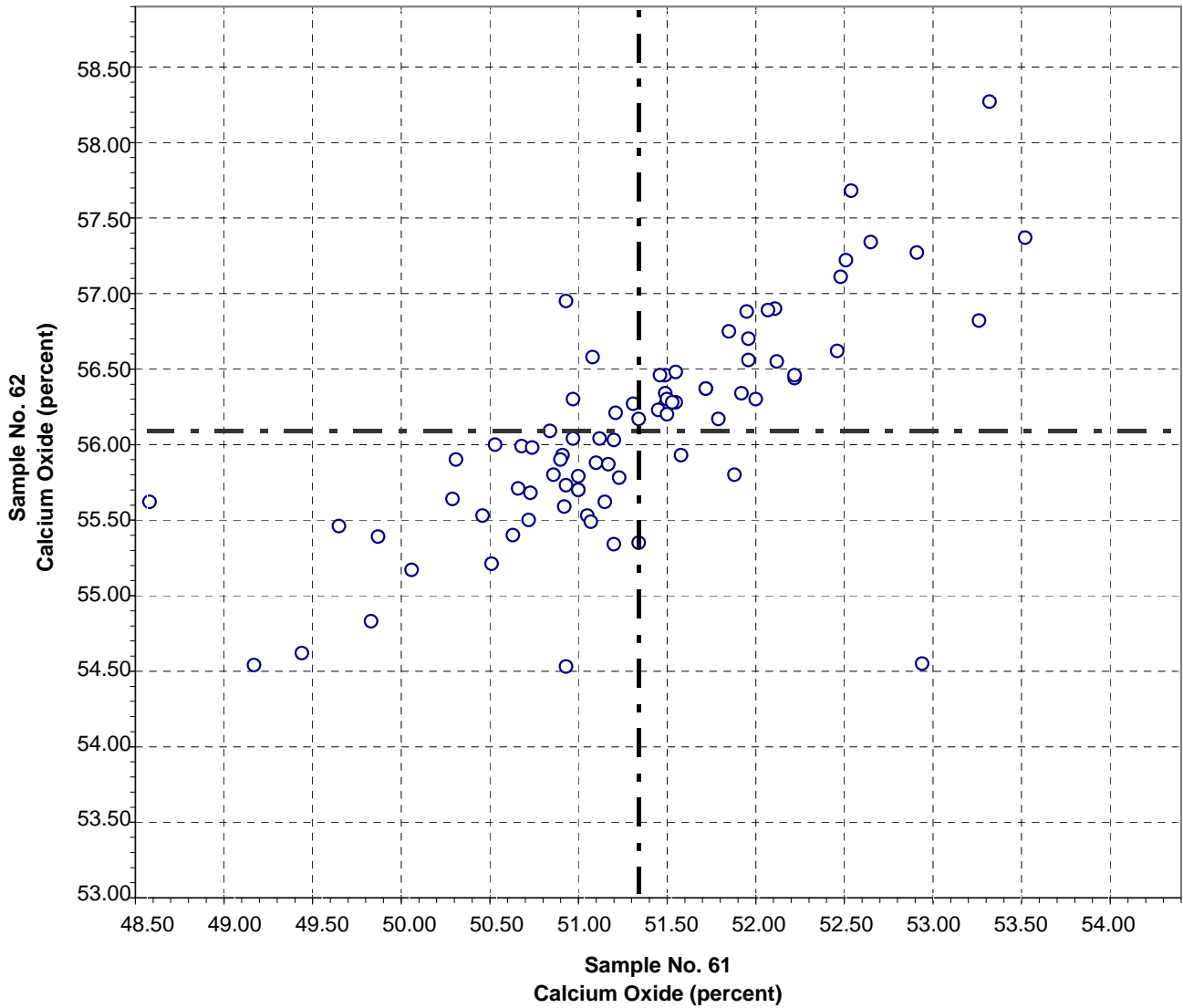


Test No. 30 Ferric Oxide 84 Points

Sample No. 61	Ave 3.82	S.D. 0.169	C.V. 4.42
Sample No. 62	Ave 3.79	S.D. 0.143	C.V. 3.76

Labs eliminated: 39, 44, 51

**CCRL Proficiency Sample Program
Calcium Oxide
BLENDED CEMENT Samples No. 61 and No. 62**

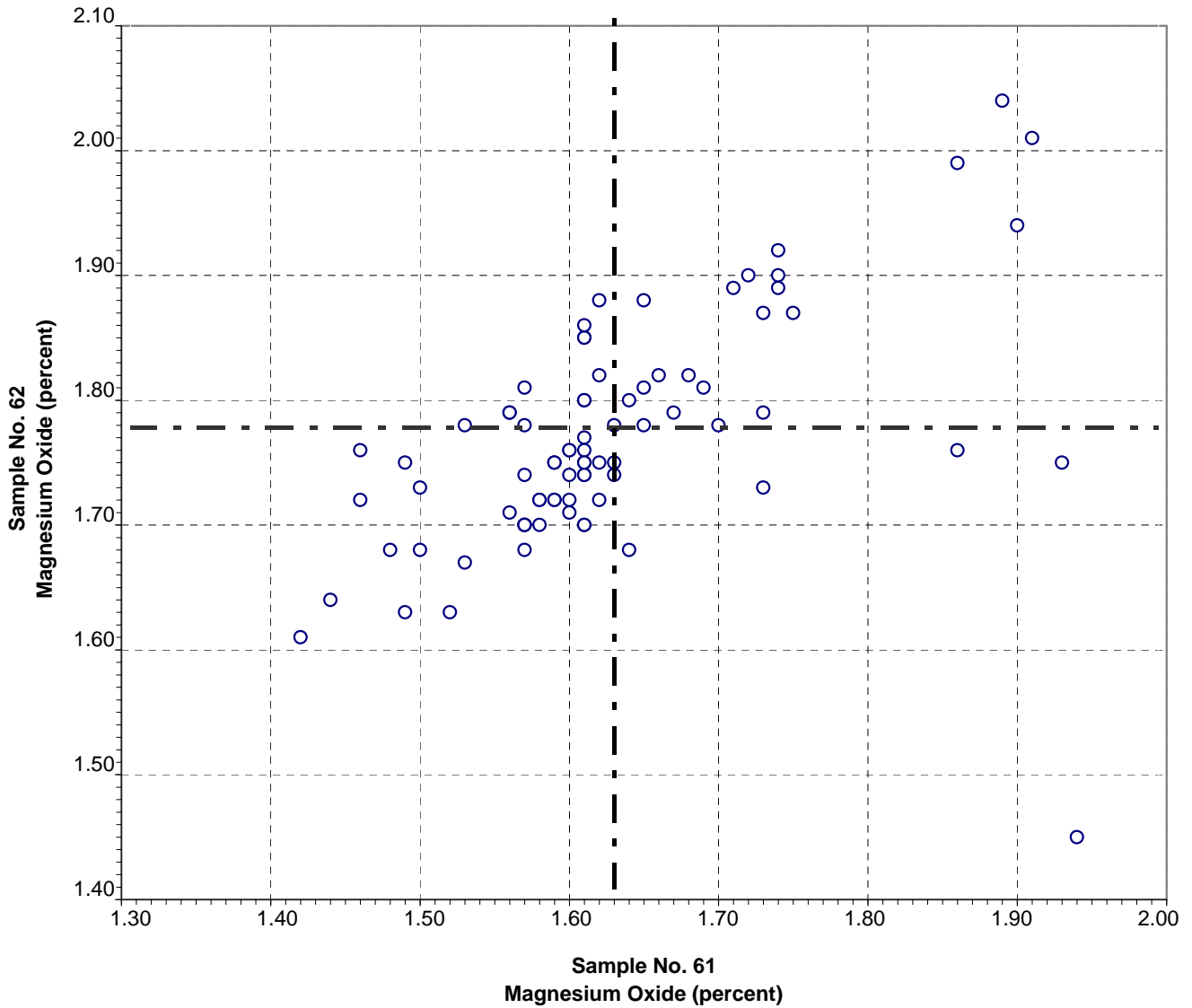


Test No. 40 Calcium Oxide 81 Points

Sample No. 61	Ave 51.31	S.D. 0.903	C.V. 1.76
Sample No. 62	Ave 56.09	S.D. 0.699	C.V. 1.25

Labs eliminated: 126, 176, 698, 1799, 3287

**CCRL Proficiency Sample Program
Magnesium Oxide
BLENDED CEMENT Samples No. 61 and No. 62**

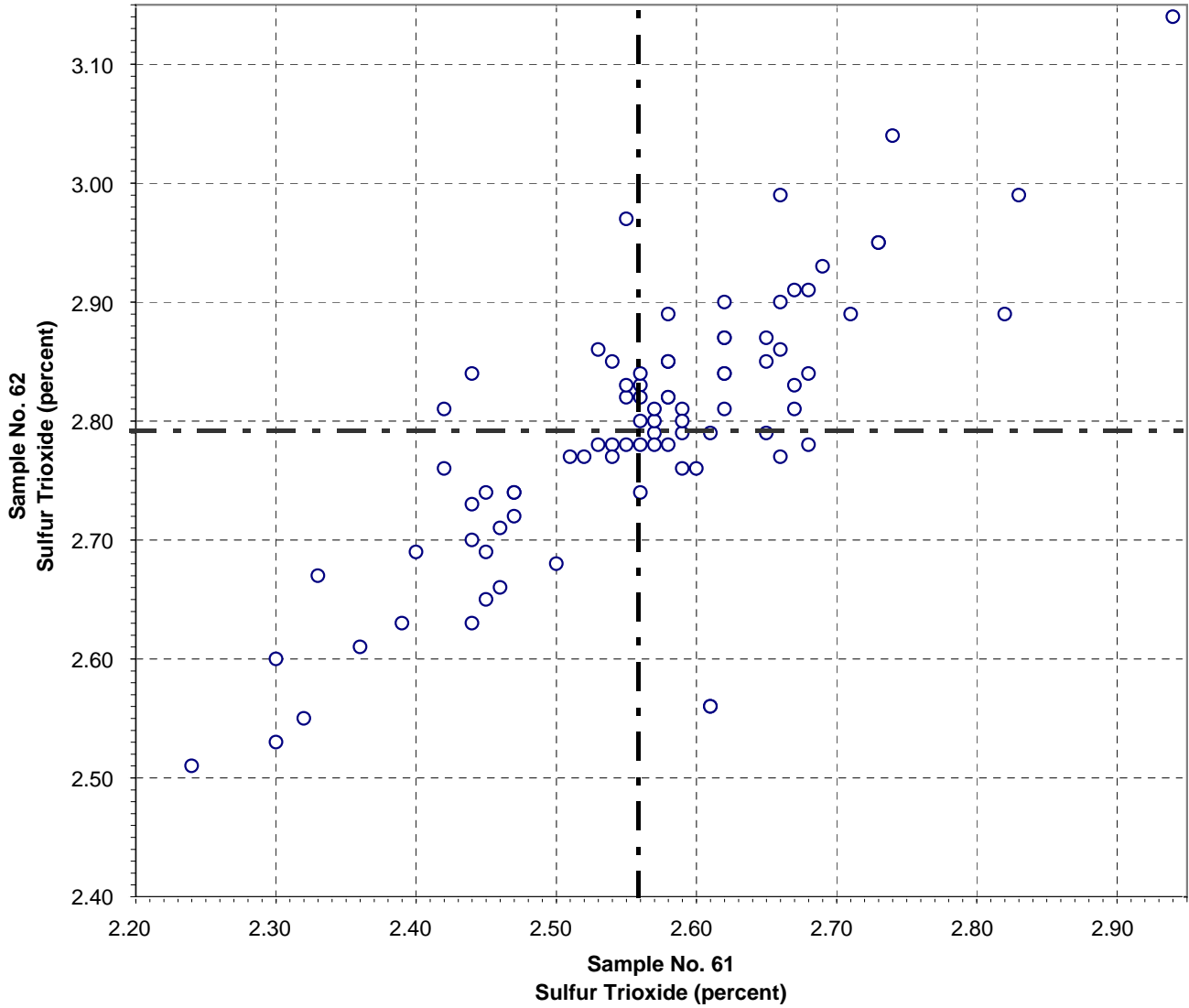


Test No. 50 Magnesium Oxide 81 Points

Sample No. 61 Ave 1.63 S.D. 0.109 C.V. 6.7
 Sample No. 62 Ave 1.77 S.D. 0.092 C.V. 5.18

Labs eliminated: 42, 413, 1799, 169, 2251, 3247, 3287

**CCRL Proficiency Sample Program
Sulfur Trioxide
BLENDED CEMENT Samples No. 61 and No. 62**

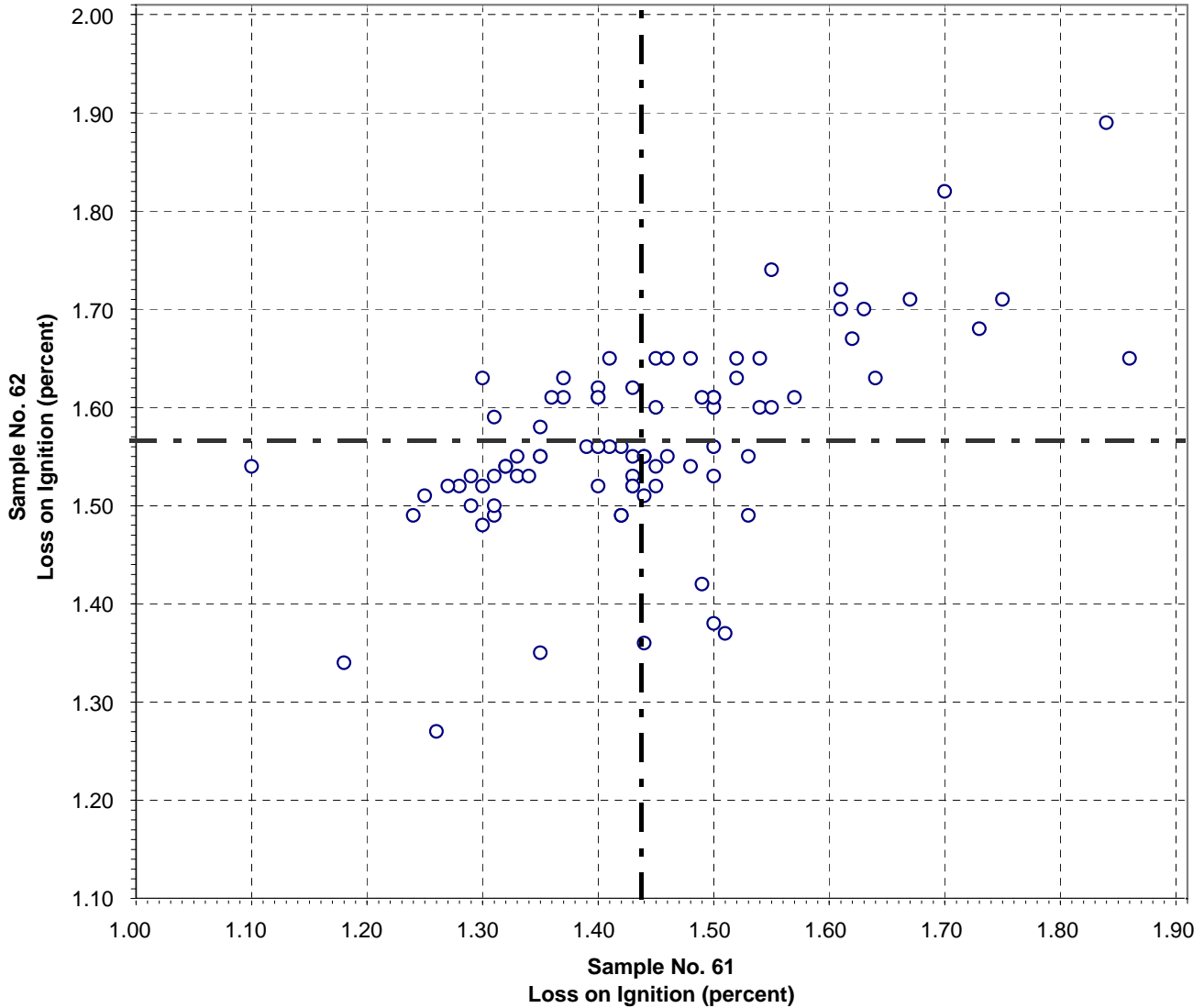


Test No. 60 Sulfur Trioxide 85 Points

Sample No. 61 Ave 2.56 S.D. 0.121 C.V. 4.72
 Sample No. 62 Ave 2.79 S.D. 0.113 C.V. 4.04

Labs eliminated: 19, 51, 126, 205, 2462, 3287

**CCRL Proficiency Sample Program
Loss on Ignition
BLENDED CEMENT Samples No. 61 and No. 62**

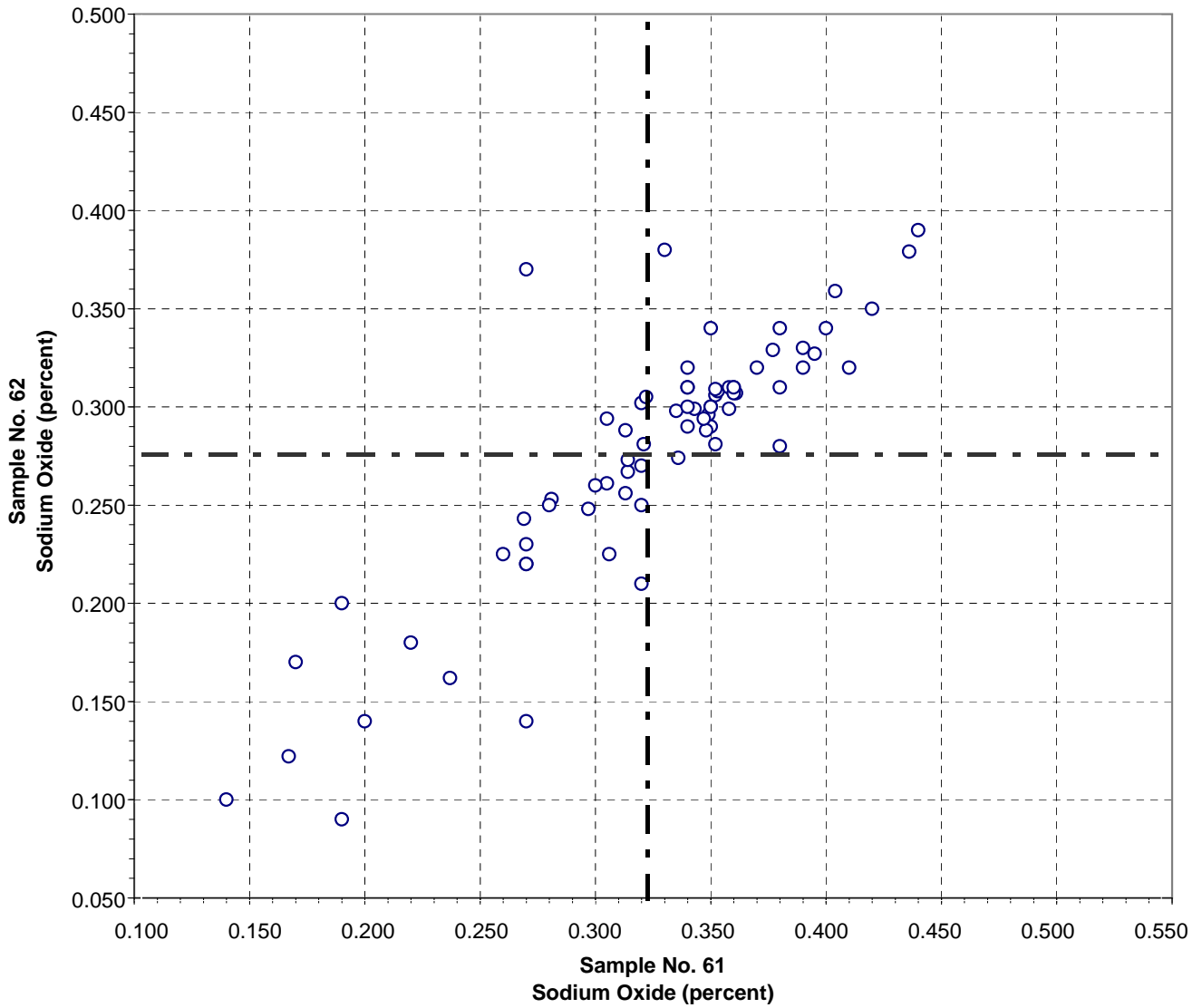


Test No. 70 Loss on Ignition 85 Points

Sample No. 61 Ave 1.44 S.D. 0.137 C.V. 9.49
 Sample No. 62 Ave 1.57 S.D. 0.099 C.V. 6.3

Labs eliminated: 38, 3235, 19, 20, 52, 309, 3247

**CCRL Proficiency Sample Program
Sodium Oxide
BLENDED CEMENT Samples No. 61 and No. 62**

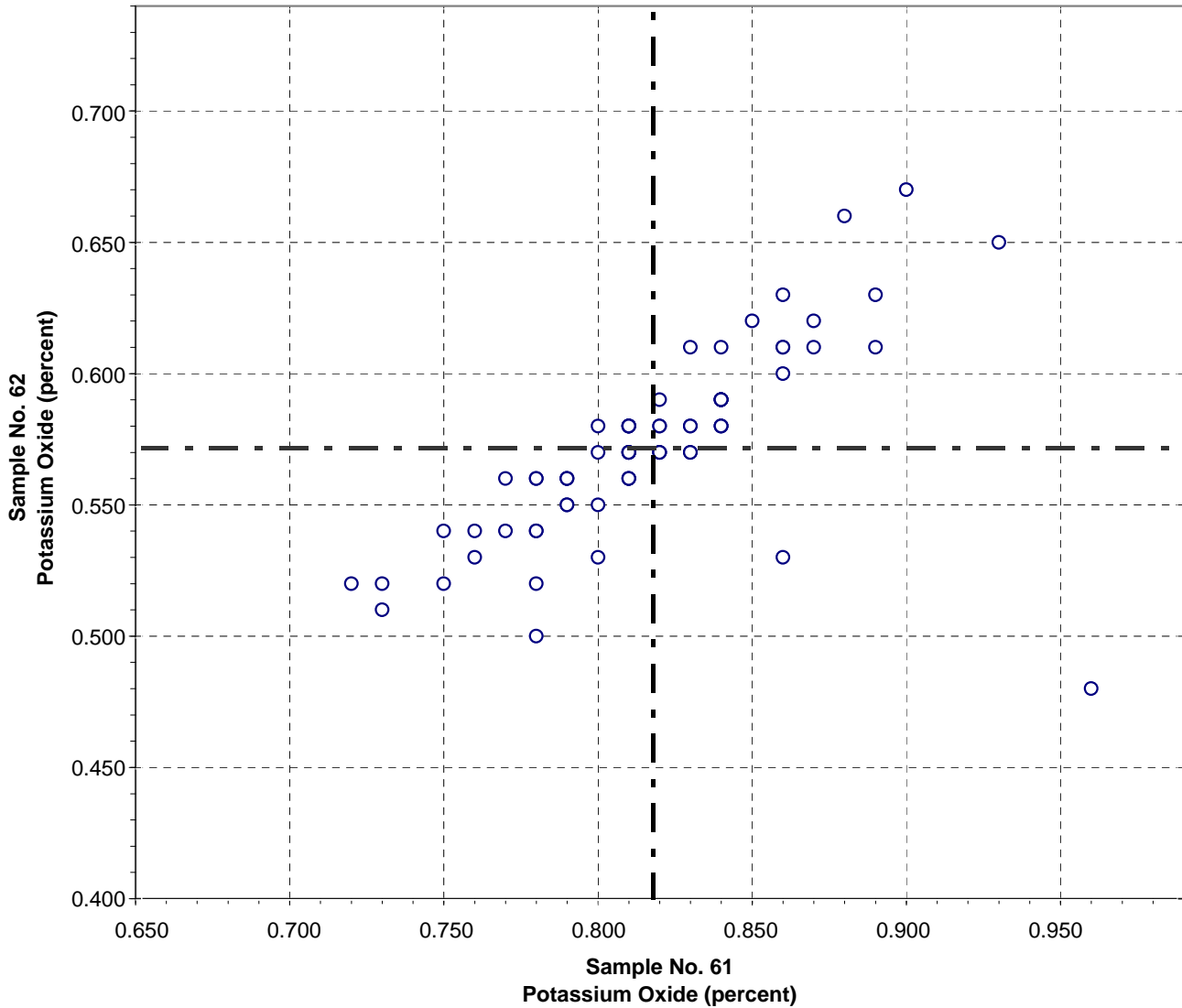


Test No. 90 Sodium Oxide 72 Points

Sample No. 61	Ave 0.323	S.D. 0.0628	C.V. 19.4
Sample No. 62	Ave 0.277	S.D. 0.0640	C.V. 23.1

Labs eliminated: 169, 2476, 2477

**CCRL Proficiency Sample Program
Potassium Oxide
BLENDED CEMENT Samples No. 61 and No. 62**

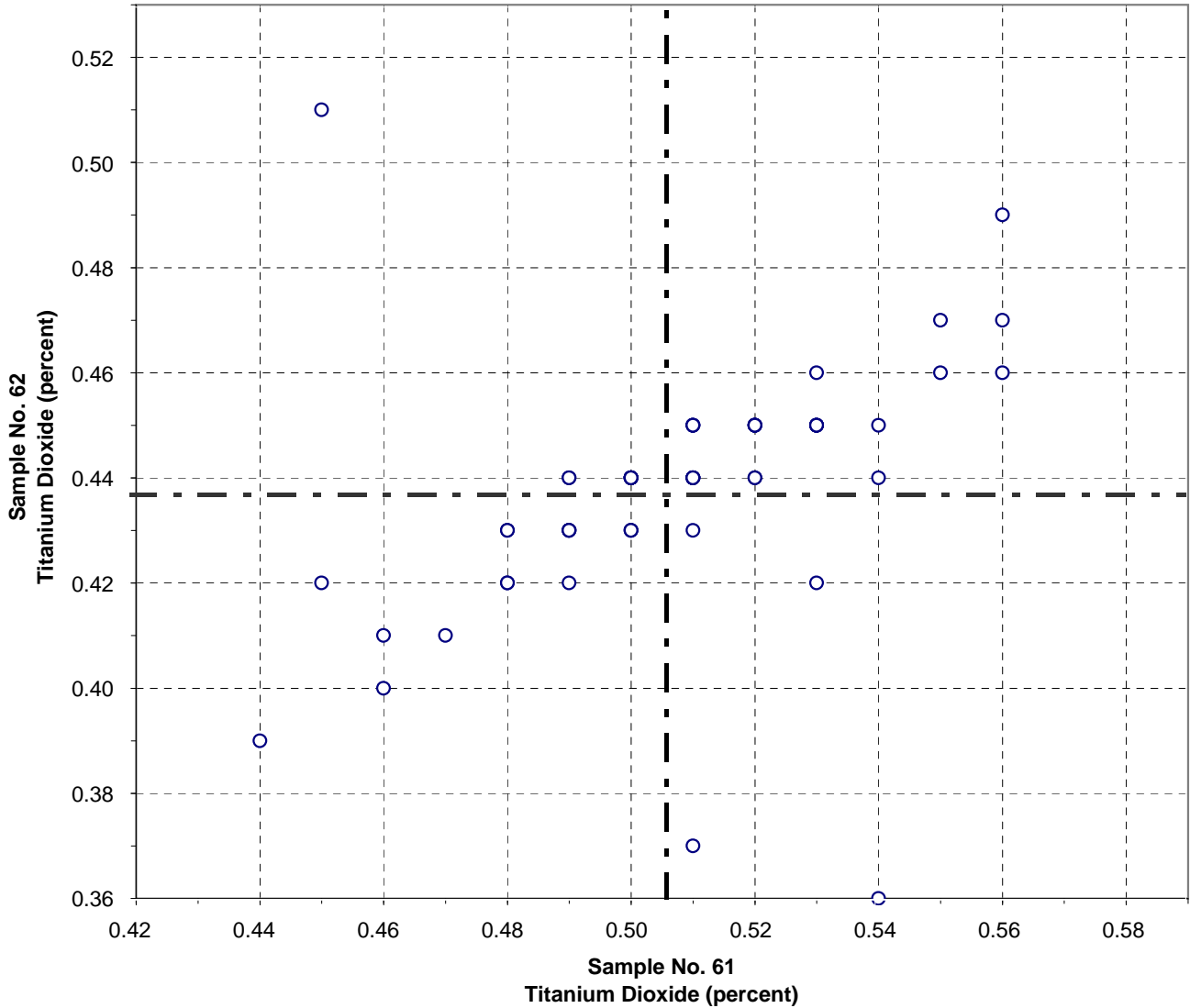


Test No. 100 Potassium Oxide 71 Points

Sample No. 61 Ave 0.818 S.D. 0.0438 C.V. 5.36
 Sample No. 62 Ave 0.572 S.D. 0.0356 C.V. 6.21

Labs eliminated: 176, 694, 30, 50, 126, 39, 1799, 2295, 3233

**CCRL Proficiency Sample Program
Titanium Dioxide
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 103

Titanium Dioxide

63 Points

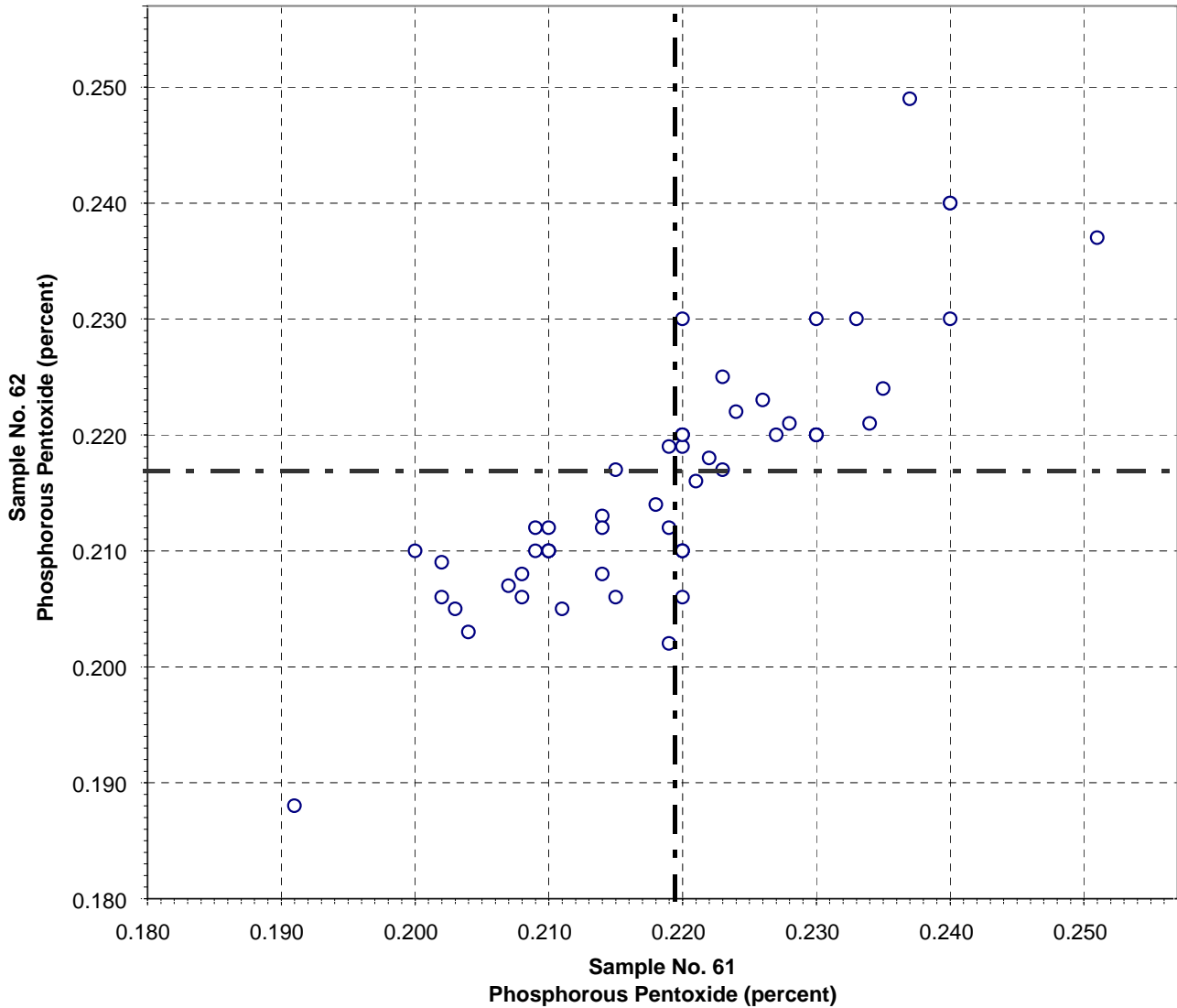
Sample No. 61 Ave 0.506 S.D. 0.027 C.V. 5.41

Sample No. 62 Ave 0.437 S.D. 0.025 C.V. 5.75

Labs eliminated: 870, 975, 126, 690, 2295

Labs off Diagram: 3247

**CCRL Proficiency Sample Program
Phosphorous Pentoxide
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 102

Phosphorous Pentoxide

56 Points

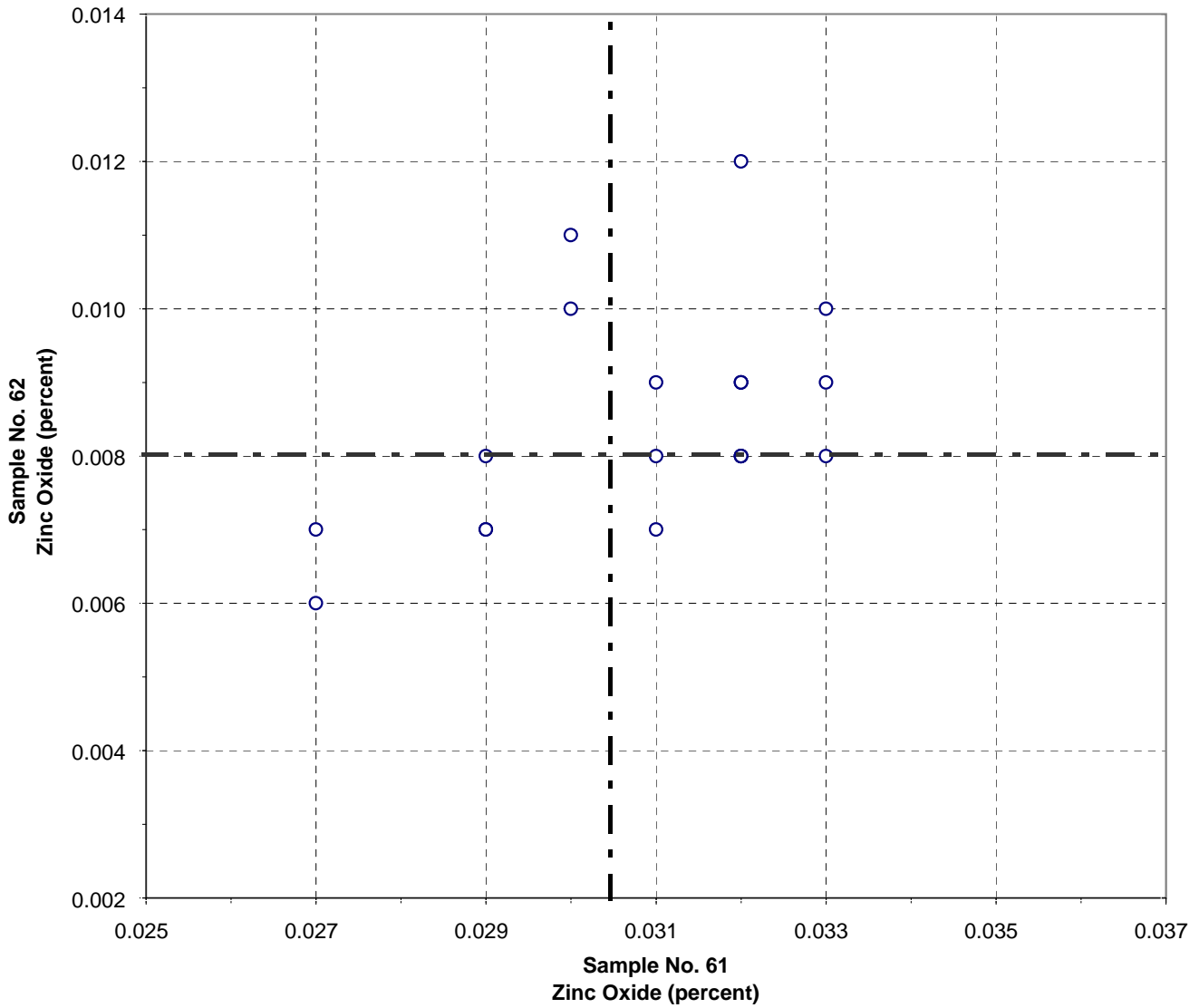
Sample No. 61 Ave 0.220 S.D. 0.012 C.V. 5.44

Sample No. 62 Ave 0.217 S.D. 0.012 C.V. 5.58

Labs eliminated: 413, 870, 2463, 126, 497, 2295, 2477

Labs off Diagram: 3235

**CCRL Proficiency Sample Program
Zinc Oxide
BLENDED CEMENT Samples No. 61 and No. 62**



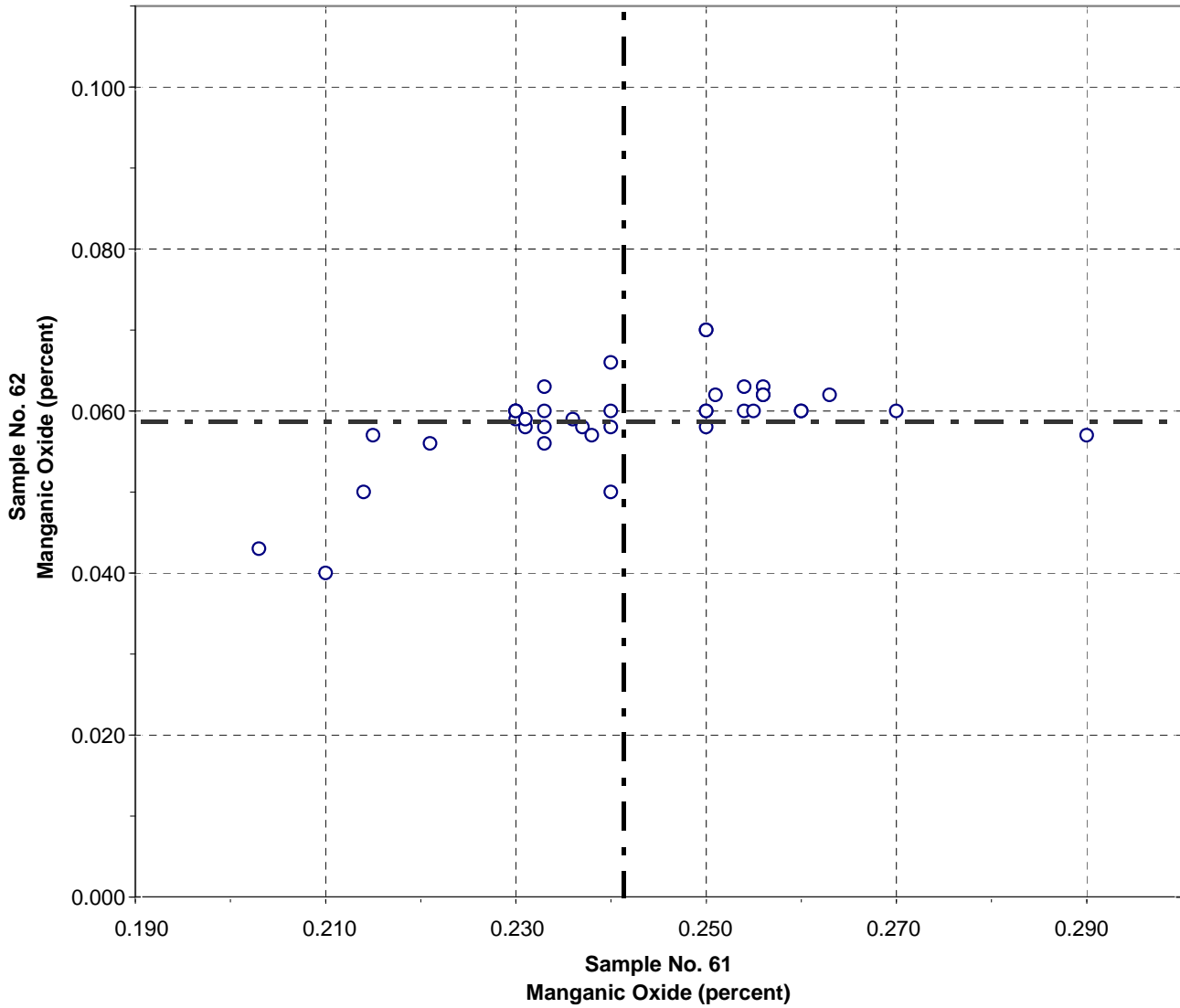
Test No. 99 Zinc Oxide 21 Points

Sample No. 61 Ave 0.031 S.D. 0.0024 C.V. 7.83
 Sample No. 62 Ave 0.008 S.D. 0.0021 C.V. 26.4

Labs eliminated: 2295, 2463, 30, 3247, 3297

Labs off Diagram: 40, 2477

**CCRL Proficiency Sample Program
Manganic Oxide
BLENDED CEMENT Samples No. 61 and No. 62**

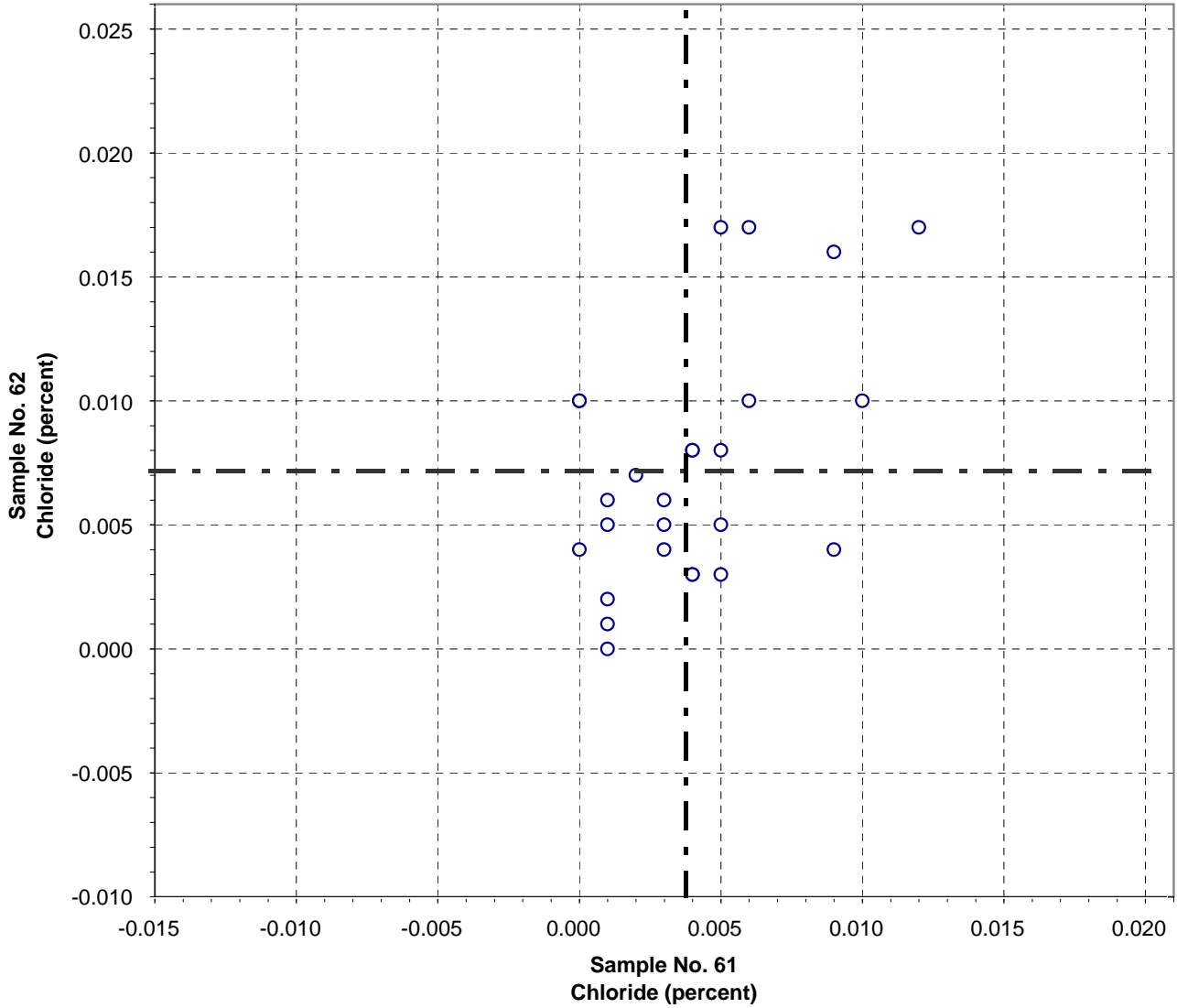


Test No. 101 Manganic Oxide 40 Points

Sample No. 61 Ave 0.241 S.D. 0.0172 C.V. 7.11
 Sample No. 62 Ave 0.059 S.D. 0.0056 C.V. 9.42

Labs eliminated: 354, 2295, 2477

**CCRL Proficiency Sample Program
Chloride
BLENDED CEMENT Samples No. 61 and No. 62**

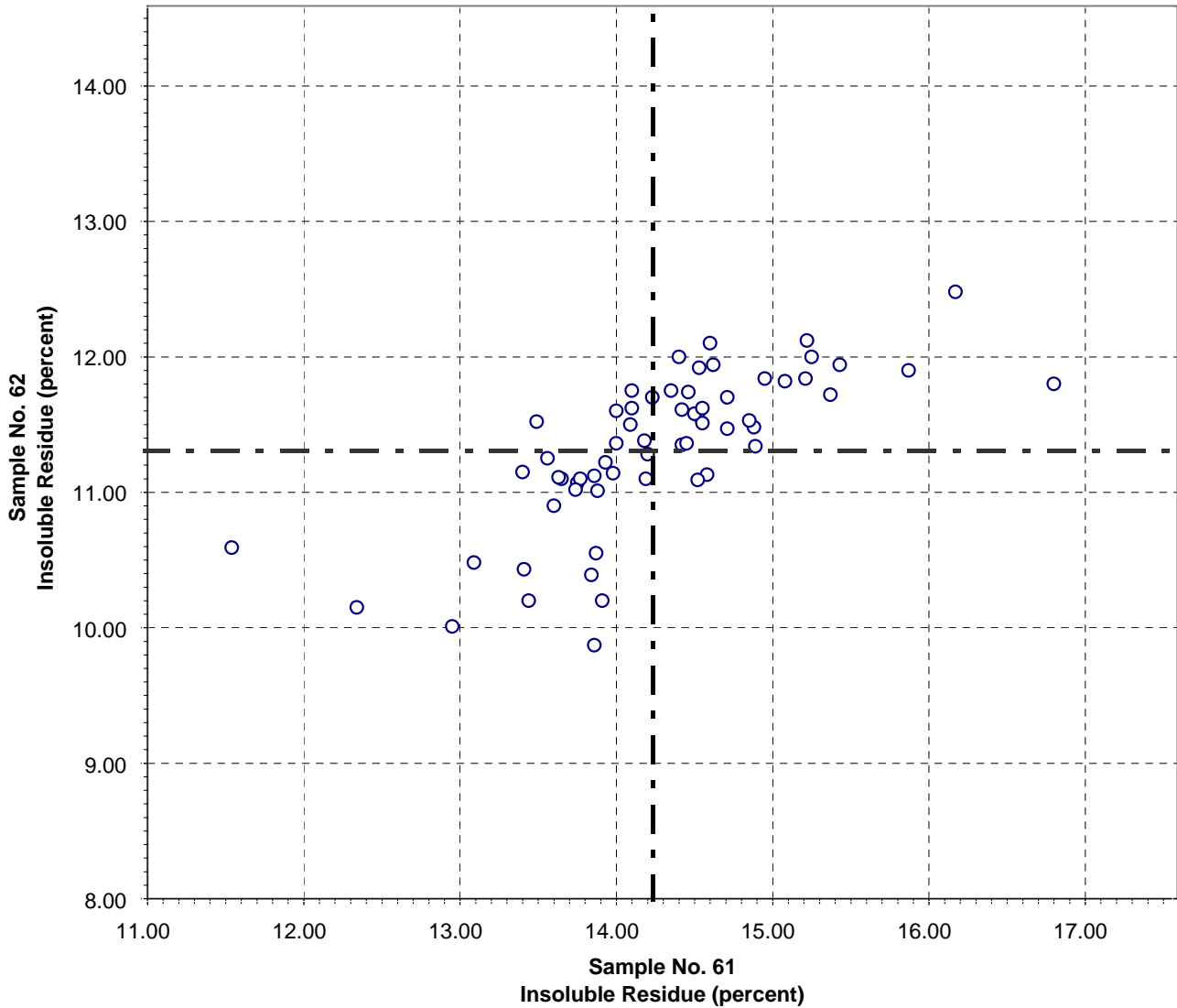


Test No. 104 Chloride 26 Points

Sample No. 61 Ave 0.004 S.D. 0.0032 C.V. 80.9
 Sample No. 62 Ave 0.007 S.D. 0.0050 C.V. 68.3

Labs eliminated: 246, 2476, 3247

**CCRL Proficiency Sample Program
Insoluble Residue
BLENDED CEMENT Samples No. 61 and No. 62**

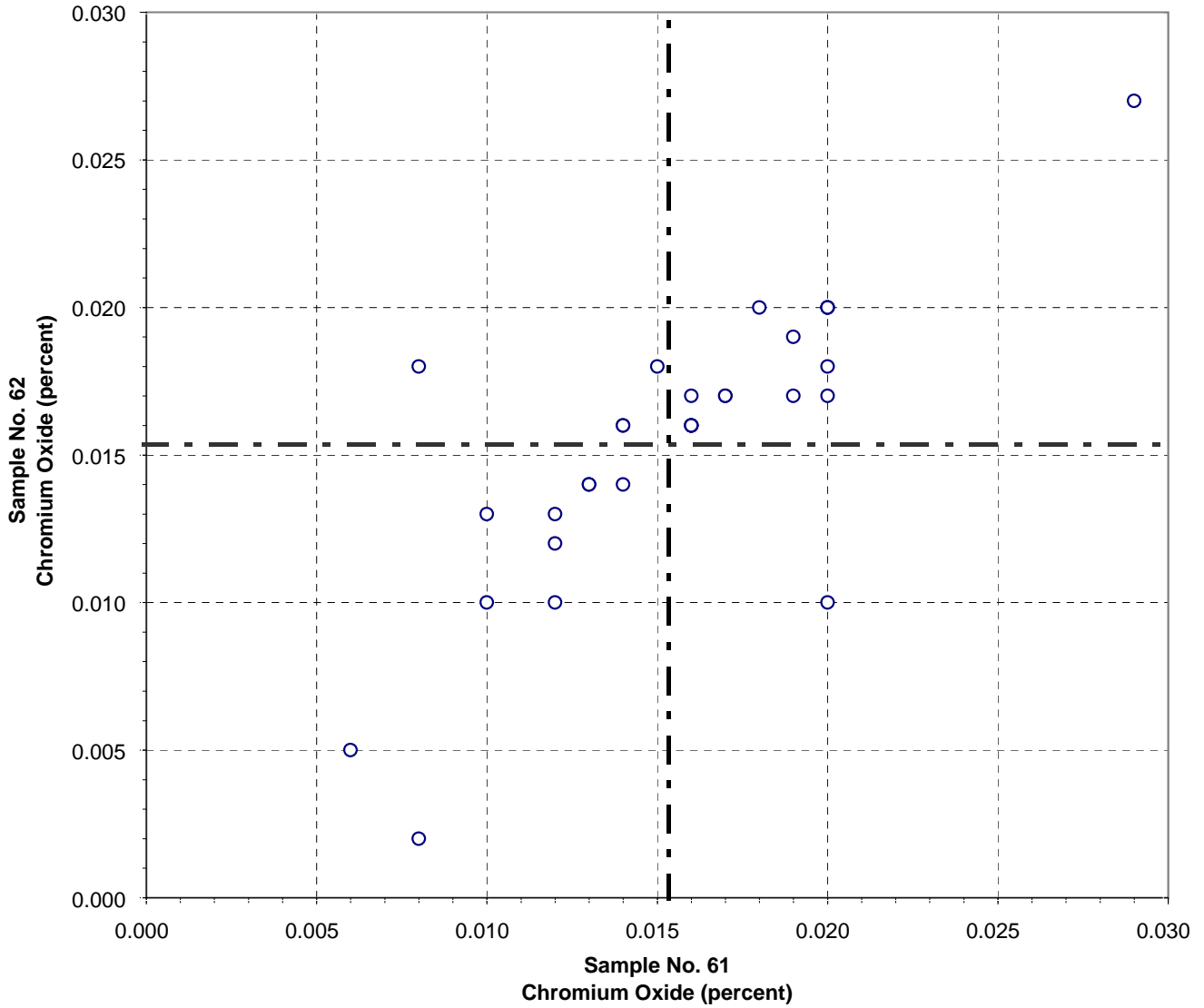


Test No. 80 Insoluble Residue 62 Points

Sample No. 61 Ave 14.26 S.D. 0.834 C.V. 5.85
 Sample No. 62 Ave 11.32 S.D. 0.568 C.V. 5.02

Labs eliminated: 176, 289, 354, 694, 24, 74, 690, 691, 695, 2975, 47, 105, 3297

**CCRL Proficiency Sample Program
Chromium Oxide
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 105

Chromium Oxide

31 Points

Sample No. 61	Ave 0.015	S.D. 0.0047	C.V. 30.3
Sample No. 62	Ave 0.015	S.D. 0.0047	C.V. 30.7

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 61 and No. 62
Final Report - Physical Results
May 16, 2008

SUMMARY OF RESULTS

Test		#Labs	Sample No. 61			Sample No. 62		
			Average	S.D.	C.V.	Average	S.D.	C.V.
N.C. Water	prcnt	94	25.8	2.2	8.46	28.9	2.7	9.27
N.C. Water	prcnt	* 91	25.5	0.43	1.69	28.8	1.51	5.24
Vicat TS Initial	min	91	124	20.7	16.8	146	38.8	26.6
Vicat TS Initial	min	* 89	121	14.7	12.2	148	37.7	25.6
Vicat TS Final	min	86	236	42.4	18.0	2619	37.6	14.4
Vicat TS Final	min	* 84	233	37.2	16.0	260	37.7	14.5
Autoclave Expan	prcnt	82	-0.02	0.022	-143.6	-0.03	0.116	-449.6
Autoclave Expan	prcnt	* 81	-0.01	0.022	-146.3	-0.04	0.050	-133.3
Air Content	prcnt	75	5.9	1.2	20.7	7.8	1.2	15.7
Air Content	prcnt	* 74	5.9	1.1	19.3	7.8	1.2	14.9
AC Mix Water	prcnt	78	67.4	3.3	4.88	69.3	3.5	5.04
AC Mix Water	prcnt	* 76	67.5	2.2	3.23	69.4	2.6	3.75
AC Flow	prcnt	78	88	4.4	5.01	87	4.7	5.40
AC Flow	prcnt	* 77	88	3.7	4.24	87	3.7	4.26
Specific Gravity		70	2.96	0.14	4.74	2.94	0.14	4.74
Specific Gravity		* 65	2.97	0.041	1.37	2.95	0.056	1.90

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

Normal Consistency	169 958 2360
Vicat TS Initial	255 2477
Vicat TS Final	126 255
Autoclave Expansion	181
Air Content	23
Air Content - Mix Water	23 1379
Air Content - Flow	1379
Specific Gravity	1379 39 691 2477 3287

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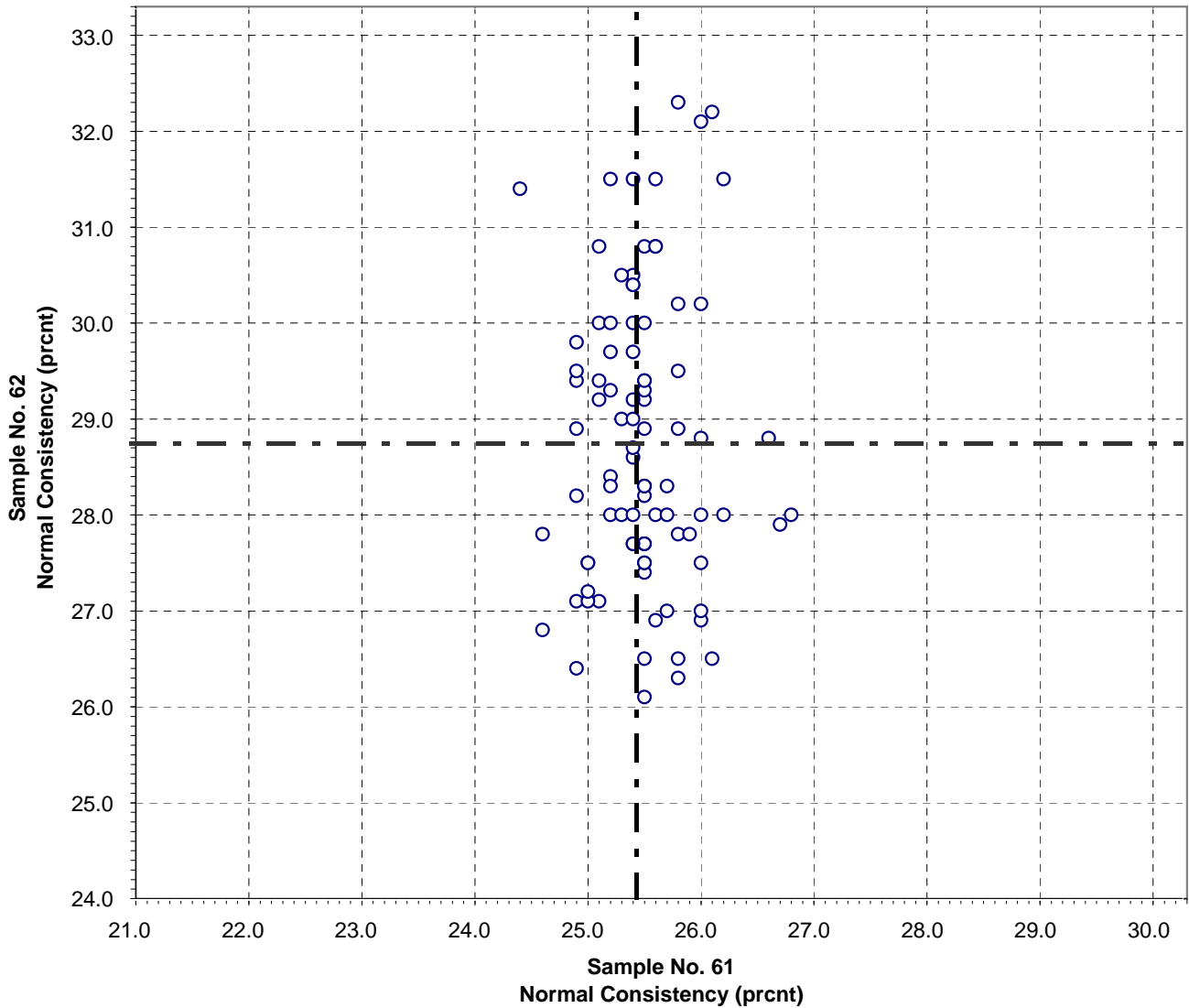
SUMMARY OF RESULTS

Test	#Labs	Sample No. 61			Sample No. 62			
		Average	S.D.	C.V.	Average	S.D.	C.V.	
Comp Str, 3 day	psi	98	3677	344.1	9.36	3327	378.9	11.39
Comp Str, 3 day	psi *	96	3689	303.9	8.24	3326	317.8	9.56
Comp Str, 7 day	psi	98	4477	384.9	8.60	4161	413.6	9.94
Comp Str, 7 day	psi *	97	4497	331.4	7.37	4180	370.9	8.87
Comp Str, 28 day	psi	88	6194	577.5	9.32	5403	544.0	10.25
Comp Str, 28 day	psi *	86	6247	462.8	7.41	5439	491.6	9.04
CS Mix Water	prcnt	87	46.2	3.5	7.60	49.7	3.8	7.72
CS Mix Water	prcnt *	81	46.0	1.5	3.24	49.6	1.6	3.33
Comp Str Flow	prcnt	89	112	5.7	5.12	107	5.4	5.00
Comp Str Flow	prcnt *	82	111	2.9	2.64	109	2.5	2.31
FINENESS								
Air Permeability	cm ² /g	92	4623	434.8	9.41	4601	429.3	9.33
Air Permeability	cm ² /g	*91	4603	395.1	8.58	4593	426.0	9.27
45µm Sieve	prcnt	90	97.49	0.55	0.568	95.36	1.00	1.043
45µm Sieve	prcnt	*89	97.49	0.56	0.570	95.43	0.78	0.816

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

Comp Strength, 3 day 169 2360
 Comp Strength, 7 day 2360
 Comp Strength, 28 day 51 2360
 Comp Strength, Mix Water 309 691 101 1323 2477 3297
 Comp Strength, Flow 14 22 201 289 698 23 2477
 Fineness - Air Permeability 34
 Fineness - 45µm Sieve 958

CCRL Proficiency Sample Program
Normal Consistency - % Water
BLENDED CEMENT Samples No. 61 and No. 62



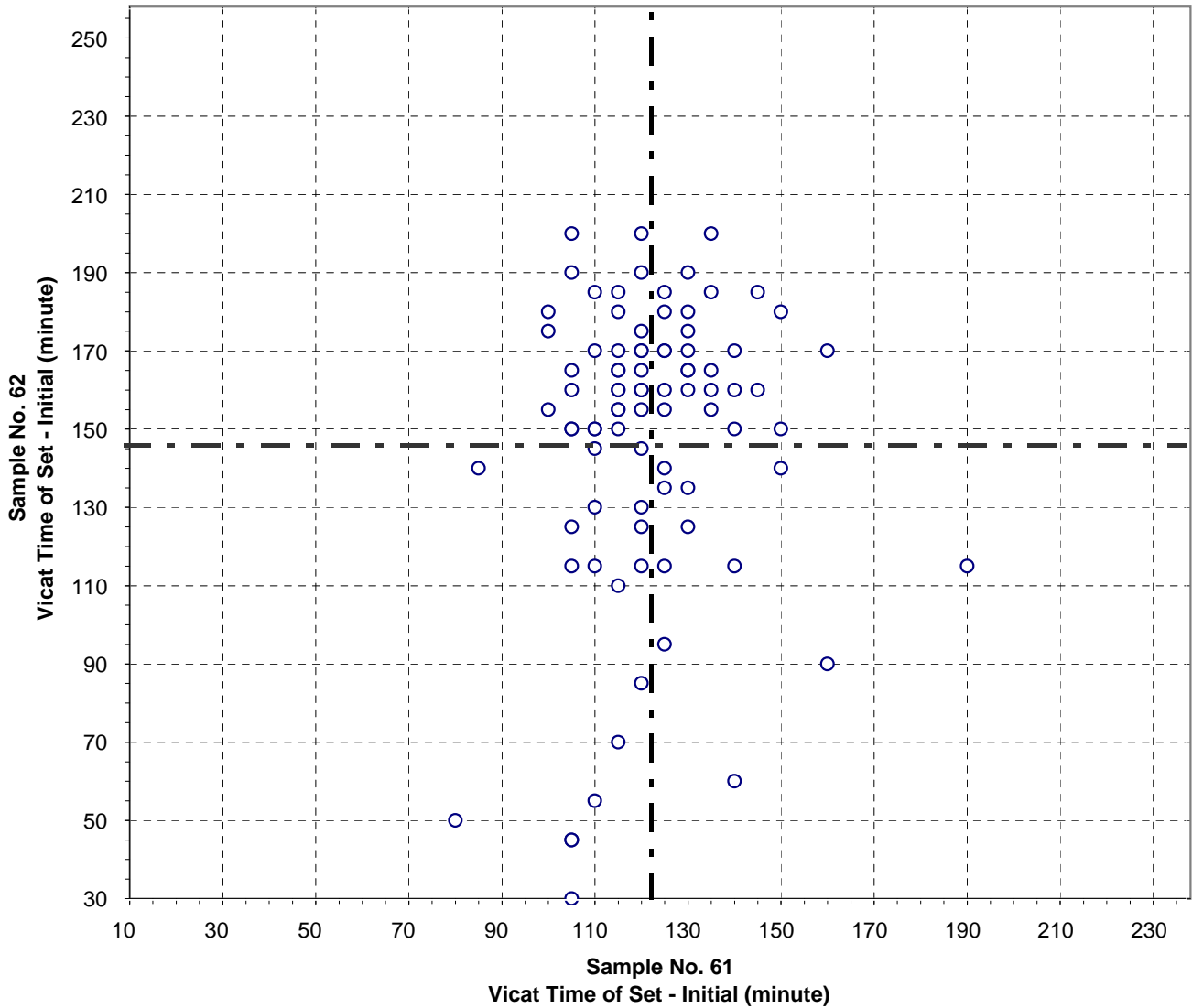
Test No. 110 Normal Consistency - % Water 91 Points

Sample No. 61 Ave 25.5 S.D. 0.43 C.V. 1.69

Sample No. 62 Ave 28.8 S.D. 1.51 C.V. 5.25

Labs eliminated: 169, 958, 2360

CCRL Proficiency Sample Program
Vicat Time of Set - Initial
BLENDED CEMENT Samples No. 61 and No. 62



Test No. 120

Vicat Time of Set - Initial

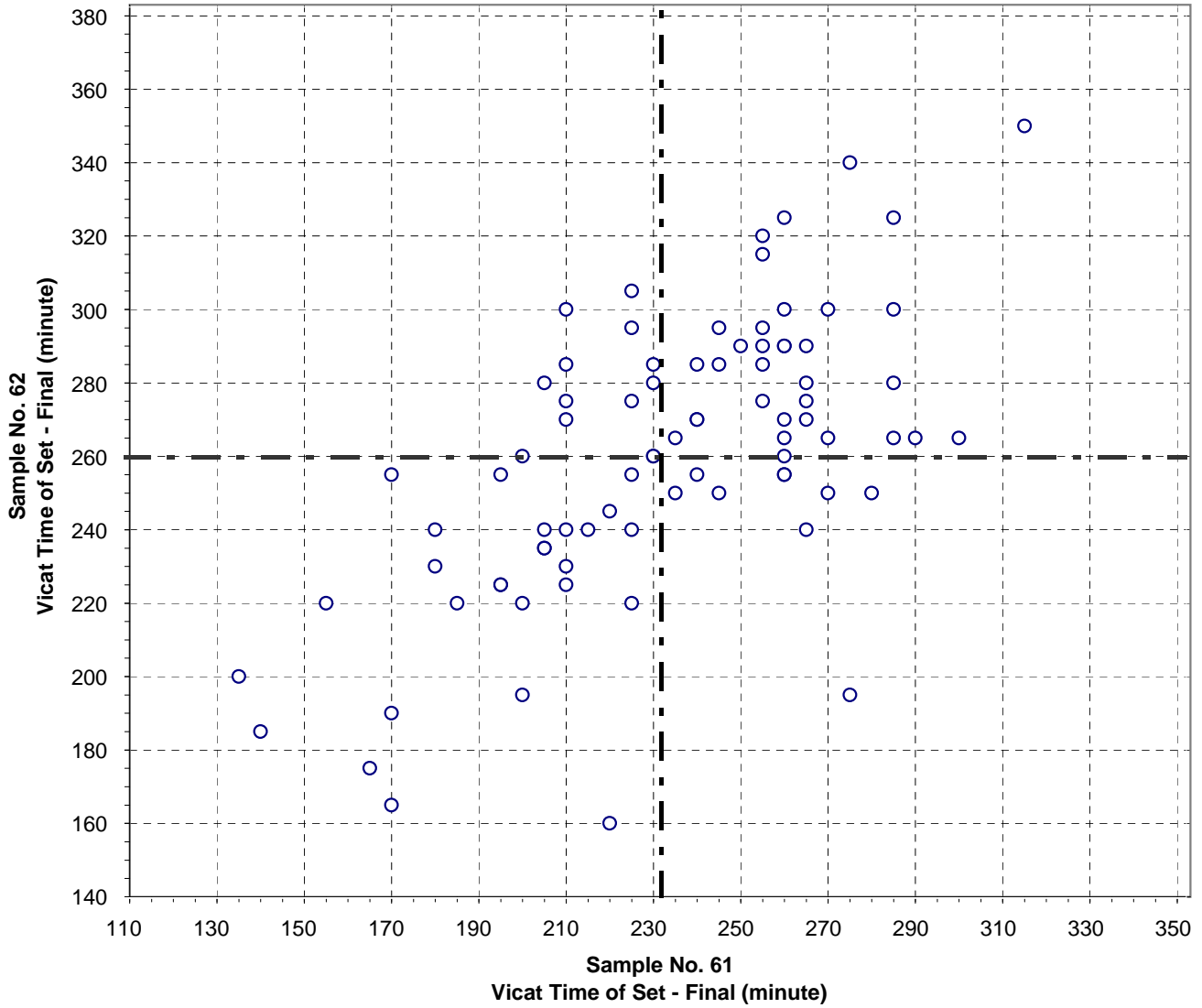
87 Points

Sample No. 61 Ave 123 S.D. 21.1 C.V. 17.1

Sample No. 62 Ave 146 S.D. 39.1 C.V. 26.7

Labs off Diagram: 255

CCRL Proficiency Sample Program
Vicat Time of Set - Final
BLENDED CEMENT Samples No. 61 and No. 62



Test No. 121

Vicat Time of Set - Final

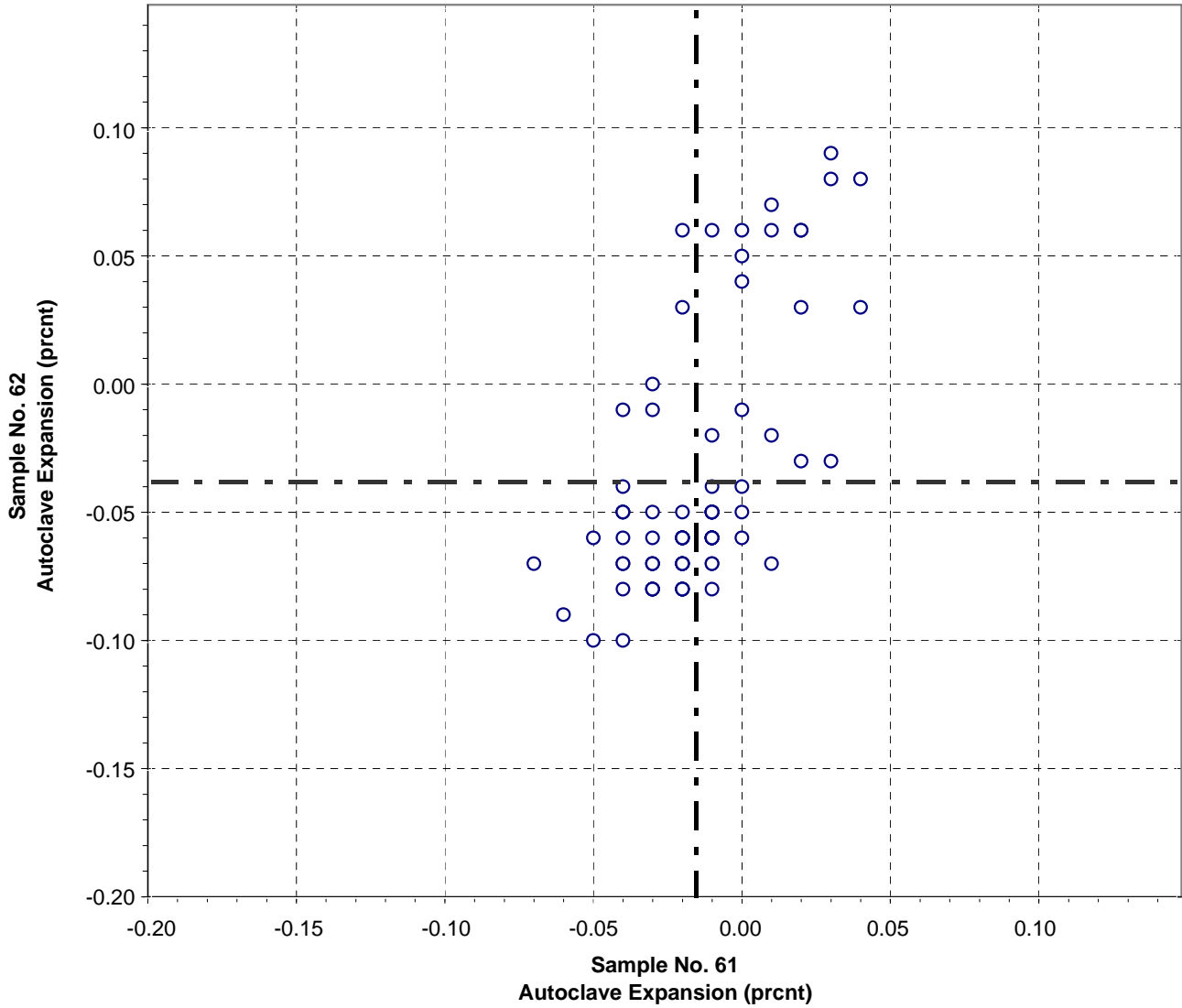
83 Points

Sample No. 61 Ave 233 S.D. 37.4 C.V. 16.1

Sample No. 62 Ave 260 S.D. 37.9 C.V. 14.5

Labs eliminated: 126, 255

**CCRL Proficiency Sample Program
Autoclave Expansion
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 160

Autoclave Expansion

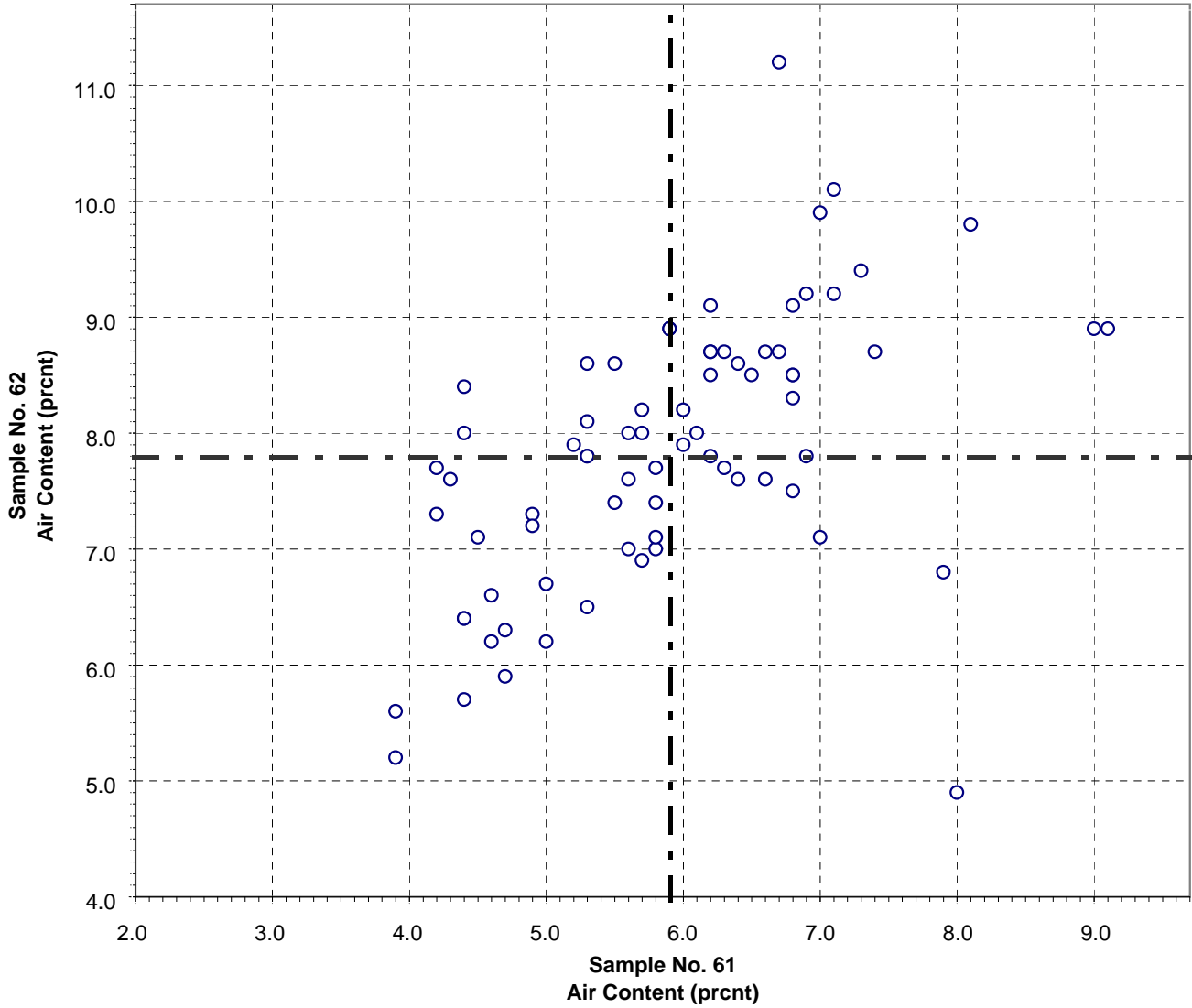
81 Points

Sample No. 61 Ave -0.01 S.D. 0.022 C.V. -146

Sample No. 62 Ave -0.04 S.D. 0.050 C.V. -133

Labs eliminated: 181

**CCRL Proficiency Sample Program
Air Content
BLENDED CEMENT Samples No. 61 and No. 62**

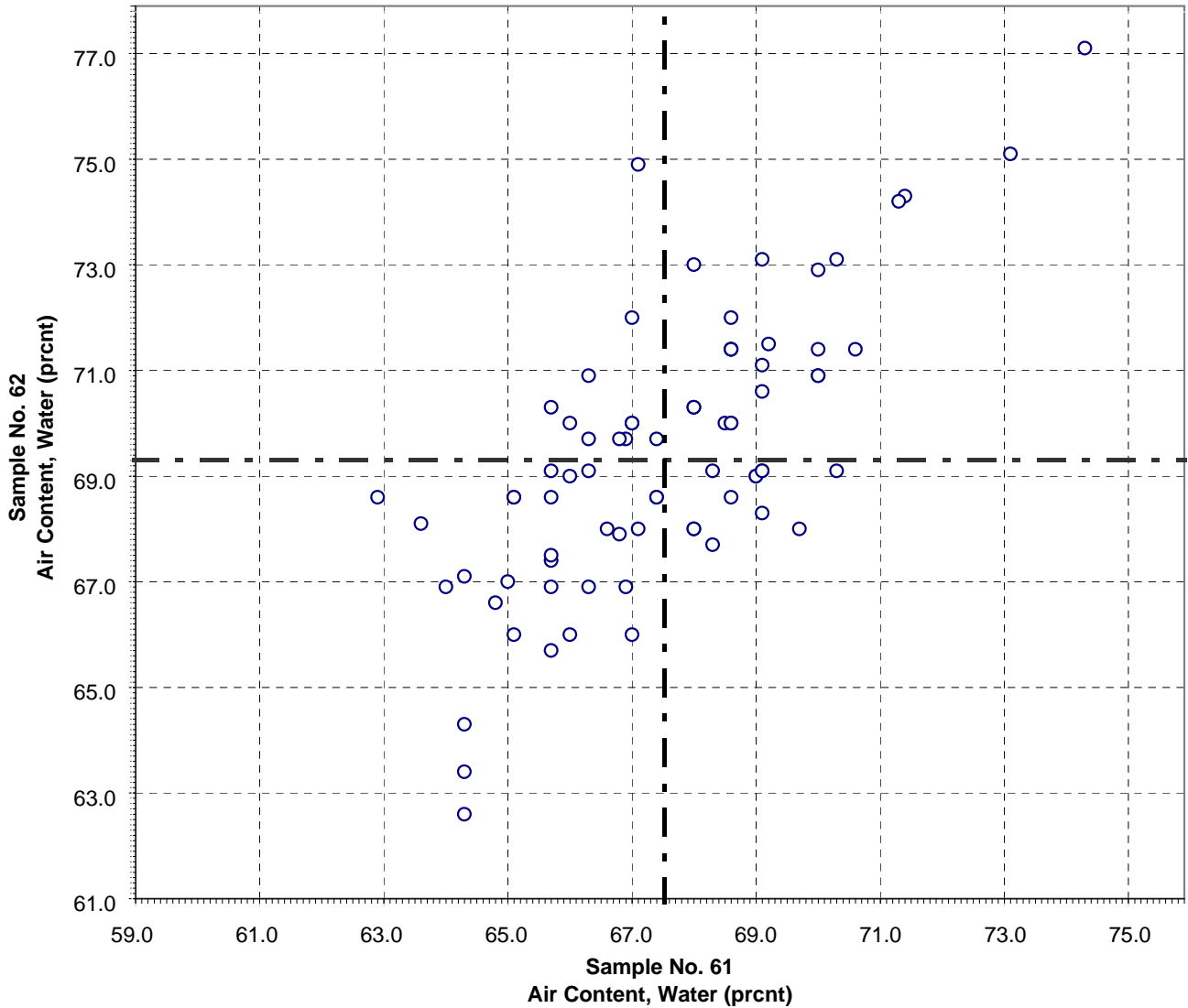


Test No. 170 Air Content 74 Points

Sample No. 61	Ave 5.9	S.D. 1.14	C.V. 19.3
Sample No. 62	Ave 7.8	S.D. 1.17	C.V. 14.9

Labs eliminated: 23

**CCRL Proficiency Sample Program
Air Content - % Water
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 180

Air Content - % Water

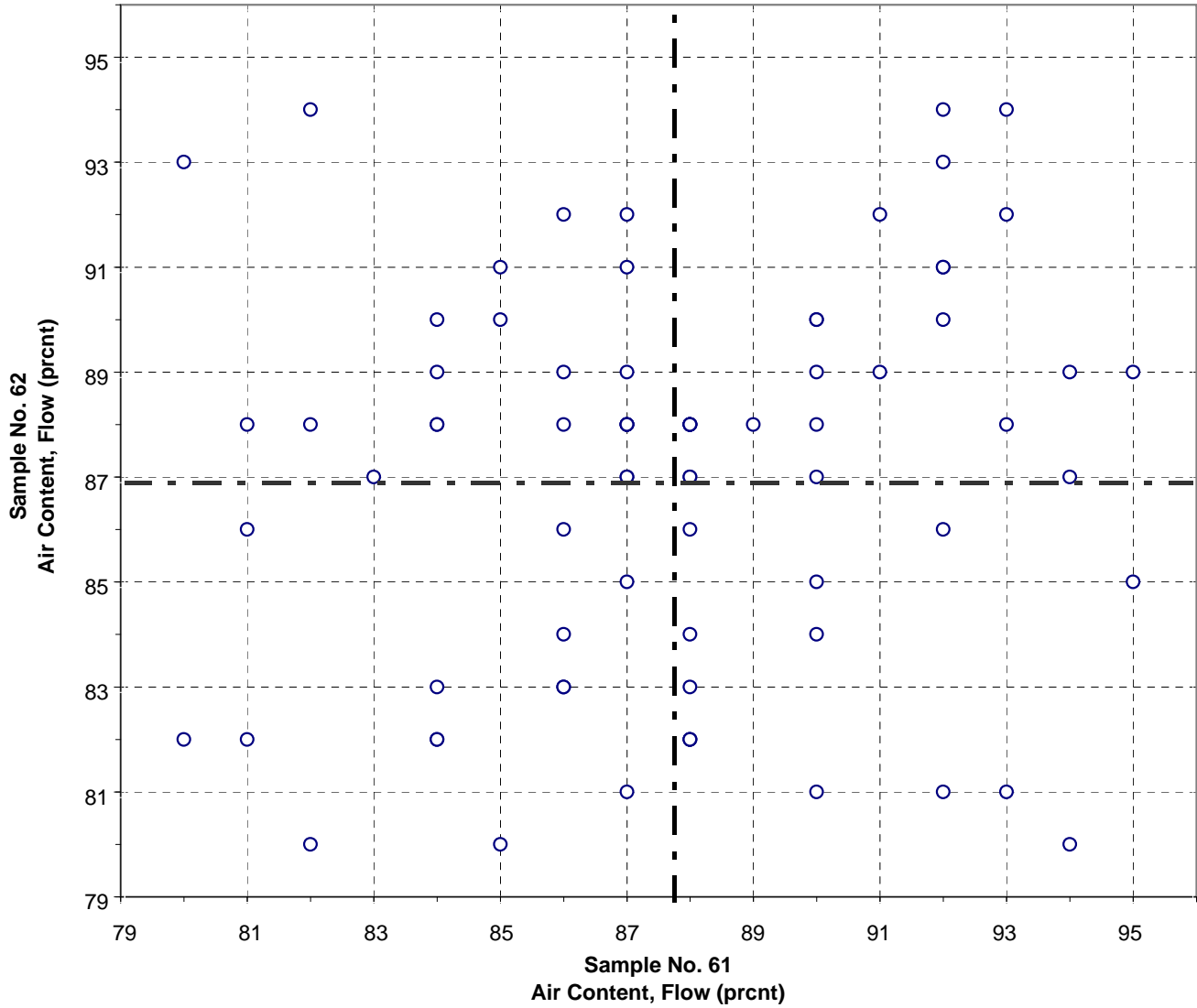
76 Points

Sample No. 61 Ave 67.5 S.D. 2.18 C.V. 3.23

Sample No. 62 Ave 69.4 S.D. 2.60 C.V. 3.75

Labs eliminated: 23, 1379

CCRL Proficiency Sample Program
Air Content - Flow
BLENDED CEMENT Samples No. 61 and No. 62



Test No. 190

Air Content - Flow

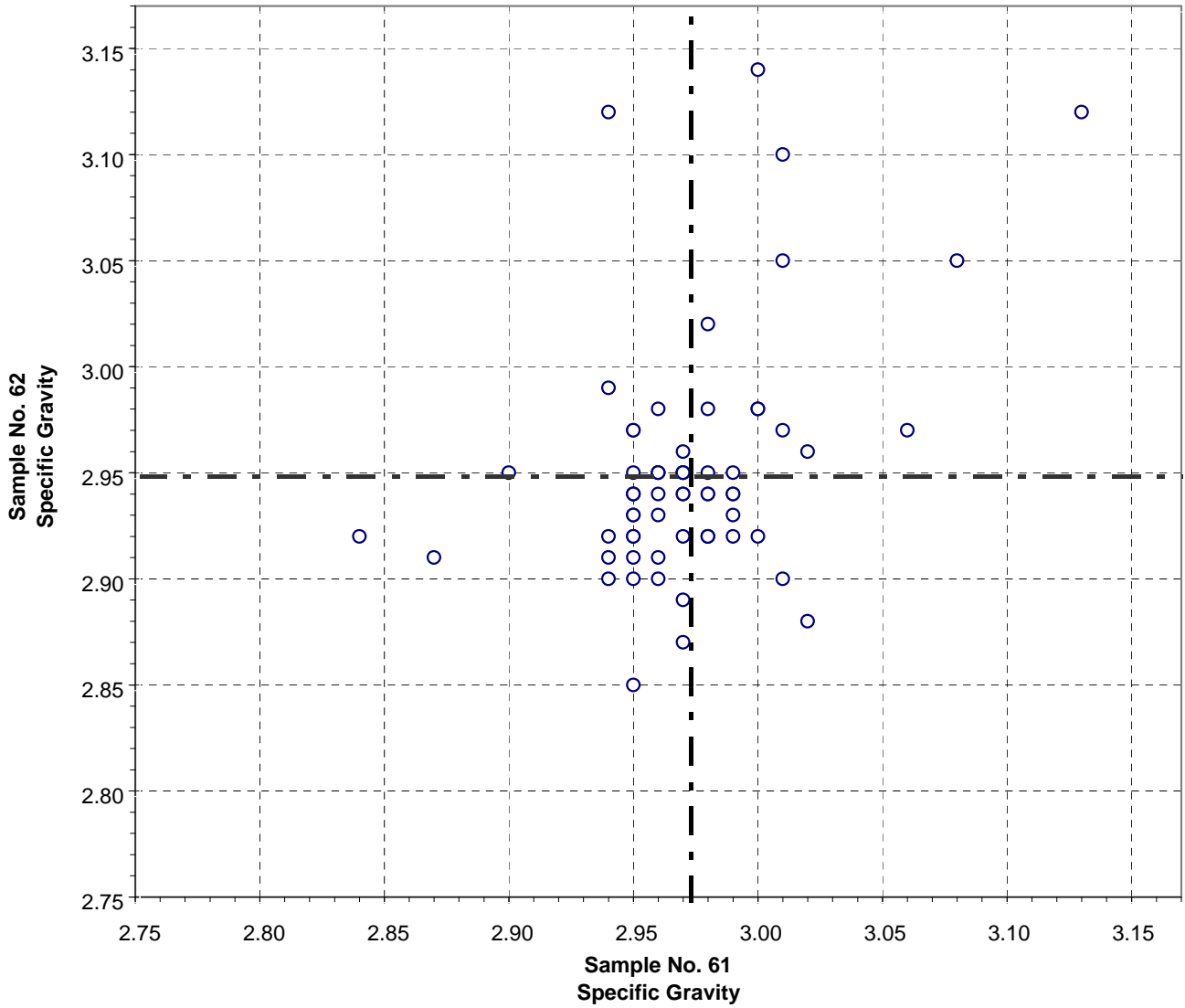
77 Points

Sample No. 61 Ave 88 S.D. 3.72 C.V. 4.24

Sample No. 62 Ave 87 S.D. 3.71 C.V. 4.26

Labs eliminated: 1379

**CCRL Proficiency Sample Program
Specific Gravity
BLENDED CEMENT Samples No. 61 and No. 62**

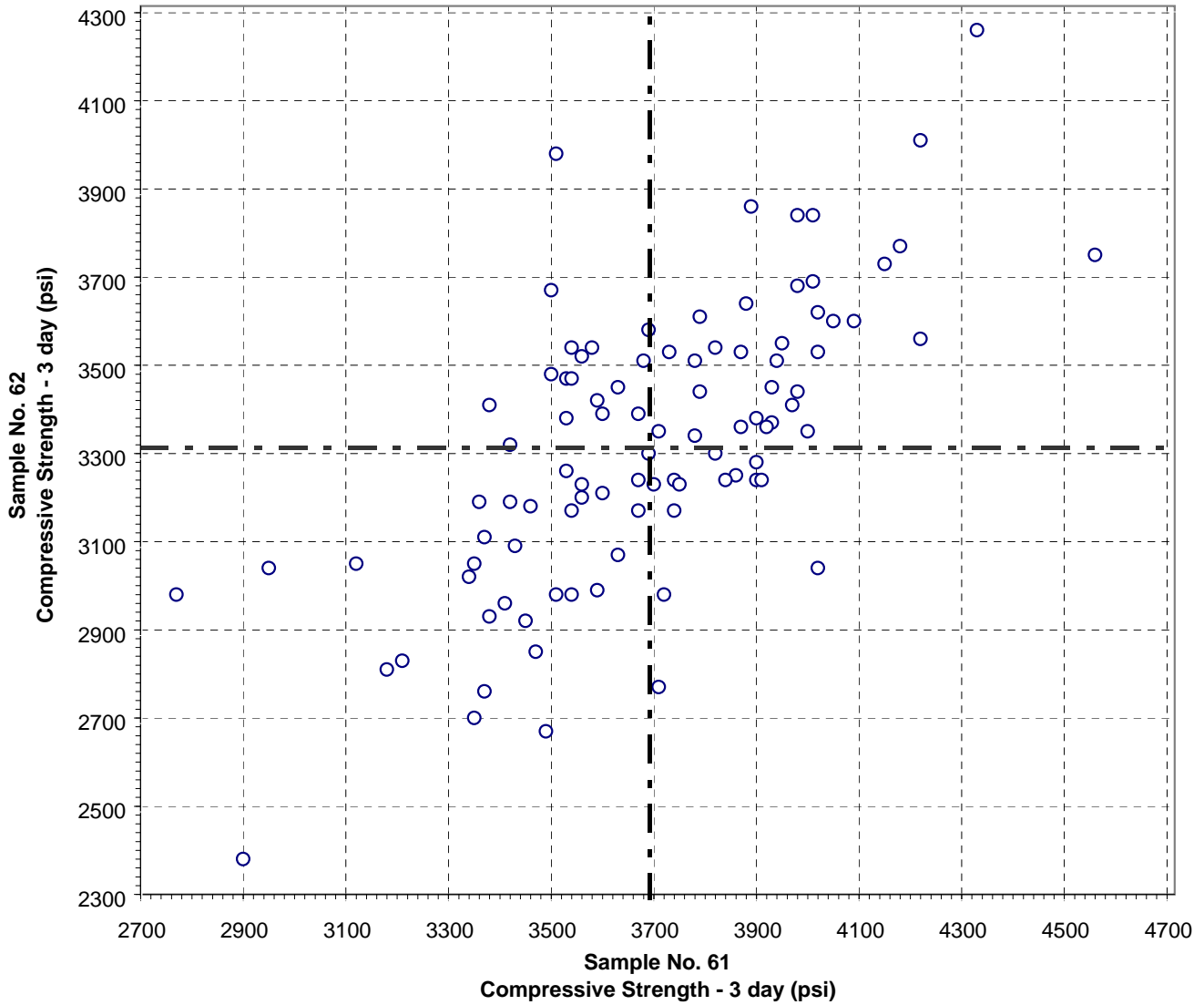


Test No. 310 Specific Gravity 65 Points

Sample No. 61 Ave 2.97 S.D. 0.041 C.V. 1.37
 Sample No. 62 Ave 2.95 S.D. 0.056 C.V. 1.9

Labs eliminated: 1379, 39, 691, 2477, 3287

**CCRL Proficiency Sample Program
Compressive Strength - 3 day
BLENDED CEMENT Samples No. 61 and No. 62**



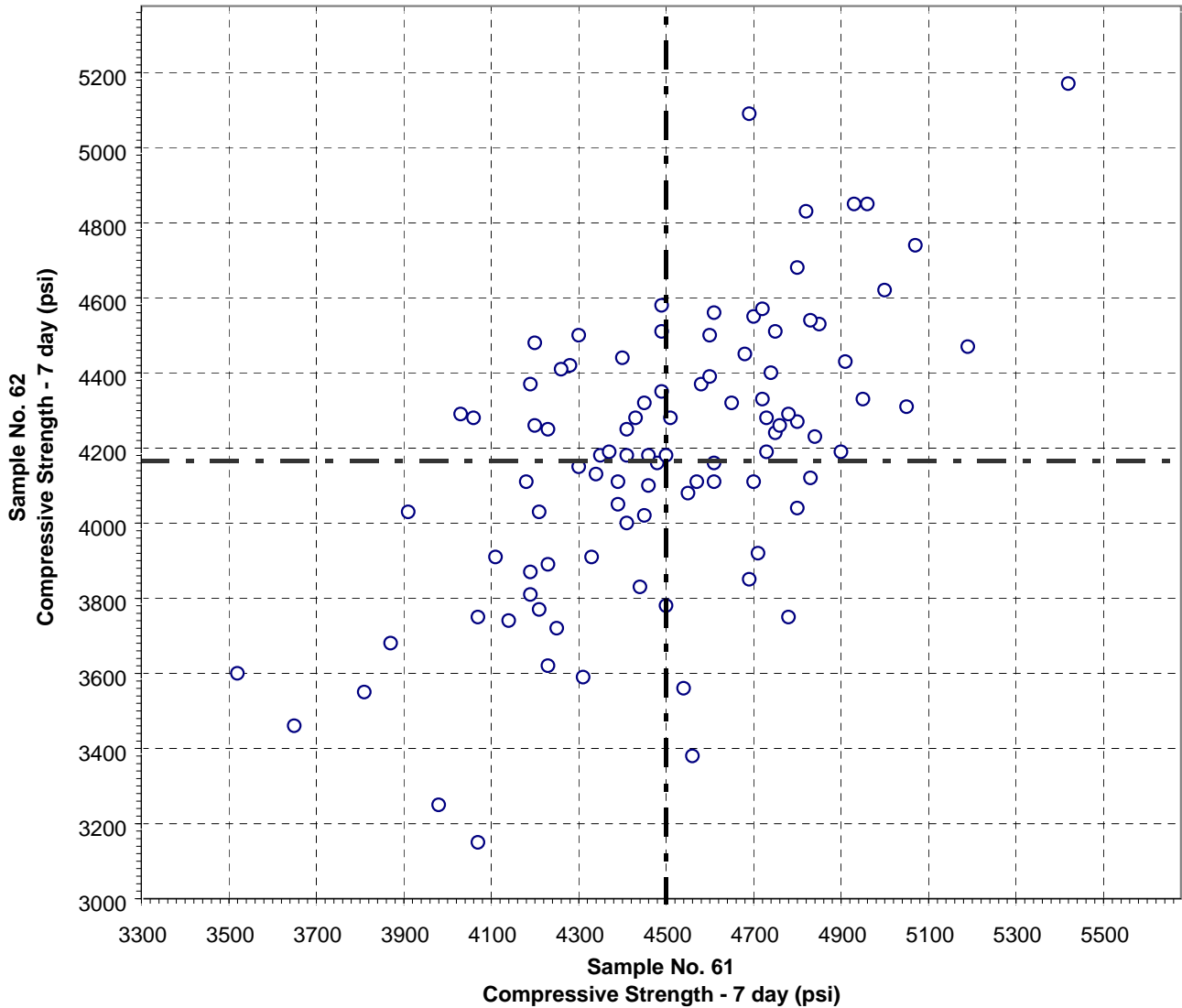
Test No. 200 Compressive Strength - 3 day 96 Points

Sample No. 61 Ave 3689 S.D. 304 C.V. 8.24

Sample No. 62 Ave 3326 S.D. 318 C.V. 9.56

Labs eliminated: 169, 2360

**CCRL Proficiency Sample Program
Compressive Strength - 7 day
BLENDED CEMENT Samples No. 61 and No. 62**



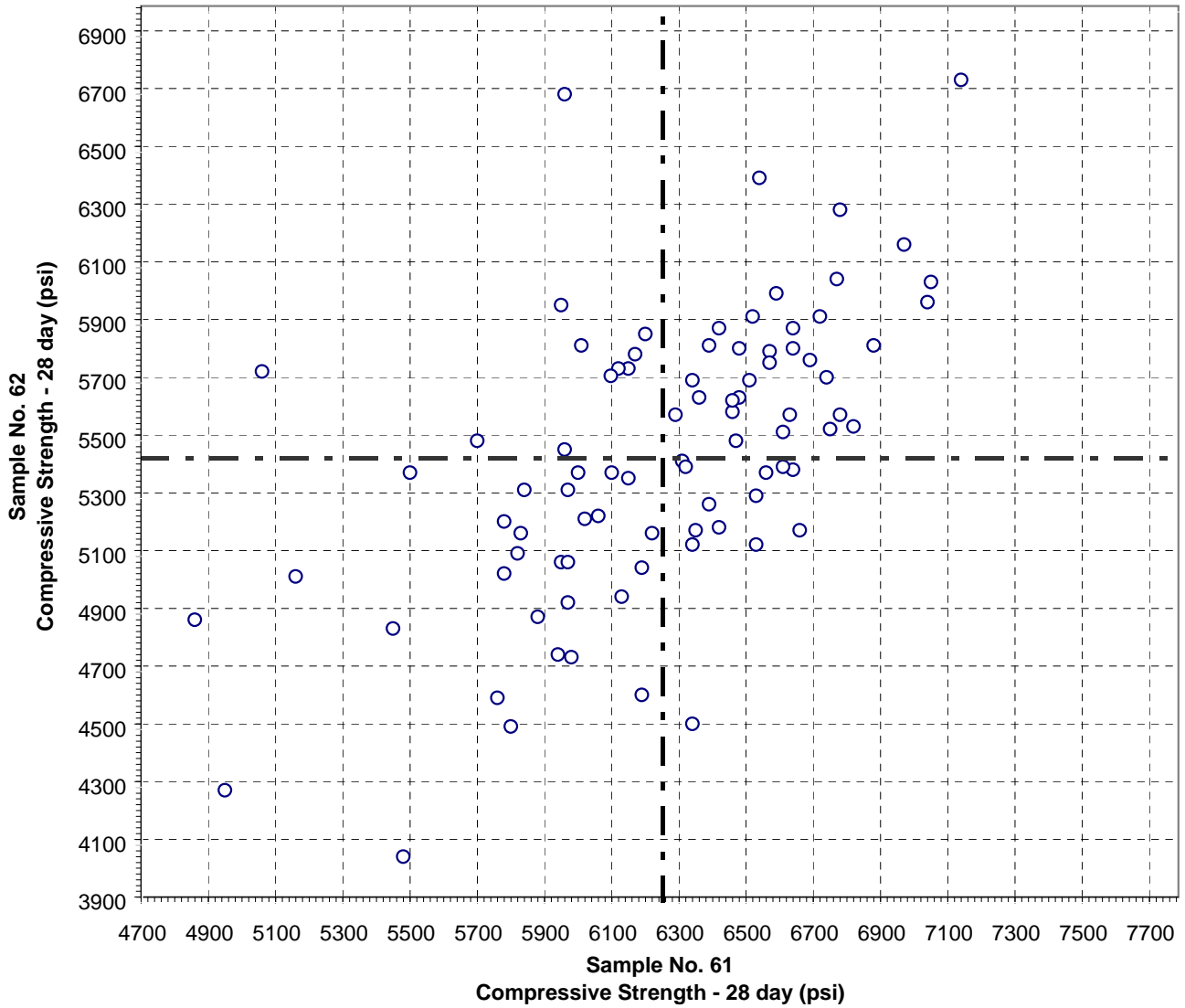
Test No. 210 Compressive Strength - 7 day 97 Points

Sample No. 61 Ave 4497 S.D. 331 C.V. 7.37

Sample No. 62 Ave 4180 S.D. 371 C.V. 8.87

Labs eliminated: 2360

**CCRL Proficiency Sample Program
Compressive Strength - 28 day
BLENDED CEMENT Samples No. 61 and No. 62**

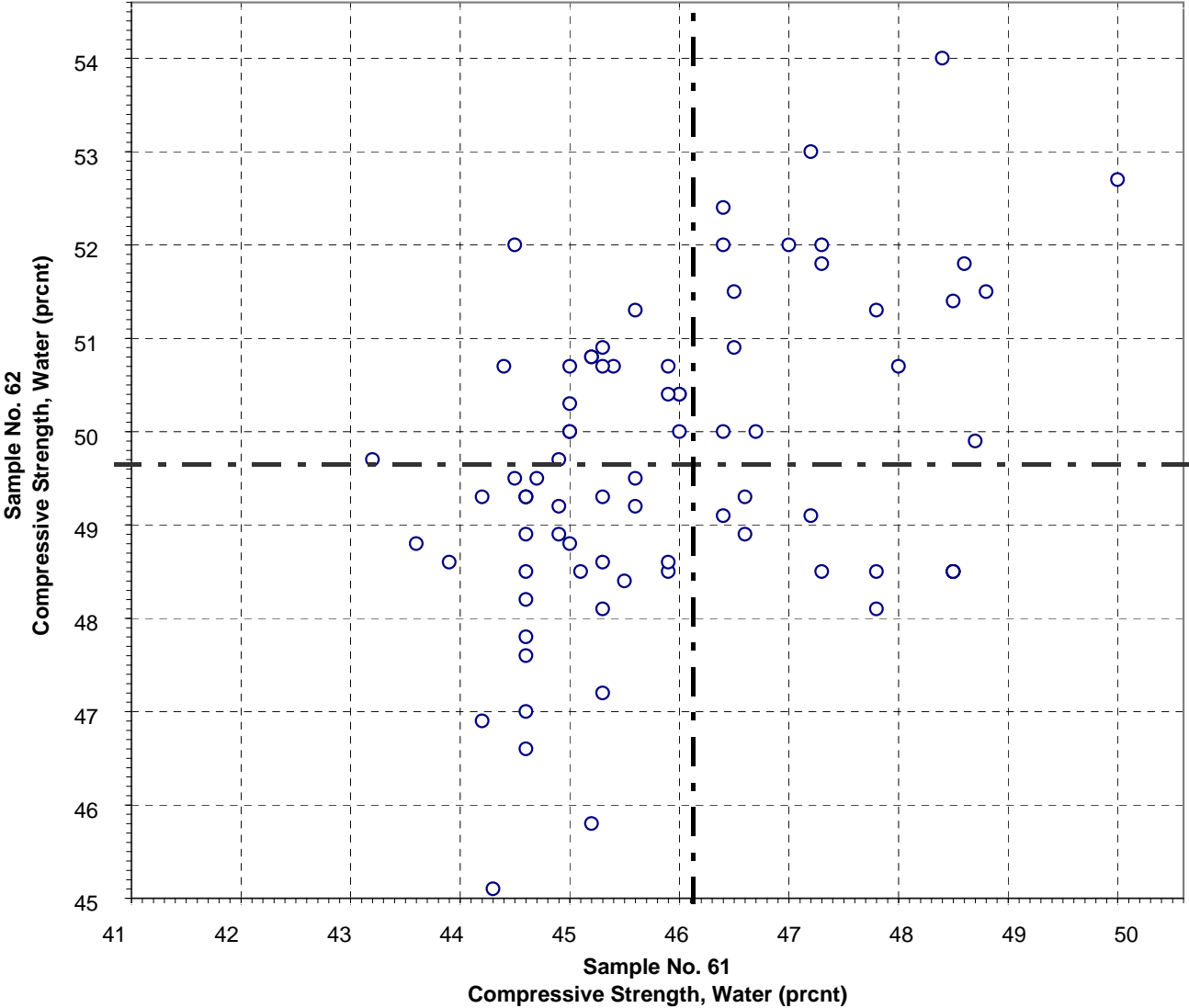


Test No. 211 Compressive Strength - 28 day 86 Points

Sample No. 61 Ave 6250 S.D. 463 C.V. 7.41
 Sample No. 62 Ave 5440 S.D. 492 C.V. 9.04

Labs eliminated: 51, 2360

CCRL Proficiency Sample Program
Compressive Strength - % Water
BLENDED CEMENT Samples No. 61 and No. 62

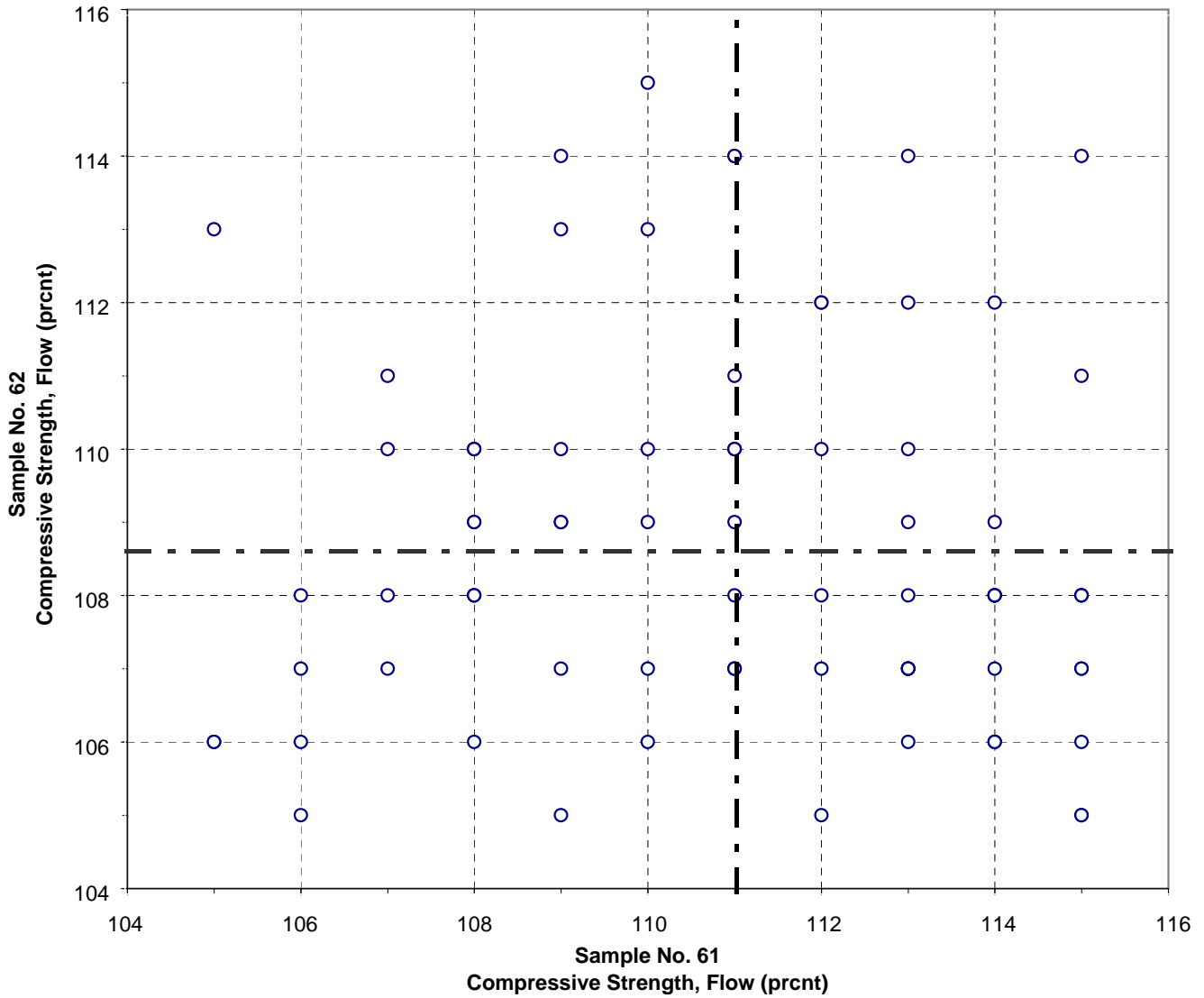


Test No. 220 Compressive Strength - % Water 80 Points

Sample No. 61 Ave 46.2 S.D. 3.53 C.V. 7.6
Sample No. 62 Ave 49.7 S.D. 3.85 C.V. 7.7

Labs off Diagram: 101, 309, 691, 1323, 2477, 3297

**CCRL Proficiency Sample Program
Compressive Strength - Flow
BLENDED CEMENT Samples No. 61 and No. 62**



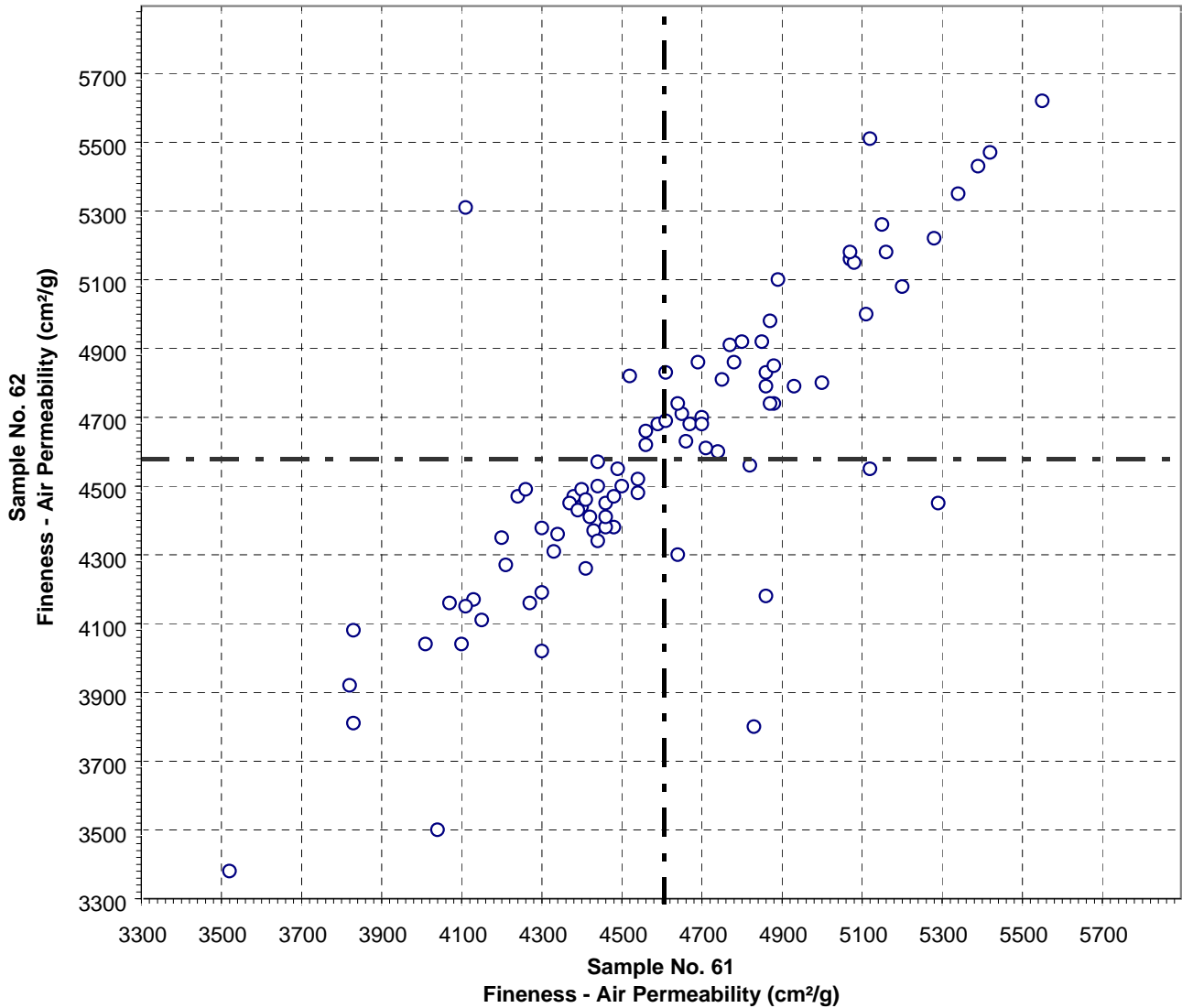
Test No. 230 Compressive Strength - Flow 82 Points

Sample No. 61 Ave 111 S.D. 2.9 C.V. 2.6

Sample No. 62 Ave 109 S.D. 2.5 C.V. 2.3

Labs eliminated: 14, 22, 201, 289, 698, 23, 2477

**CCRL Proficiency Sample Program
Fineness - Air Permeability
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 270

Fineness - Air Permeability

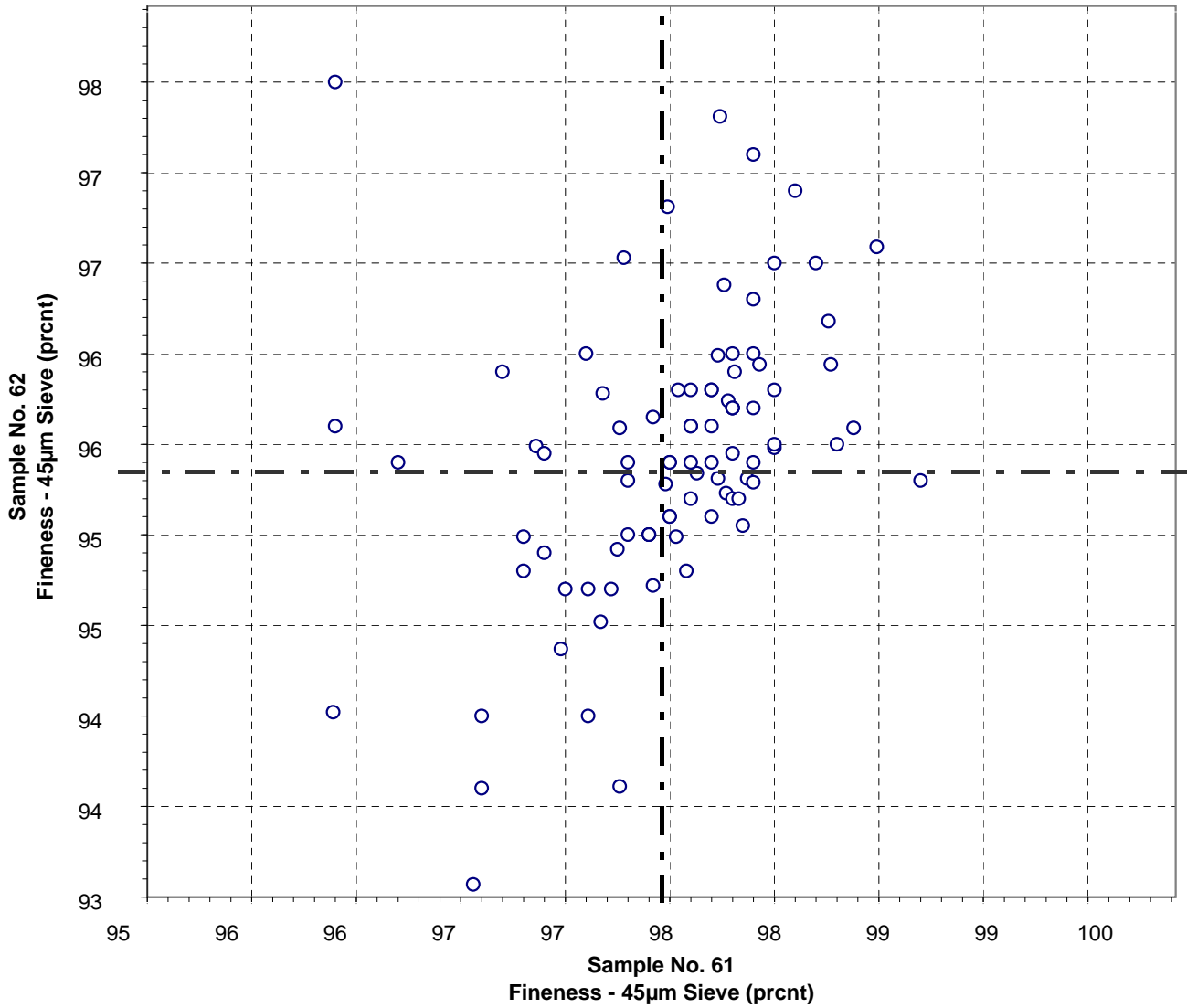
91 Points

Sample No. 61 Ave 4603 S.D. 395 C.V. 8.6

Sample No. 62 Ave 4593 S.D. 426 C.V. 9.3

Labs eliminated: 34

**CCRL Proficiency Sample Program
 Fineness - 45µm % Passing
 BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 281 Fineness - 45µm % Passing 88 Points

Sample No. 61 Ave 97.50 S.D. 0.544 C.V. 0.56
 Sample No. 62 Ave 95.39 S.D. 0.988 C.V. 1.04

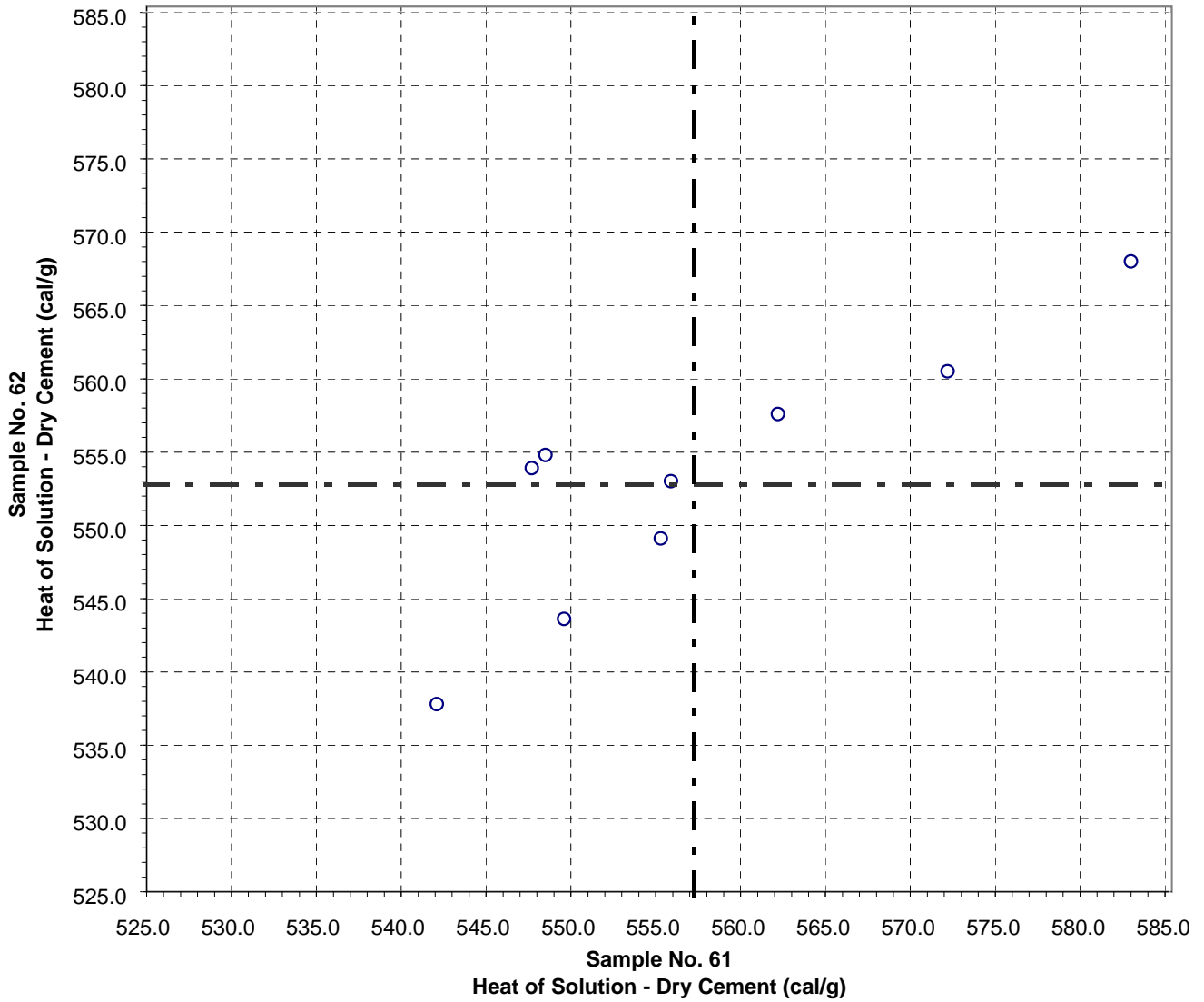
Labs off Diagram: 958

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 61 and No. 62
Final Report - Heat of Hydration Results
May 16, 2008

SUMMARY OF RESULTS

Test	#Labs	Sample No. 61			Sample No. 62		
		Average	S.D.	C.V.	Average	S.D.	C.V.
Heat Solution. Dry cal/g	9	557.4	13.1	2.35	553.1	9.0	1.62
Heat Sol, 7 day cal/g	9	485.4	18.8	3.88	478.9	12.7	2.64
Heat Sol, 28 day cal/g	7	482.0	18.0	3.74	473.2	12.8	2.70
Heat Hyd, 7 day cal/g	9	75.7	10.1	13.34	74.5	7.3	9.80
Heat Hyd, 28 day cal/g	7	83.3	12.1	14.5	81.4	10.6	13.0

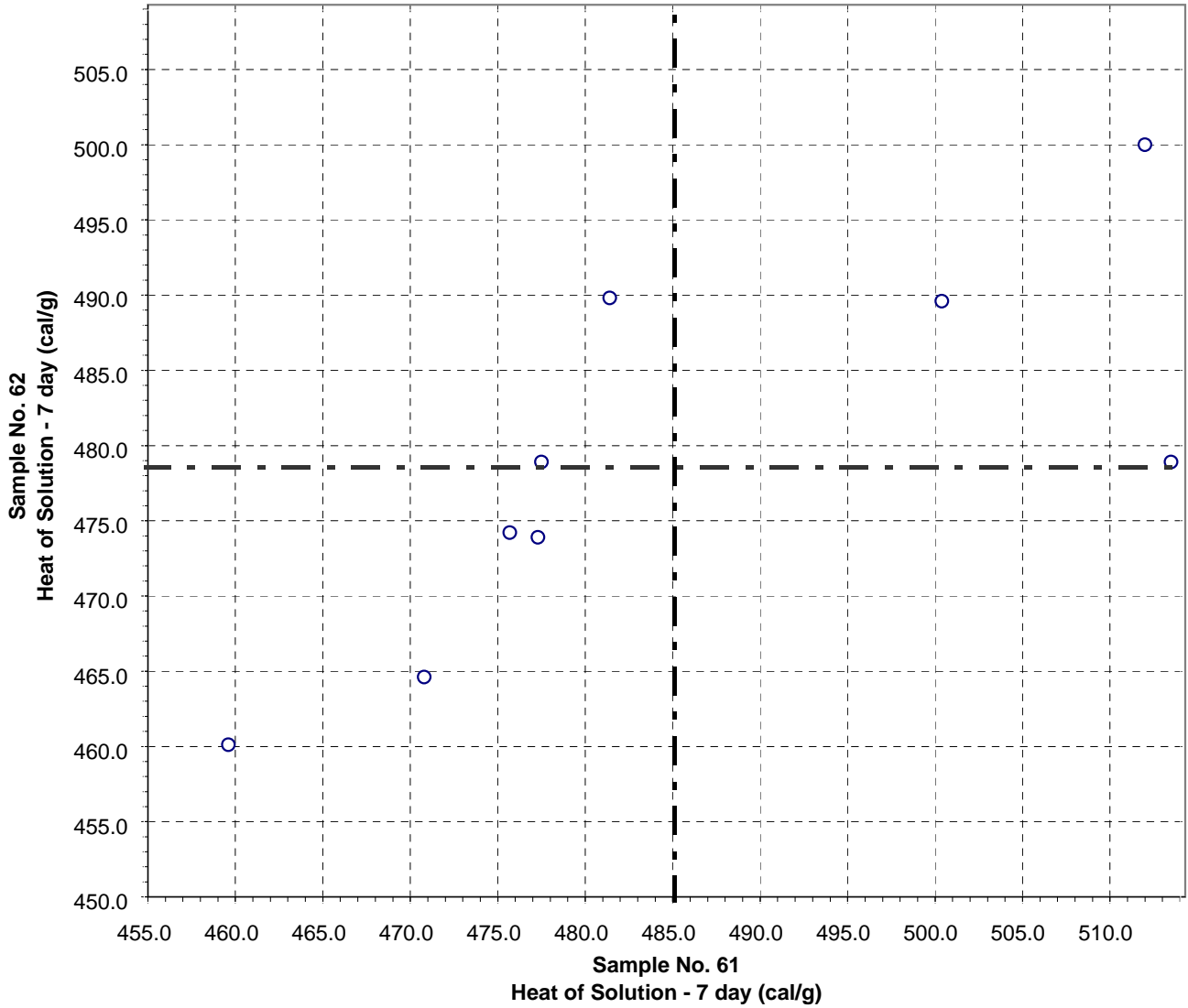
**CCRL Proficiency Sample Program
Heat of Solution - Dry Cement
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 291 Heat of Solution - Dry Cement 9 Points

Sample No. 61	Ave 557.4	S.D. 13.10	C.V. 2.35
Sample No. 62	Ave 553.1	S.D. 8.95	C.V. 1.62

CCRL Proficiency Sample Program
Heat of Solution - 7 day
BLENDED CEMENT Samples No. 61 and No. 62



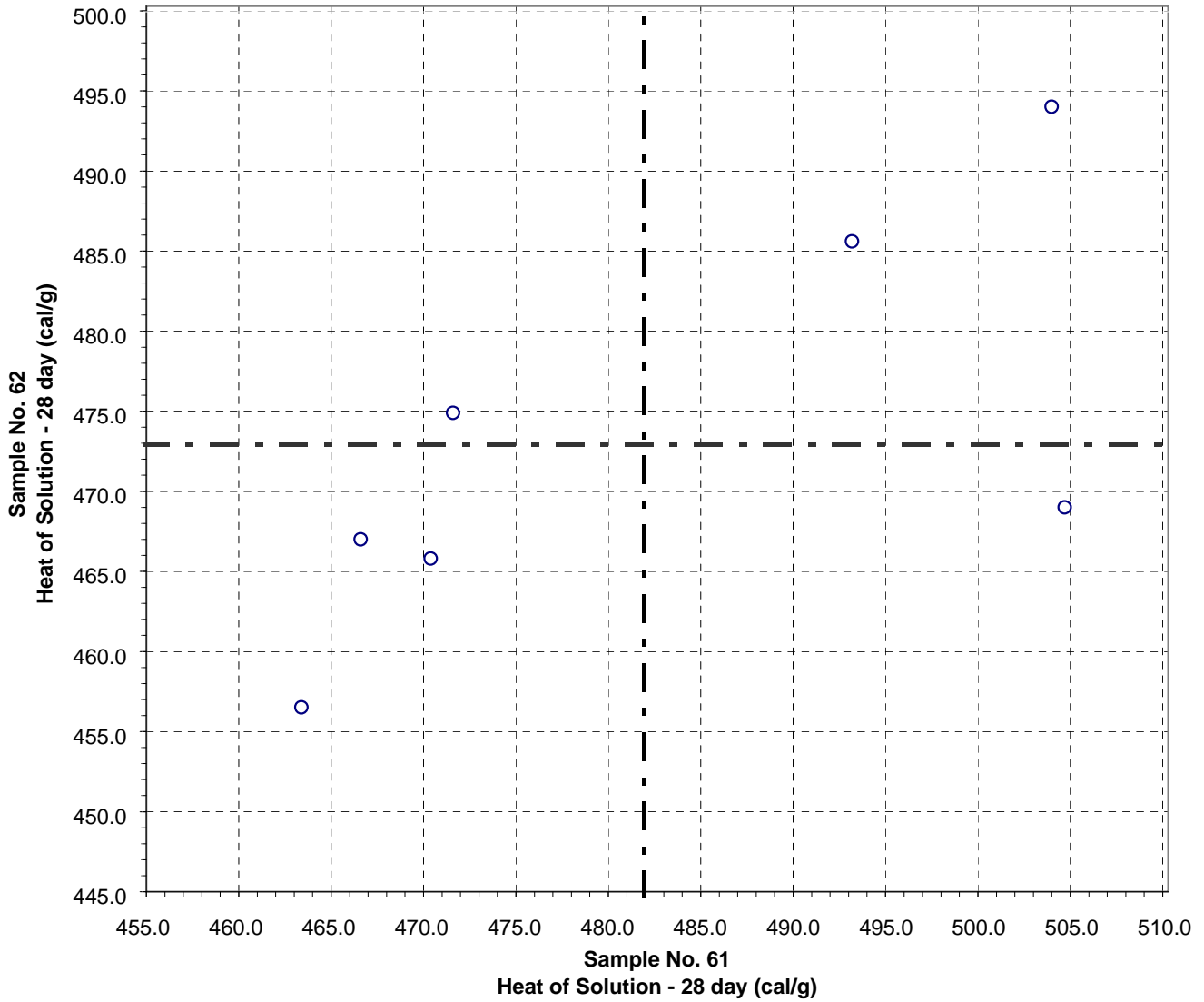
Test No. 292

Heat of Solution - 7 day

9 Points

Sample No. 61	Ave 485.4	S.D. 18.84	C.V. 3.9
Sample No. 62	Ave 478.9	S.D. 12.67	C.V. 2.6

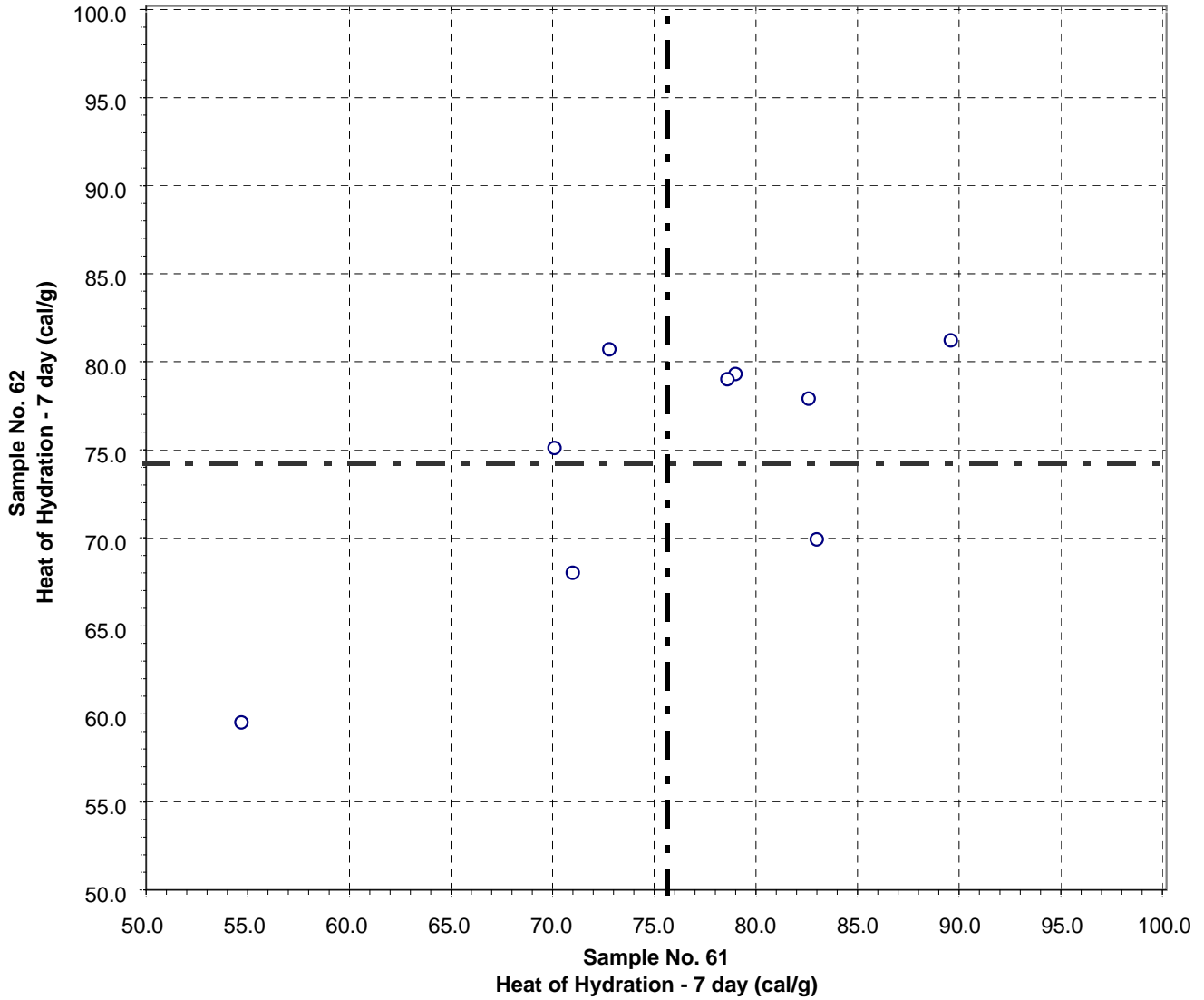
**CCRL Proficiency Sample Program
Heat of Solution - 28 day
BLENDED CEMENT Samples No. 61 and No. 62**



Test No. 301 Heat of Solution - 28 day 7 Points

Sample No. 61	Ave 482	S.D. 18	C.V. 3.74
Sample No. 62	Ave 473	S.D. 12.8	C.V. 2.7

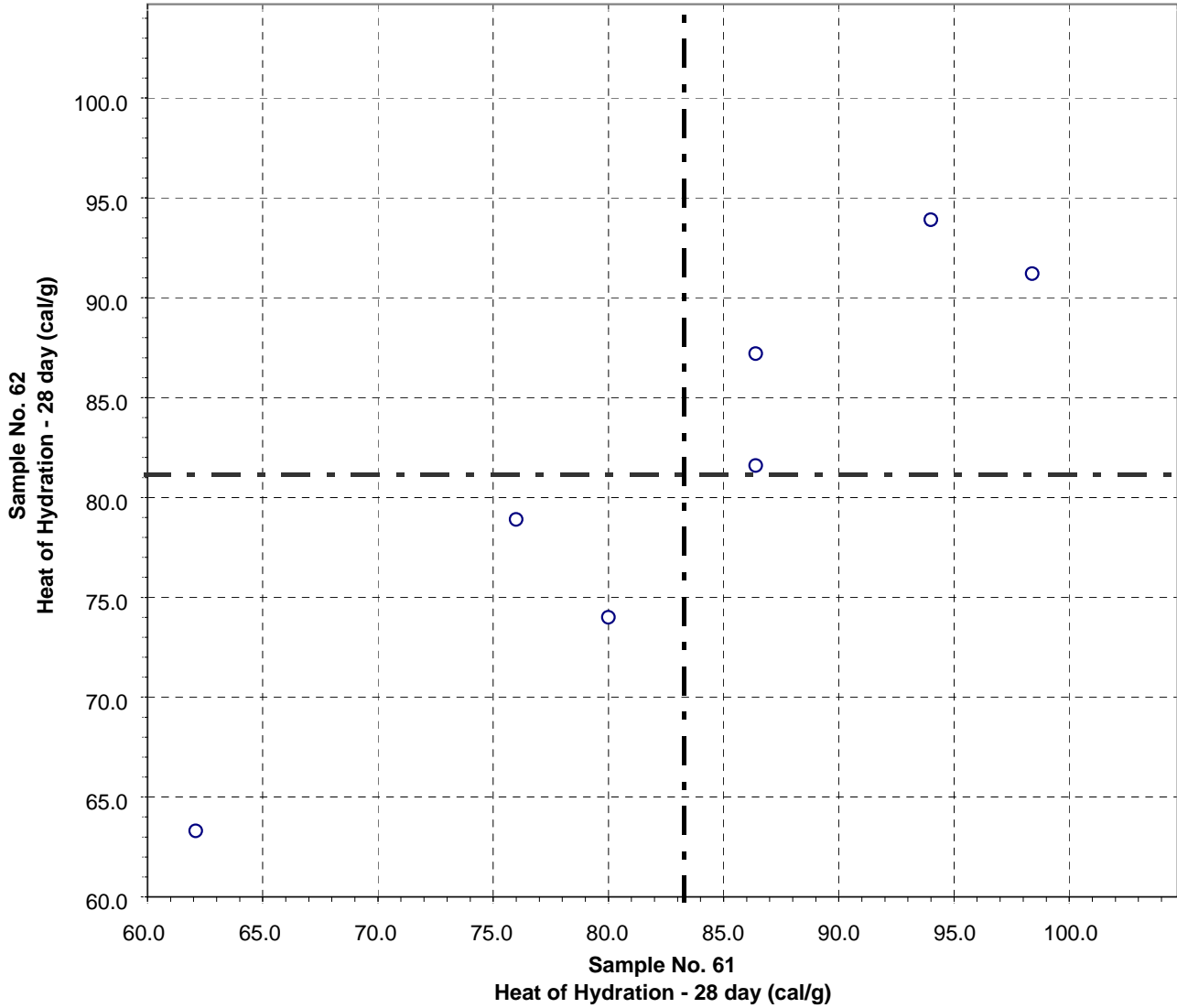
CCRL Proficiency Sample Program
Heat of Hydration - 7 day
BLENDED CEMENT Samples No. 61 and No. 62



Test No. 290 Heat of Hydration - 7 day 9 Points

Sample No. 61	Ave 75.7	S.D. 10.10	C.V. 13.3
Sample No. 62	Ave 74.5	S.D. 7.31	C.V. 9.8

CCRL Proficiency Sample Program
Heat of Hydration - 28 day
BLENDED CEMENT Samples No. 61 and No. 62



Test No. 300 Heat of Hydration - 28 day 7 Points

Sample No. 61	Ave 83.3	S.D. 12.08	C.V. 14.5
Sample No. 62	Ave 81.4	S.D. 10.60	C.V. 13.0