CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Blended Cement Proficiency Samples
Number 65 and Number 66

May 2010

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

May 7, 2010

TO: Participants in the CCRL Blended Cement Proficiency Sample Program

SUBJECT: Final Report on Blended Cement Proficiency Samples No. 65 and No. 66

Following is the final report for the current pair of CCRL **Blended Cement** Proficiency Samples which were distributed in February 2010. Both cements were an ASTM C595 Blended Hydraulic Cement. Sample No 65 was a Type IP (12) and No. 66 was a Type IP (25).

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 of CCRL EXTRA Samples.

It is presently anticipated that the next Blended Cement Proficiency Samples will be distributed in February 2011.

Sincerely,

Robin K. Haupt

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. 65 and No. 66

This letter, and the material included with it, constitute the final report, and summary of results for the current pair of Blended Cement Proficiency Samples, which were distributed in February 2010. 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.

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 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.

Participants subscribing to the primary 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. Participants in the secondary chemical analysis should note that laboratory ratings are assigned using primary chemical statistics.

Please note that individual laboratory ratings were not given for the flow of air content mortar (test no. 190)

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[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.*

and compressive strength mortar (test no. 230). Air content flows in the range of 87.5 ± 7.5 are satisfactory, labs with flow values outside this range will be flagged as a "Labs Eliminated" or "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. 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

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. Each laboratory will receive a complete set of diagrams according to their subscription to the given program.

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 ±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. 65 and No. 66
Final Report - Chemical Results
May 7, 2010

SUMMARY OF RESULTS

Test		#Labs	Sample No. 65 Average	S.D.	C.V.	Sample No. 66 Average	S.D.	C.V.
Silicon Dioxide	%	87	20.68	1.10	5.3	28.50	1.70	6.1
Silicon Dioxide	%	* 80	20.57	0.25	1.2	28.46	0.71	2.5
Aluminum Oxide	%	86	4.90	0.48	9.8	8.17	0.72	8.8
Aluminum Oxide	%	* 79	4.88	0.12	2.4	8.27	0.22	2.6
Ferric Oxide	%	87	2.80	0.28	10.0	4.28	0.33	7.8
Ferric Oxide	%	* 81	2.75	0.06	2.3	4.32	0.19	4.5
Calcium Oxide	%	85	60.42	1.50	2.5	50.82	1.70	3.3
Calcium Oxide	%	* 79	60.53	0.55	0.92	50.45	0.72	1.4
Magnesium Oxide	%	86	2.78	0.23	8.2	2.03	0.19	9.3
Magnesium Oxide	%	* 79	2.79	0.08	2.8	2.01	0.10	5.0
Sulfur Trioxide	%	87	3.75	0.26	7.0	2.49	0.26	10.4
Sulfur Trioxide	%	* 79	3.79	0.09	2.3	2.48	0.11	4.3
Loss on Ignition	%	88	3.38	0.19	5.5	2.01	0.20	10.2
Loss on Ignition	%	* 86	3.39	0.11	3.1	2.01	0.11	5.4
Sodium Oxide	%	78	0.257	0.043	16.6	0.337	0.068	20.3
Sodium Oxide	%	* 74	0.257	0.029	11.4	0.342	0.046	13.3
Potassium Oxide	%	80	0.52	0.051	9.8	0.60	0.075	12.4
Potassium Oxide	%	* 75	0.53	0.021	3.9	0.62	0.030	4.9

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

Silicon Dioxide	51 42 52 169 24 38 3431
Aluminum Oxide	50 169 42 690 975 3431 3503
Ferric Oxide	51 169 3320 50 3431 3503
Calcium Oxide	20 50 10 169 284 3059
Magnesium Oxide	169 1715 3431 50 2251 2463 3503
Sulfur Trioxide	40 51 20 169 176 284 690 3431
Loss on Ignition	169 1715
Sodium Oxide	105 40 176 2463
Potassium Oxide	176 169 497 3320 3409

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 65 and No. 66
Final Report - Chemical Results
May 7, 2010

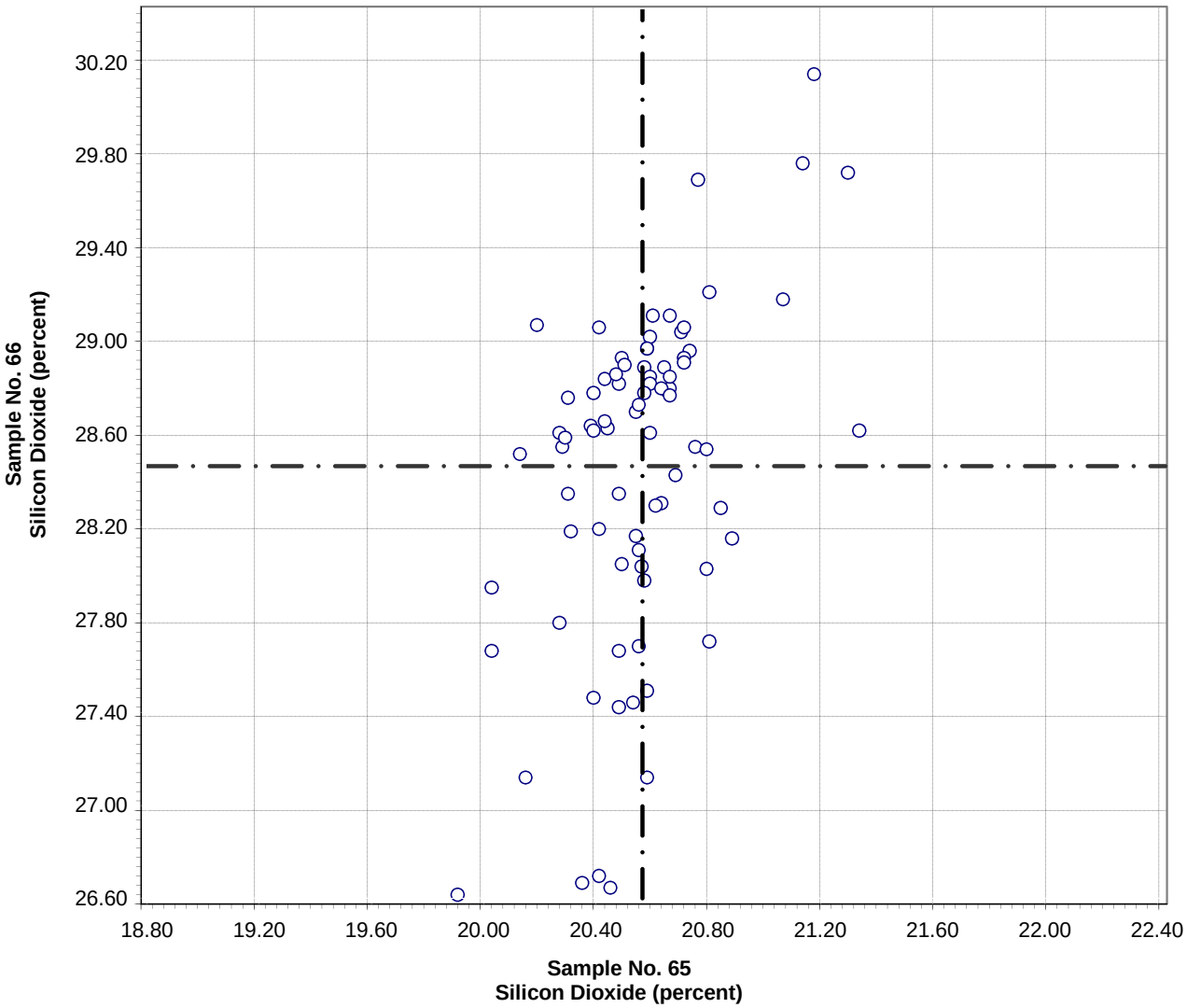
SUMMARY OF RESULTS

			Sample No. 65			Sample No. 66		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Titanium Dioxide	%	65	0.32	0.037	11.6	0.53	0.062	11.6
Titanium Dioxide	%	* 60	0.31	0.010	3.3	0.54	0.030	5.5
Phosphorous Pent	%	69	0.165	0.022	13.2	0.137	0.023	17.0
Phosphorous Pent	%	* 61	0.160	0.006	3.6	0.132	0.008	5.8
Zinc oxide	%	28	0.050	0.002	4.8	0.016	0.002	12.9
Manganic Oxide	%	51	0.112	0.008	6.9	0.093	0.011	12.2
Manganic Oxide	%	* 47	0.113	0.005	4.6	0.096	0.008	8.2
Chloride	%	31	0.040	0.019	47.9	0.005	0.004	90.9
Chloride	%	* 30	0.039	0.019	47.8	0.004	0.003	79.3
Insoluble Residue	%	74	1.78	0.37	20.6	13.69	3.65	26.7
Insoluble Residue	%	* 66	1.83	0.23	12.5	14.71	1.19	8.1
Chromium Oxide	%	29	0.014	0.004	31.8	0.013	0.006	47.2
Chromium Oxide	%	* 27	0.013	0.002	14.7	0.011	0.003	23.2

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

Titanium Dioxide	169 2462 3059 3297 3409
Phosphorous Pentoxide	2462 694 1799 20 169 2463 2465 2466
Manganic Oxide	2462 2466 2463 3409
Chloride	36
Insoluble Residue	40 51 169 181 695 698 3297 3431
Chromium Oxide	176 2462

CCRL Proficiency Sample Program
Silicon Dioxide
BLENDED CEMENT Samples No. 65 and No. 66

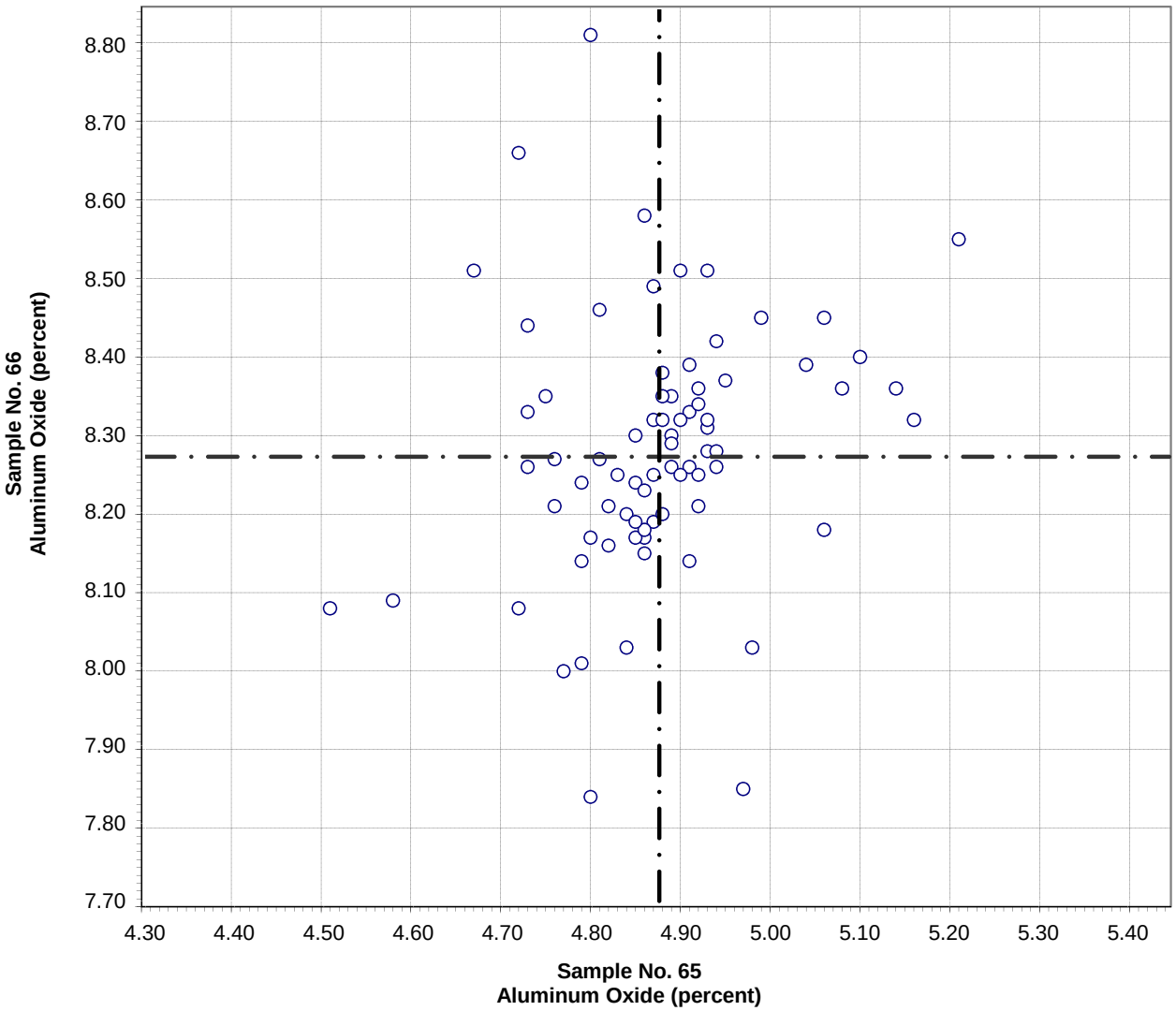


Test No. 10 Silicon Dioxide 80 Points

Sample No. 65	Ave	20.57	S.D.	0.25	C.V.	1.2
Sample No. 66	Ave	28.46	S.D.	0.71	C.V.	2.5

Labs eliminated: 51, 42, 52, 169, 24, 38, 3431

CCRL Proficiency Sample Program
Aluminum Oxide
BLENDED CEMENT Samples No. 65 and No. 66



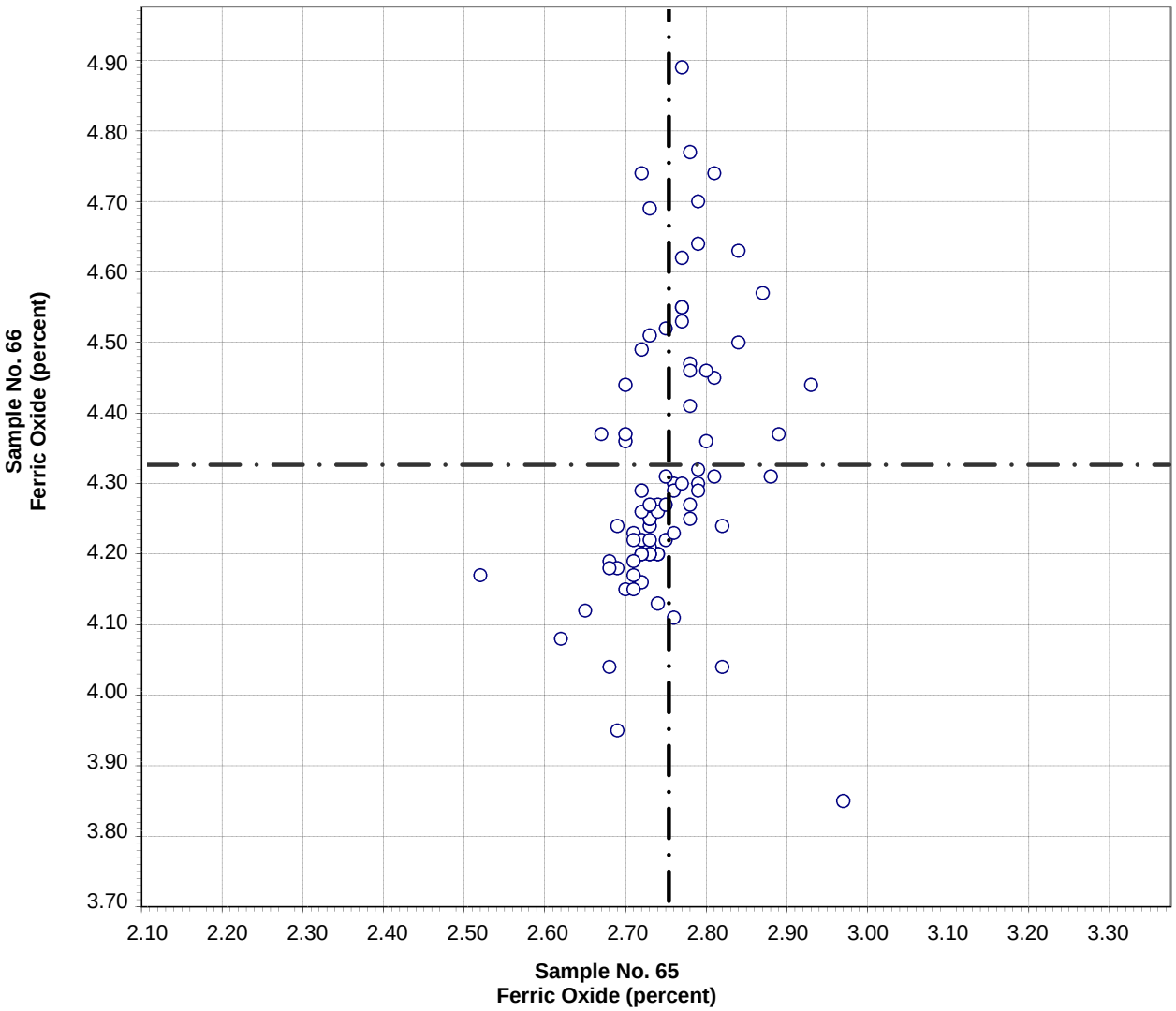
Test No. 21 Aluminum Oxide 76 Points

Sample No. 65	Ave	4.88	S.D.	0.12	C.V. 2.4
Sample No. 66	Ave	8.27	S.D.	0.22	C.V. 2.6

Labs eliminated: 50, 169, 42, 690, 975, 3431, 3503

Labs off Diagram: 126, 284, 2466

CCRL Proficiency Sample Program
Ferric Oxide
BLENDED CEMENT Samples No. 65 and No. 66

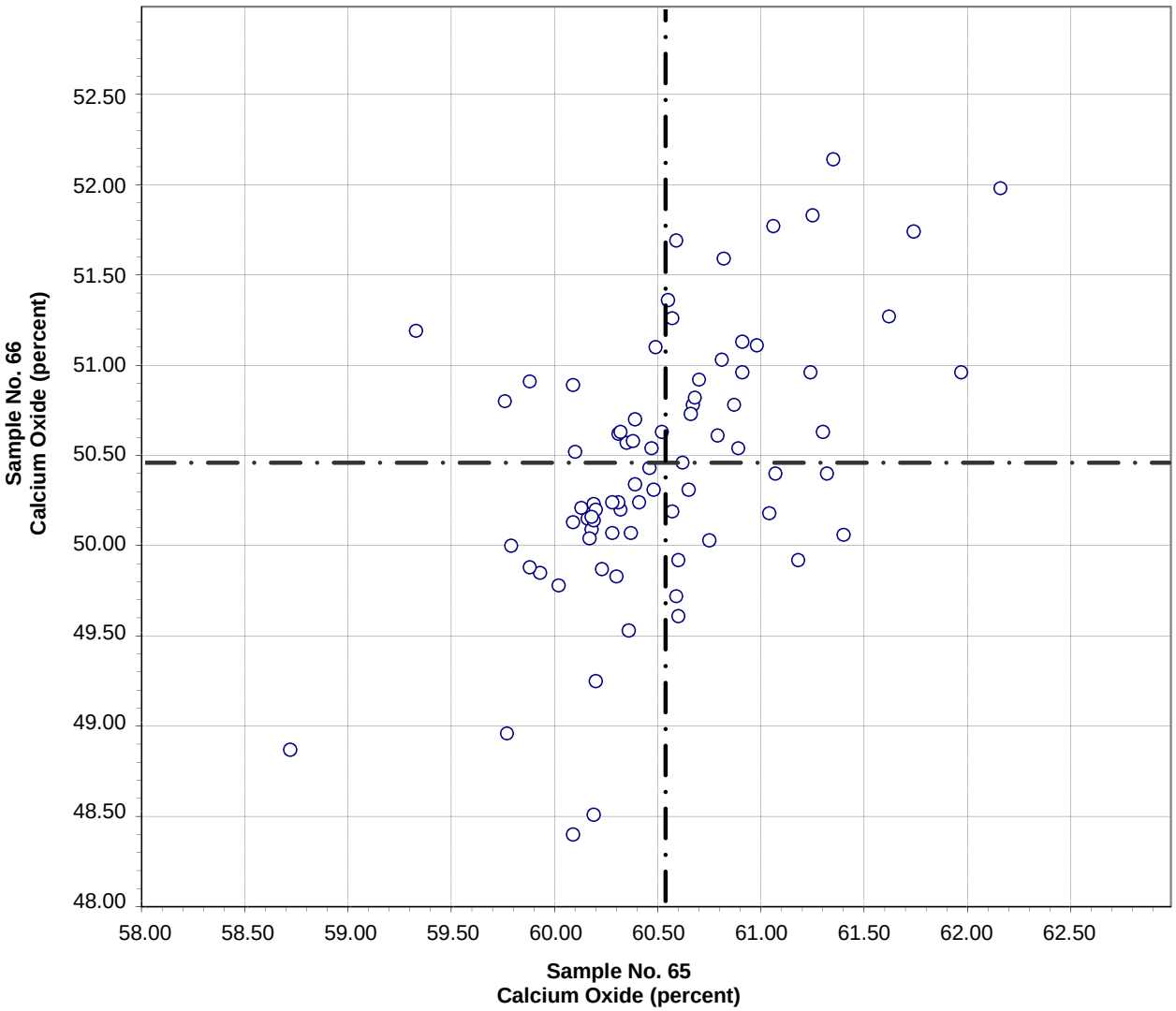


Test No. 30 Ferric Oxide 81 Points

Sample No. 65	Ave	2.75	S.D.	0.06	C.V.	2.3
Sample No. 66	Ave	4.32	S.D.	0.19	C.V.	4.5

Labs eliminated: 51, 169, 3320, 50, 3431, 3503

CCRL Proficiency Sample Program
Calcium Oxide
BLENDED CEMENT Samples No. 65 and No. 66

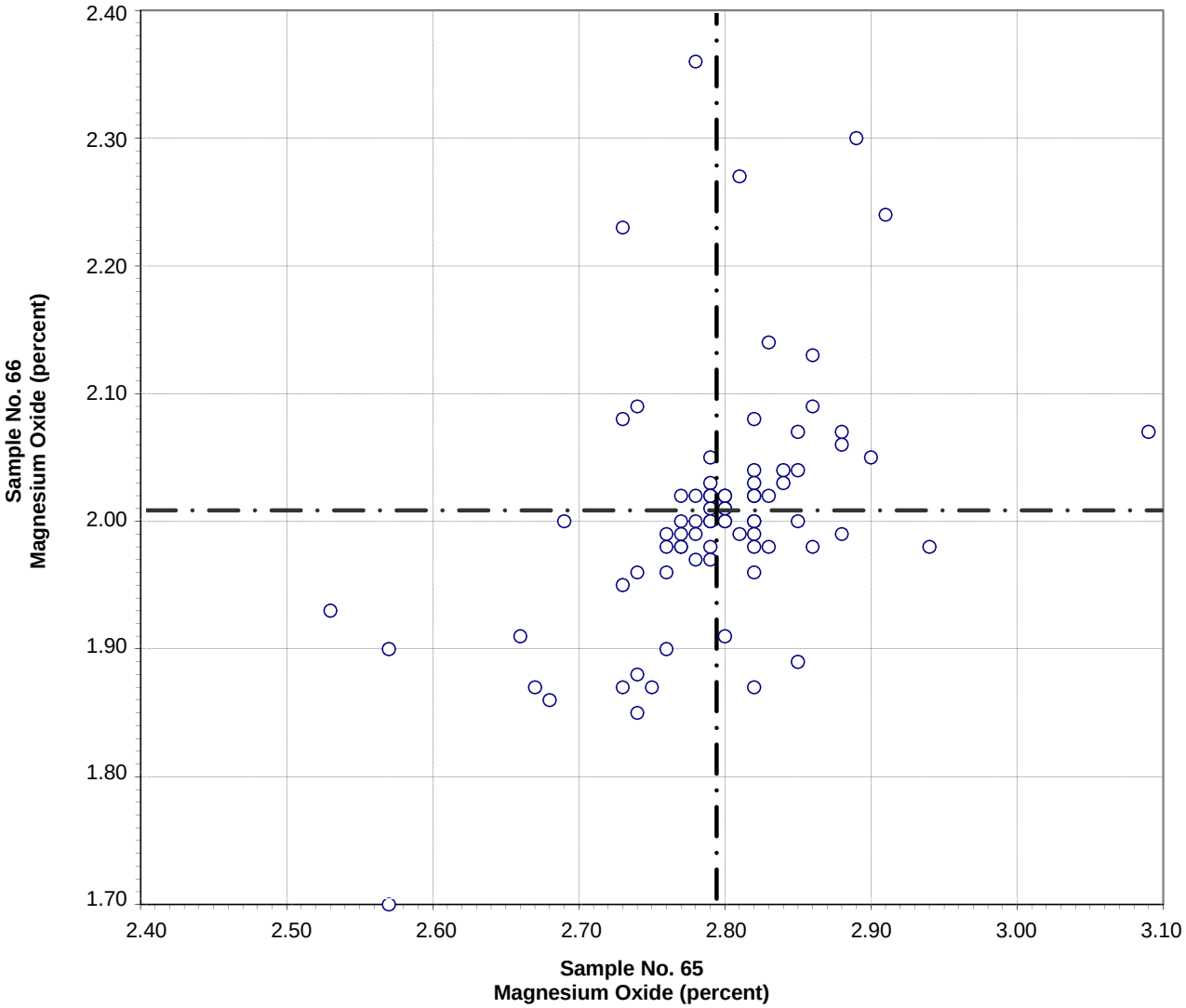


Test No. 40 Calcium Oxide 79 Points

Sample No. 65	Ave	60.53	S.D.	0.55	C.V.	0.9
Sample No. 66	Ave	50.45	S.D.	0.72	C.V.	1.4

Labs eliminated: 20, 50, 10, 169, 284, 3059

CCRL Proficiency Sample Program
Magnesium Oxide
BLENDED CEMENT Samples No. 65 and No. 66

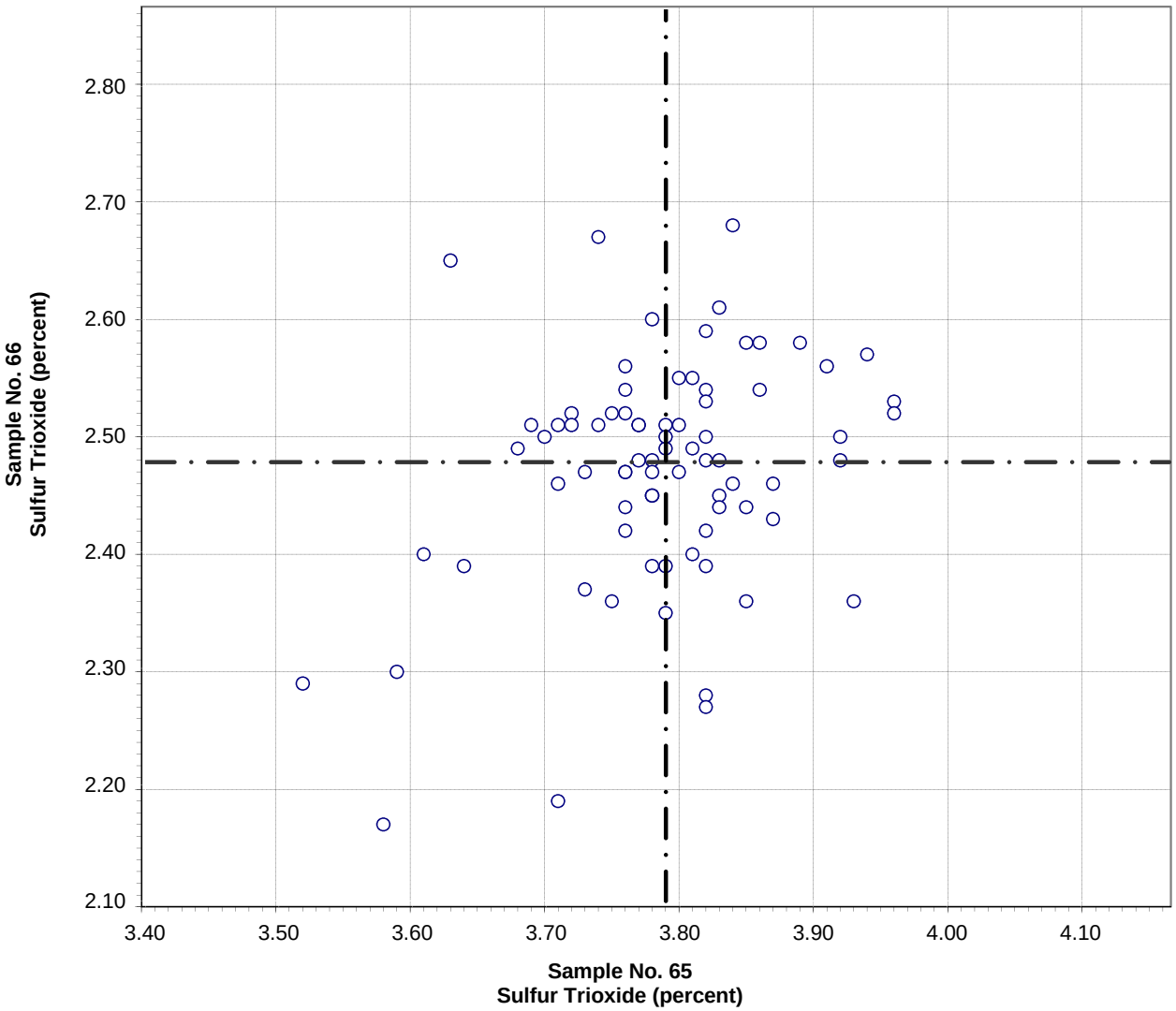


Test No. 50 Magnesium Oxide 79 Points

Sample No. 65	Ave	2.79	S.D.	0.08	C.V. 2.8
Sample No. 66	Ave	2.01	S.D.	0.10	C.V. 5.0

Labs eliminated: 169, 1715, 3431, 50, 2251, 2463, 3503

CCRL Proficiency Sample Program
Sulfur Trioxide
BLENDED CEMENT Samples No. 65 and No. 66



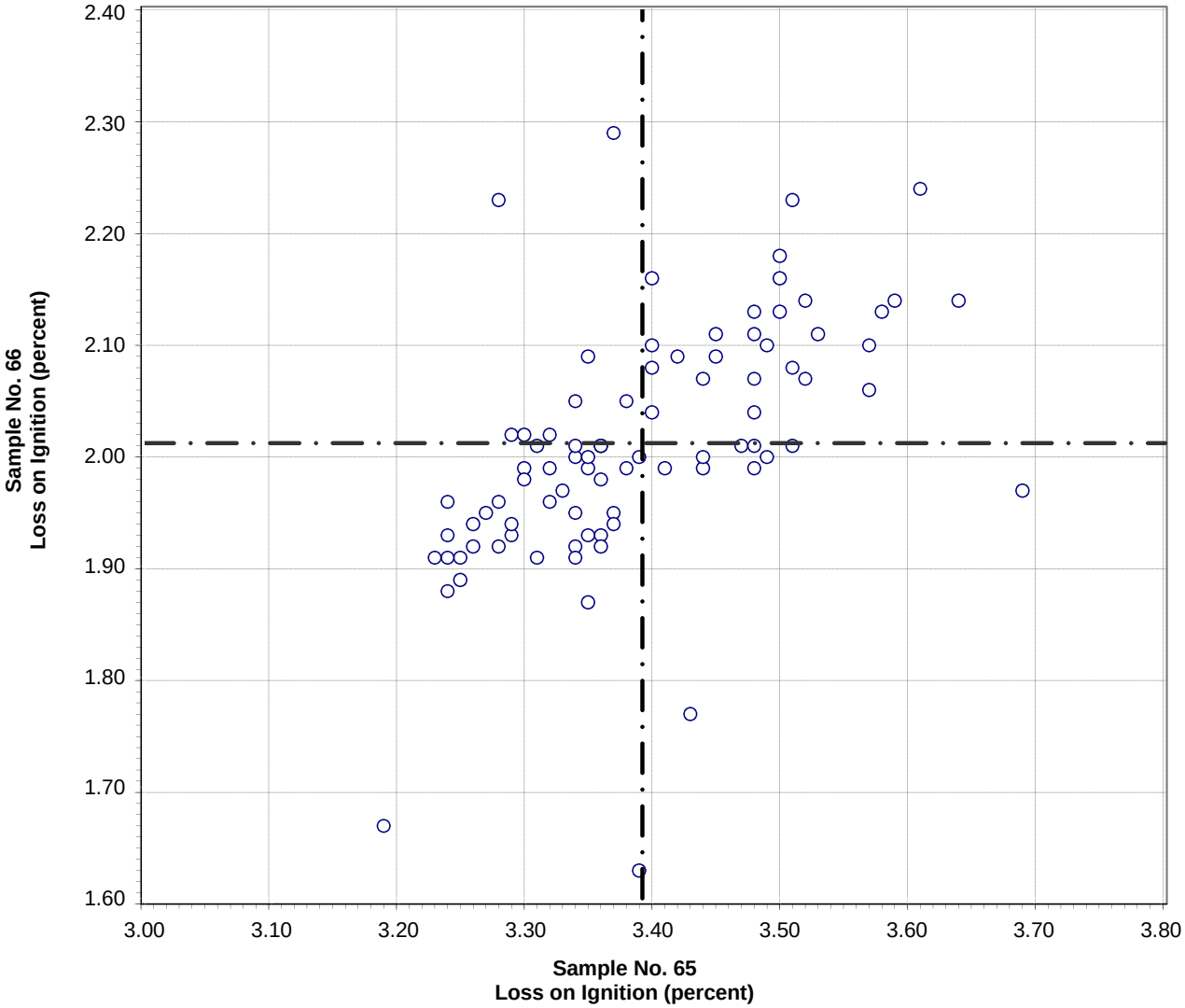
Test No. 60 Sulfur Trioxide 78 Points

Sample No. 65	Ave	3.79	S.D.	0.09	C.V. 2.3
Sample No. 66	Ave	2.48	S.D.	0.11	C.V. 4.3

Labs eliminated: 40, 51, 20, 169, 176, 284, 690, 3431

Labs off Diagram: 694

CCRL Proficiency Sample Program
Loss on Ignition
BLENDED CEMENT Samples No. 65 and No. 66

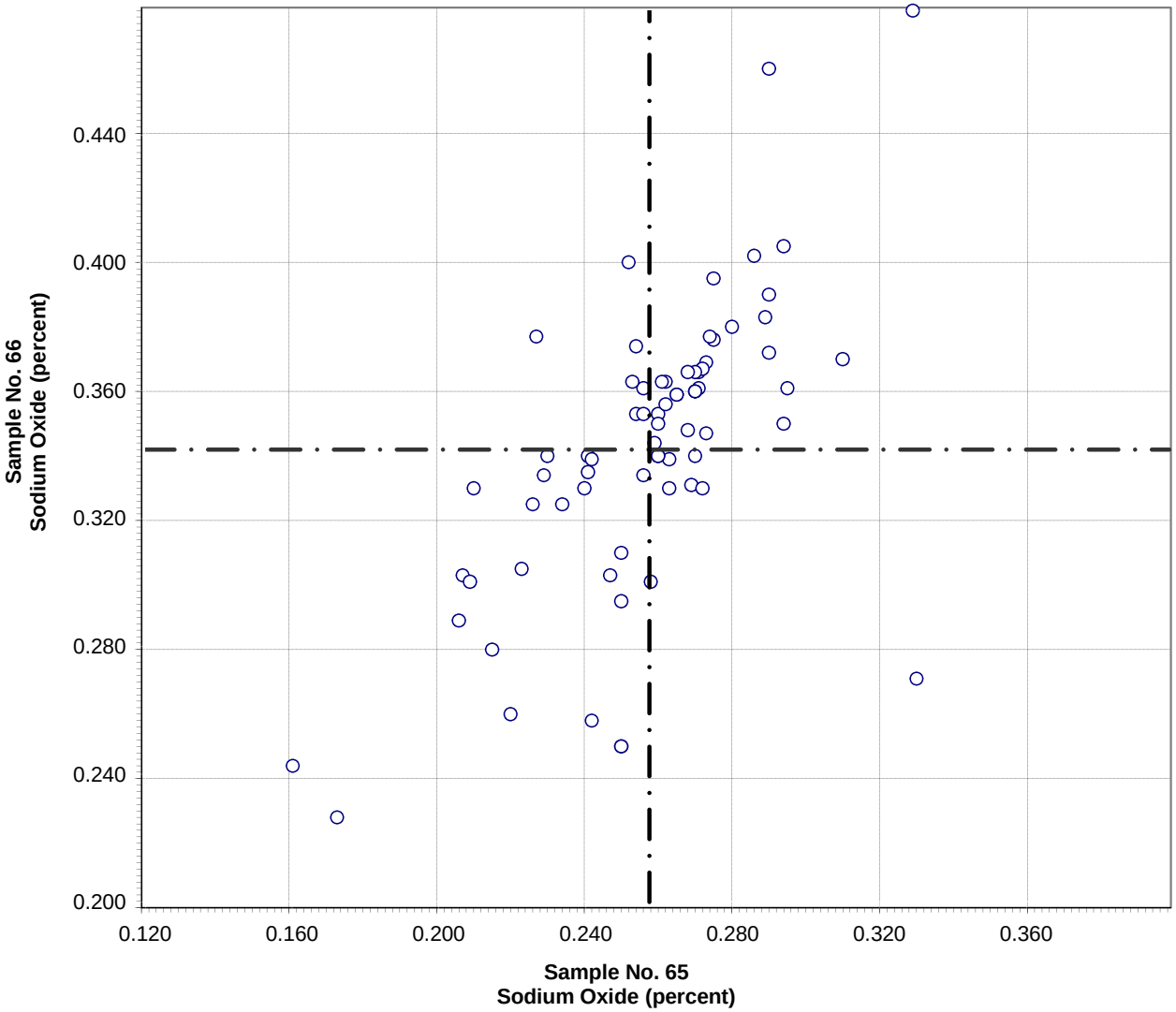


Test No. 70 Loss on Ignition 86 Points

Sample No. 65	Ave	3.39	S.D.	0.11	C.V. 3.1
Sample No. 66	Ave	2.01	S.D.	0.11	C.V. 5.4

Labs eliminated: 169, 1715

CCRL Proficiency Sample Program
Sodium Oxide
BLENDED CEMENT Samples No. 65 and No. 66

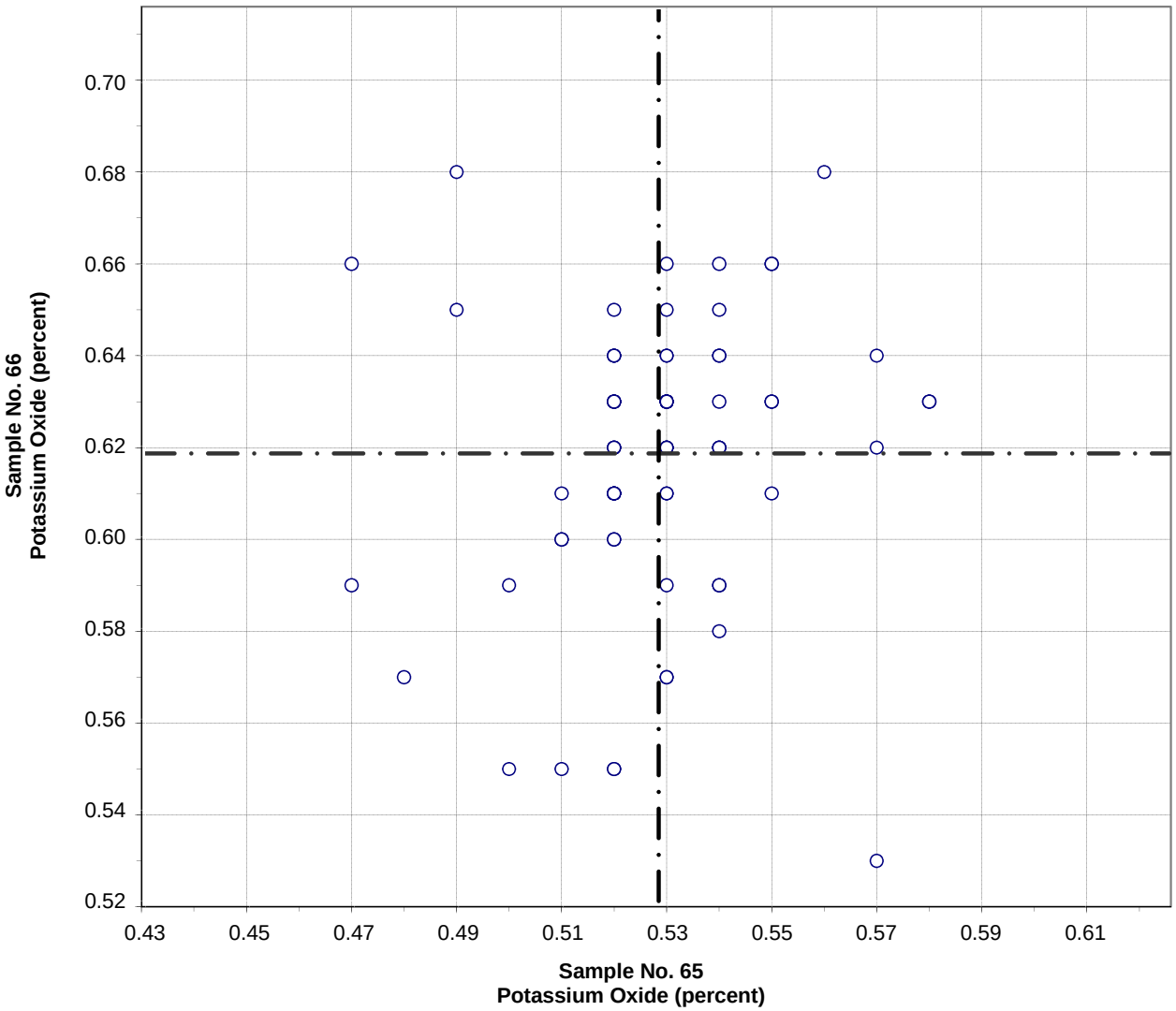


Test No. 90 Sodium Oxide 74 Points

Sample No. 65	Ave	0.257	S.D.	0.029	C.V.	11.4
Sample No. 66	Ave	0.342	S.D.	0.046	C.V.	13.3

Labs eliminated: 105, 40, 176, 2463

CCRL Proficiency Sample Program
Potassium Oxide
BLENDED CEMENT Samples No. 65 and No. 66

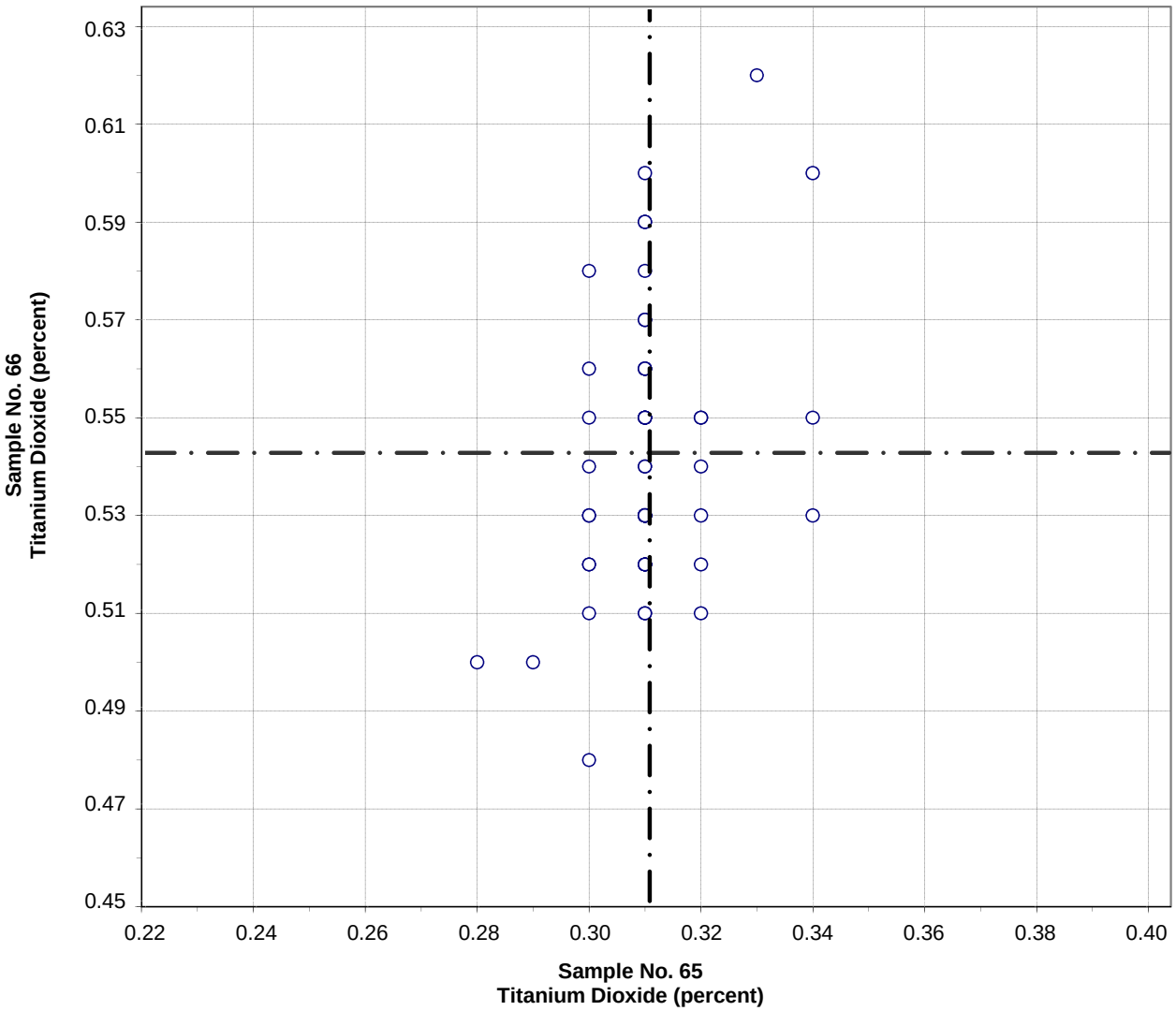


Test No. 100 Potassium Oxide 75 Points

Sample No. 65	Ave	0.53	S.D.	0.02	C.V. 3.9
Sample No. 66	Ave	0.62	S.D.	0.03	C.V. 4.9

Labs eliminated: 176, 169, 497, 3320, 3409

CCRL Proficiency Sample Program
Titanium Dioxide
BLENDED CEMENT Samples No. 65 and No. 66



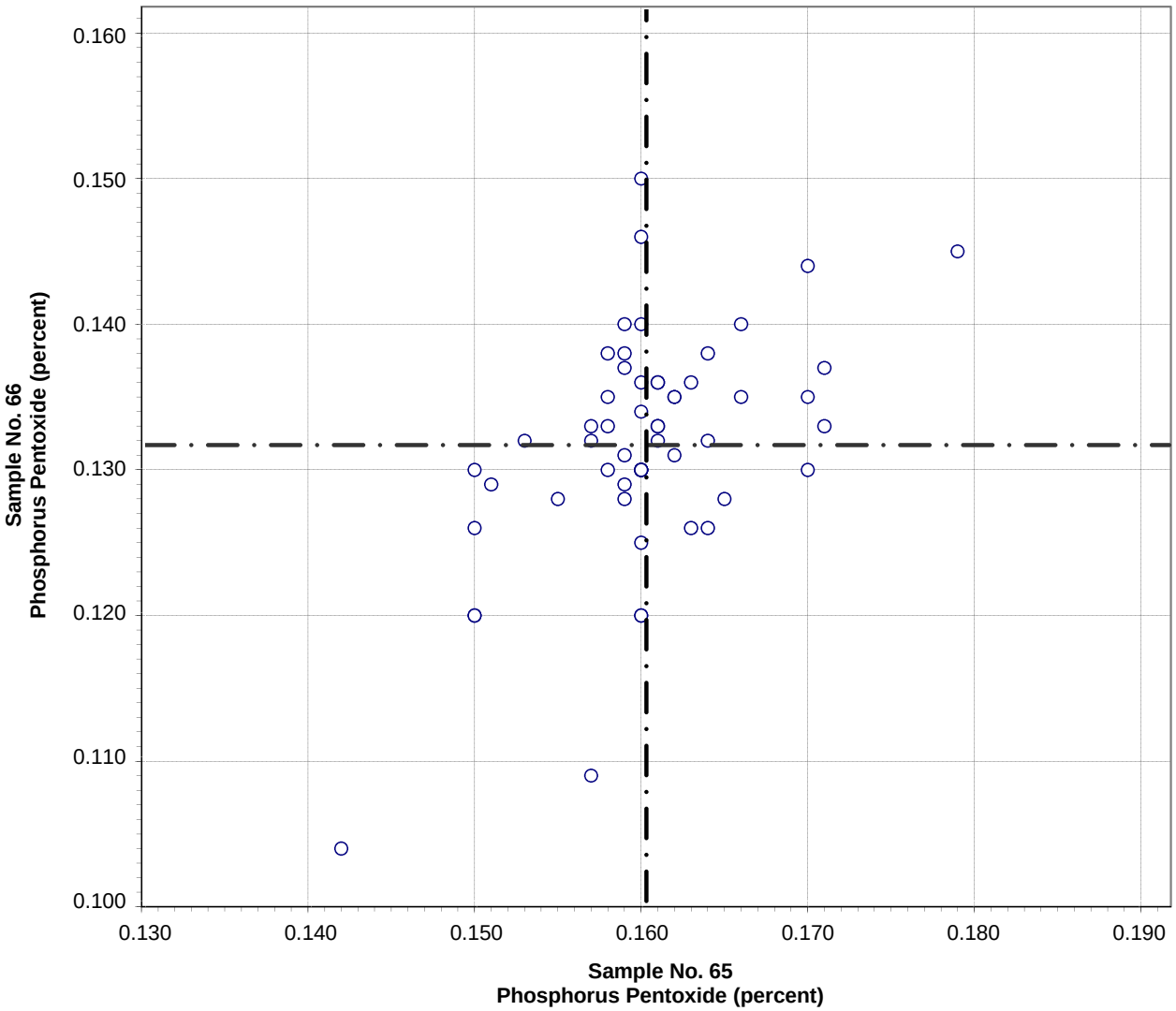
Test No. 103 Titanium Dioxide 59 Points

Sample No. 65	Ave	0.31	S.D.	0.010	C.V.	3.3
Sample No. 66	Ave	0.54	S.D.	0.030	C.V.	5.5

Labs eliminated: 169, 2462, 3059, 3297, 3409

Labs off Diagram: 124

CCRL Proficiency Sample Program
Phosphorus Pentoxide
BLENDED CEMENT Samples No. 65 and No. 66

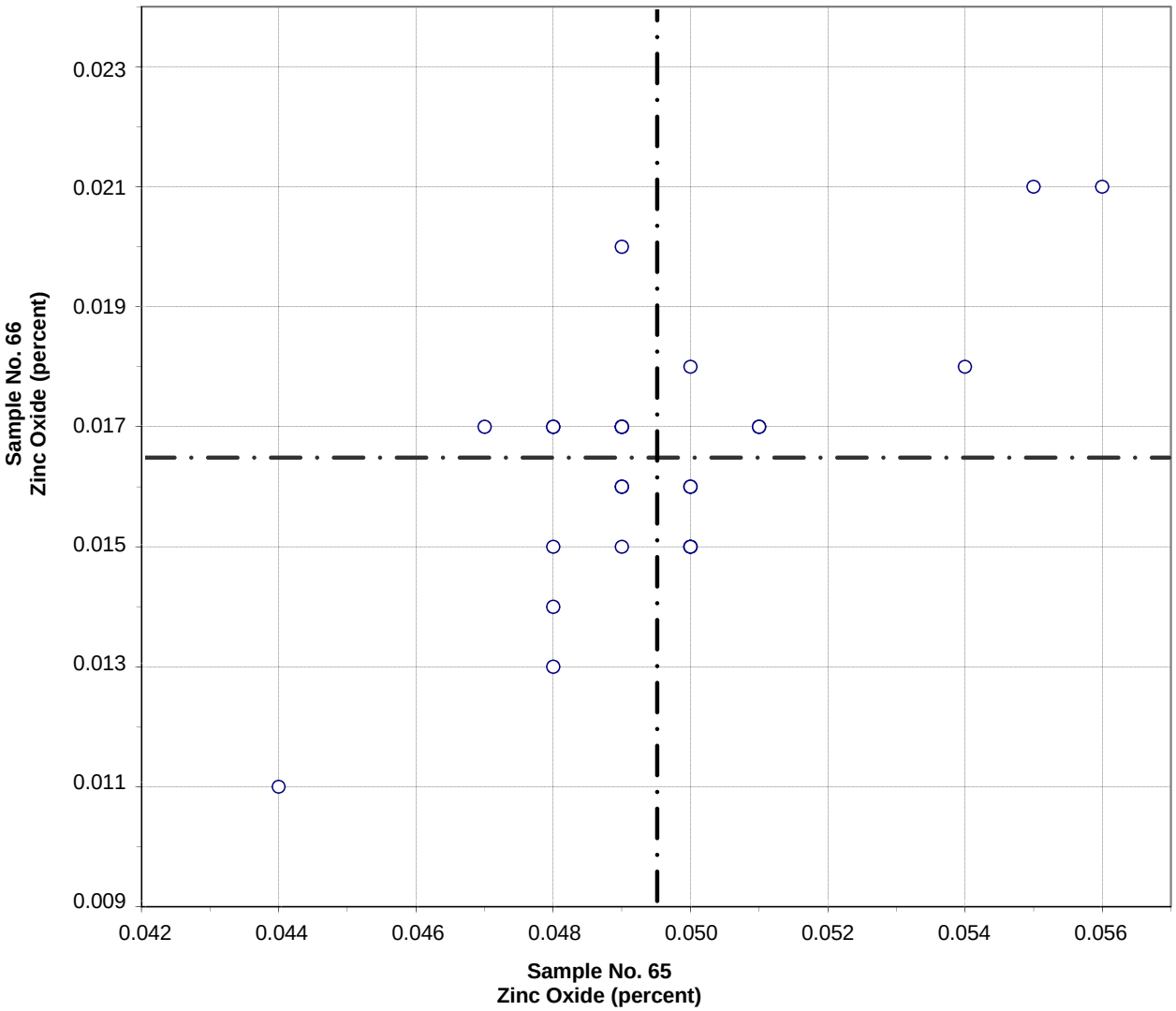


Test No. 102 Phosphorus Pentoxide 61 Points

Sample No. 65	Ave	0.160	S.D.	0.006	C.V. 3.6
Sample No. 66	Ave	0.132	S.D.	0.008	C.V. 5.8

Labs eliminated: 2462, 694, 1799, 20, 169, 2463, 2465, 2466

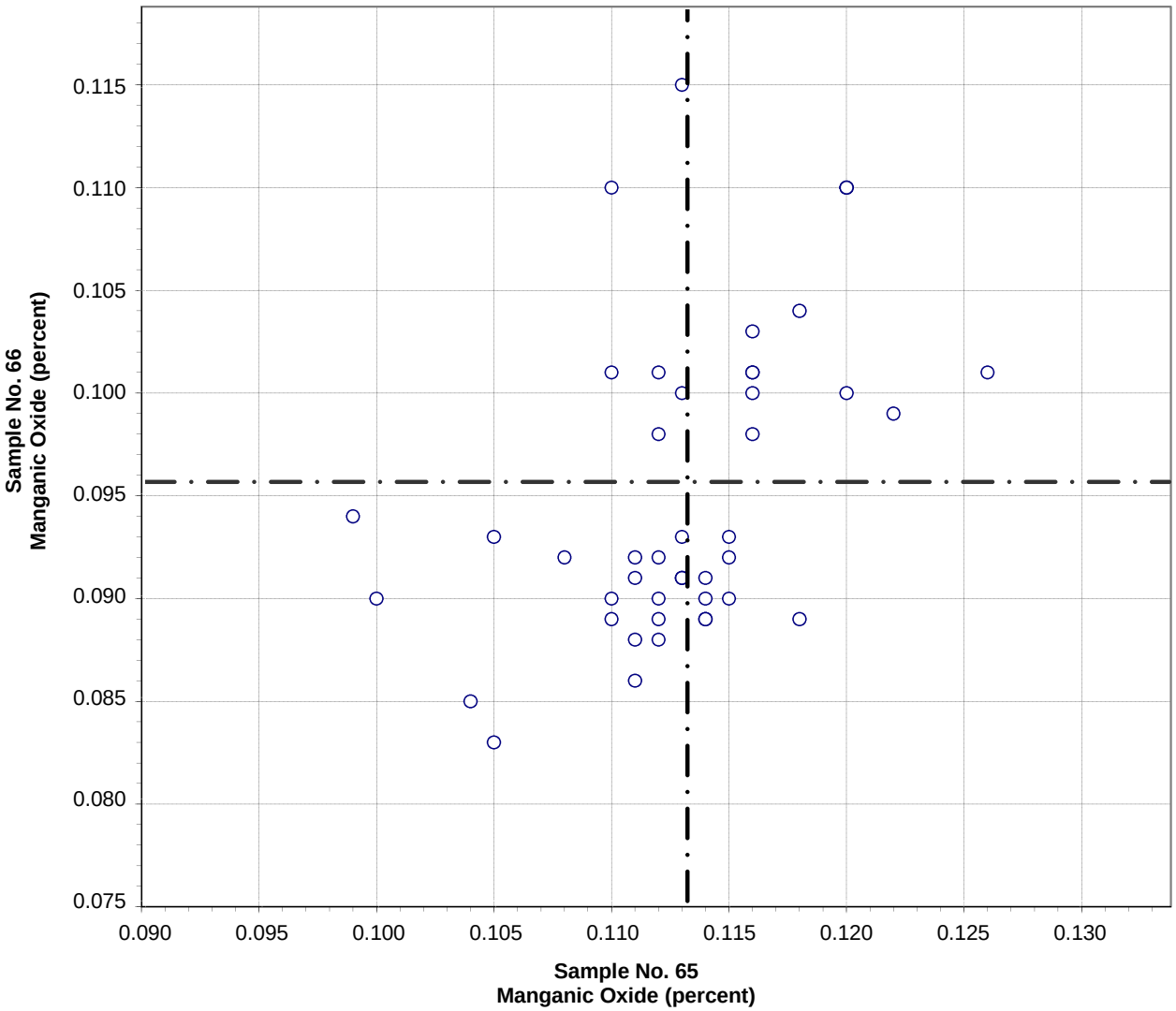
CCRL Proficiency Sample Program
Zinc Oxide
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 99 Zinc Oxide 28 Points

Sample No. 65	Ave	0.050	S.D.	0.002	C.V.	4.8
Sample No. 66	Ave	0.016	S.D.	0.002	C.V.	12.9

CCRL Proficiency Sample Program
Manganic Oxide
BLENDED CEMENT Samples No. 65 and No. 66

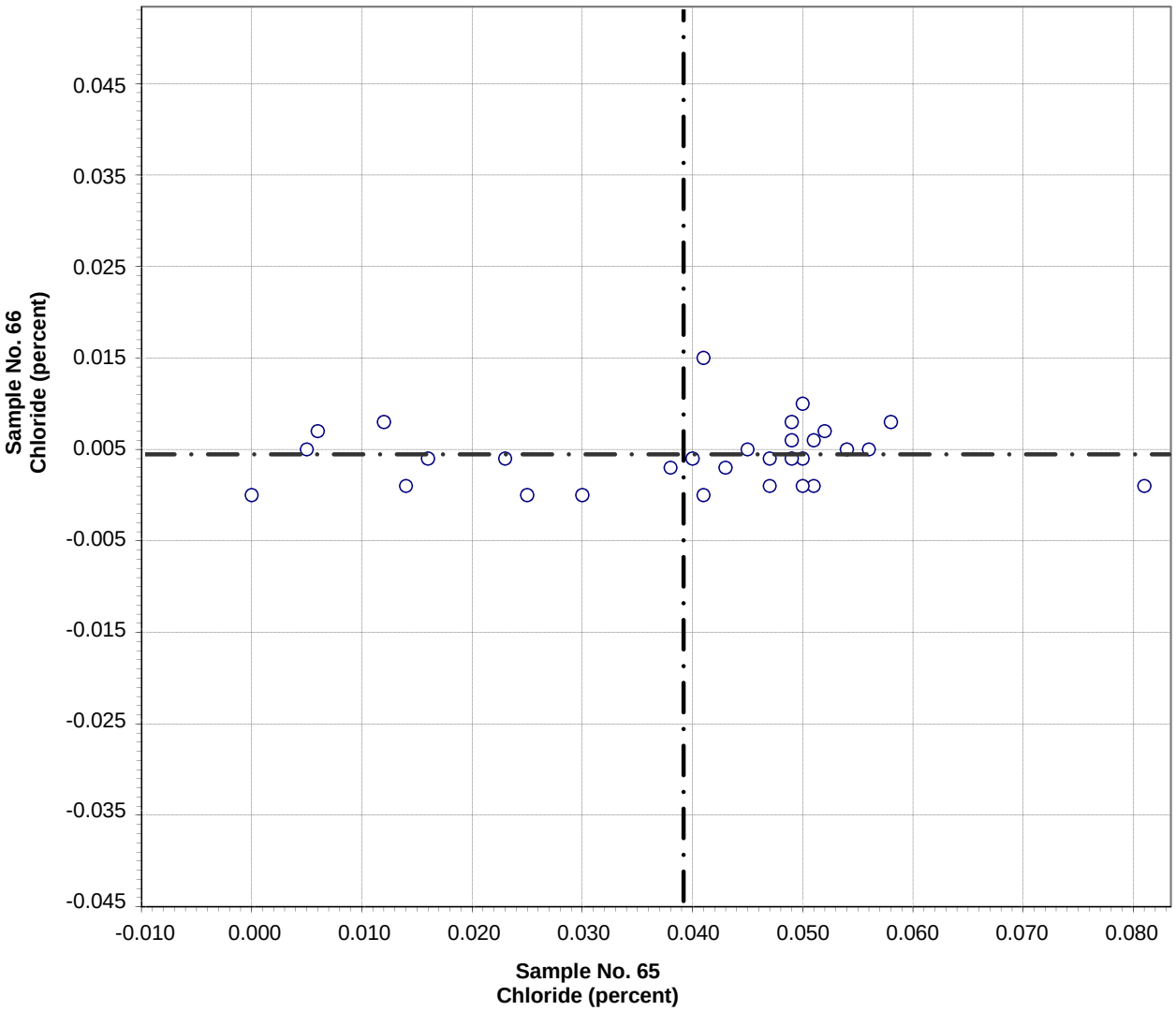


Test No. 101 Manganic Oxide 47 Points

Sample No. 65	Ave	0.113	S.D.	0.005	C.V.	4.6
Sample No. 66	Ave	0.096	S.D.	0.008	C.V.	8.2

Labs eliminated: 2462, 2466, 2463, 3409

CCRL Proficiency Sample Program
Chloride
BLENDED CEMENT Samples No. 65 and No. 66

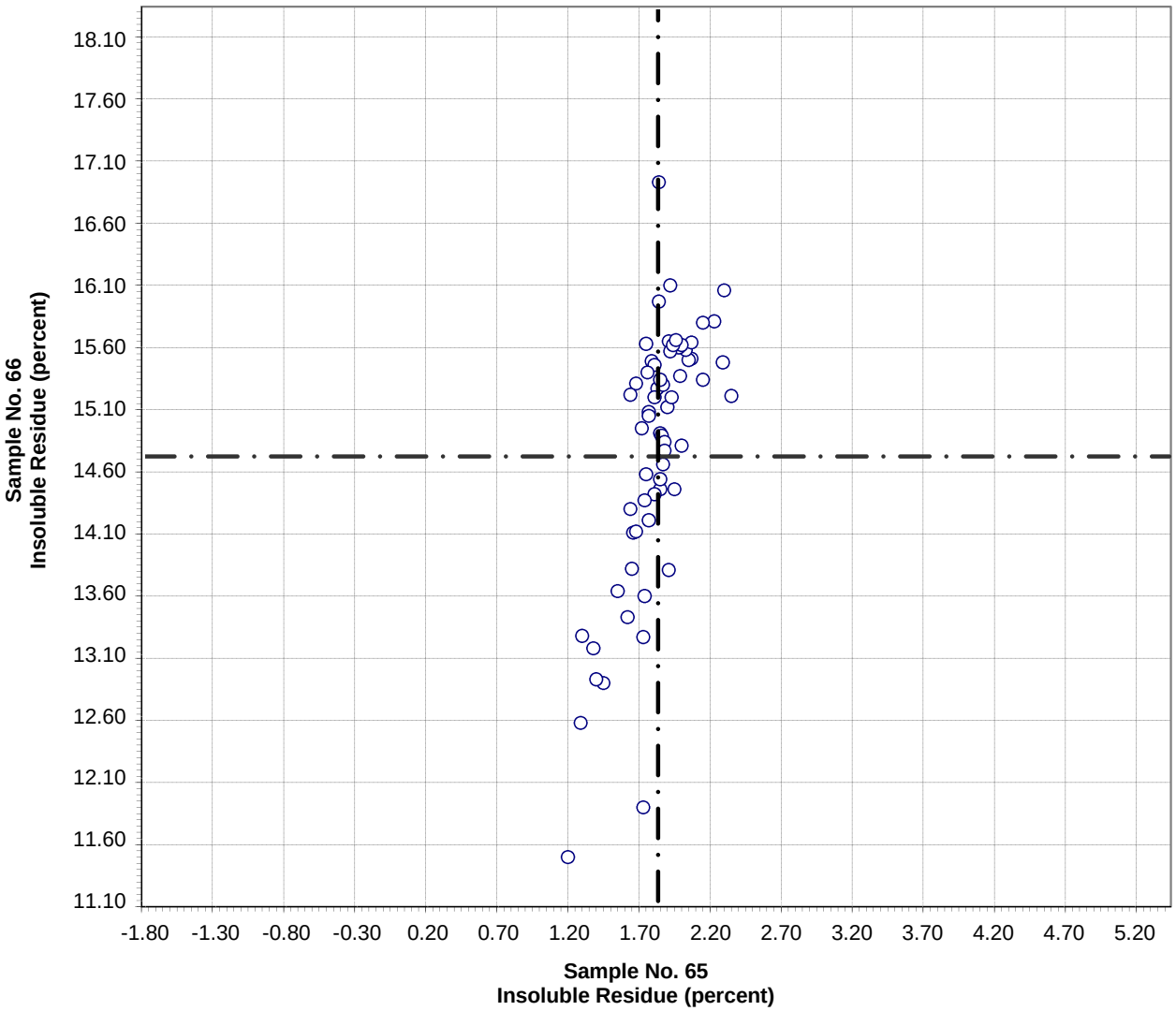


Test No. 104 Chloride 30 Points

Sample No. 65	Ave	0.039	S.D.	0.019	C.V.	47.8
Sample No. 66	Ave	0.004	S.D.	0.003	C.V.	79.3

Labs eliminated: 36

CCRL Proficiency Sample Program
Insoluble Residue
BLENDED CEMENT Samples No. 65 and No. 66



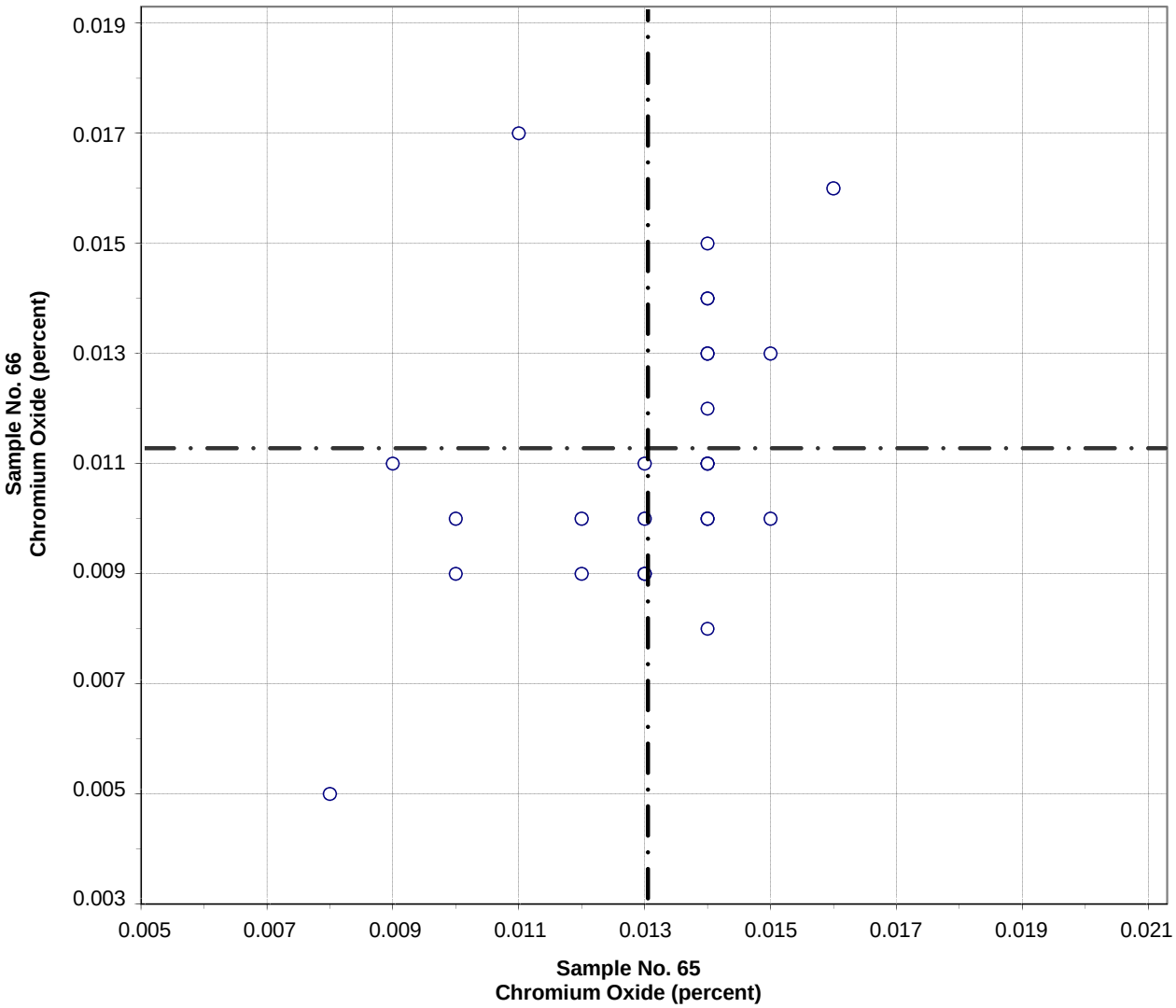
Test No. 80 Insoluble Residue 65 Points

Sample No. 65 Ave 1.83 S.D. 0.23 C.V. 12.5
Sample No. 66 Ave 14.71 S.D. 1.19 C.V. 8.1

Labs eliminated: 40, 51, 169, 181, 695, 698, 3297, 3431

Labs off Diagram: 958

CCRL Proficiency Sample Program
Chromium Oxide
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 105 Chromium Oxide 27 Points

Sample No. 65	Ave	0.013	S.D.	0.002	C.V.	14.7
Sample No. 66	Ave	0.011	S.D.	0.003	C.V.	23.2

Labs eliminated: 176, 2462

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 65 and No. 66
Final Report - Physical Results
May 7, 2010

SUMMARY OF RESULTS

				Sample No. 65			Sample No. 66		
Test			#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
N.C. Water	%		97	27.0	0.8	2.8	24.0	0.5	2.2
N.C. Water	%	*	95	27.0	0.6	2.3	24.0	0.5	2.0
Vicat TS Initial	min		96	148	16	10.9	140	18	12.8
Vicat TS Initial	min	*	92	149	14	9.5	139	15	10.7
Vicat TS Final	min		93	250	30	12.1	247	30	12.2
Vicat TS Final	min	*	91	248	28	11.1	244	25	10.0
Autoclave Expan	%		87	0.04	0.09	248.2	-0.02	0.03	-165.0
Autoclave Expan	%	*	80	0.03	0.02	53.3	-0.02	0.02	-105.4
Air Content	%		75	7.7	1.1	14.4	7.6	1.5	19.9
Air Content	%	*	72	7.7	0.9	11.8	7.7	1.2	15.2
AC Mix Water	%		75	72.0	20.3	28.2	67.2	18.2	27.2
AC Mix Water	%	*	72	70.3	2.3	3.3	65.7	3.2	4.9
AC Flow	%		76	85	4.5	5.2	88	4.6	5.3
AC Flow	%	*	75	85	3.4	4.1	87	3.8	4.4
Specific Gravity			77	3.09	0.04	1.2	2.98	0.06	2.1
Specific Gravity		*	74	3.09	0.04	1.2	2.97	0.05	1.6

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

Normal Consistency	42 2477
Vicat TS Initial	39 124 605 3431
Vicat TS Final	23 3503
Autoclave Expansion	74 958 2476 2 34 1773 3320
Air Content	1251 42 2476
Air Content - Mix Water	169 2295 3503
Air Content - Flow	3503
Specific Gravity	10 1799 1799

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 65 and No. 66
Final Report - Physical Results
May 7, 2010

SUMMARY OF RESULTS

Test		#Labs	Sample No. 65 Average	S.D.	C.V.	Sample No. 66 Average	S.D.	C.V.
Comp Str, 3 day	psi	97	4163	318	7.6	2964	289	9.8
Comp Str, 3 day	psi	* 95	4166	295	7.1	2961	268	9.1
Comp Str, 7 day	psi	97	5035	357	7.1	3891	377	9.7
Comp Str, 28 day	psi	83	6338	460	7.2	5904	501	8.5
Comp Str, 28 day	psi	* 82	6322	438	6.9	5884	470	8.0
CS Mix Water	%	91	49.7	3.2	6.5	45.3	3.1	6.9
CS Mix Water	%	* 87	49.4	1.3	2.7	44.8	1.8	4.0
Com Str Flow	%	95	107	4.3	4.0	112	5.5	5.0
Com Str Flow	%	* 87	108	2.4	2.2	111	2.6	2.3
FINENESS								
Air Permeability	cm^2/g	91	5039	332	6.6	3852	375	9.7
Air Permeability	cm^2/g	* 86	5034	241	4.8	3792	270	7.1
45µm Sieve	%	92	95.69	1.00	1.1	93.03	6.60	7.2
45µm Sieve	%	* 87	95.83	0.64	0.7	93.90	0.84	0.9

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

Compressive Strength 3 day 2477 3503

Compressive Strength 28 day 3503

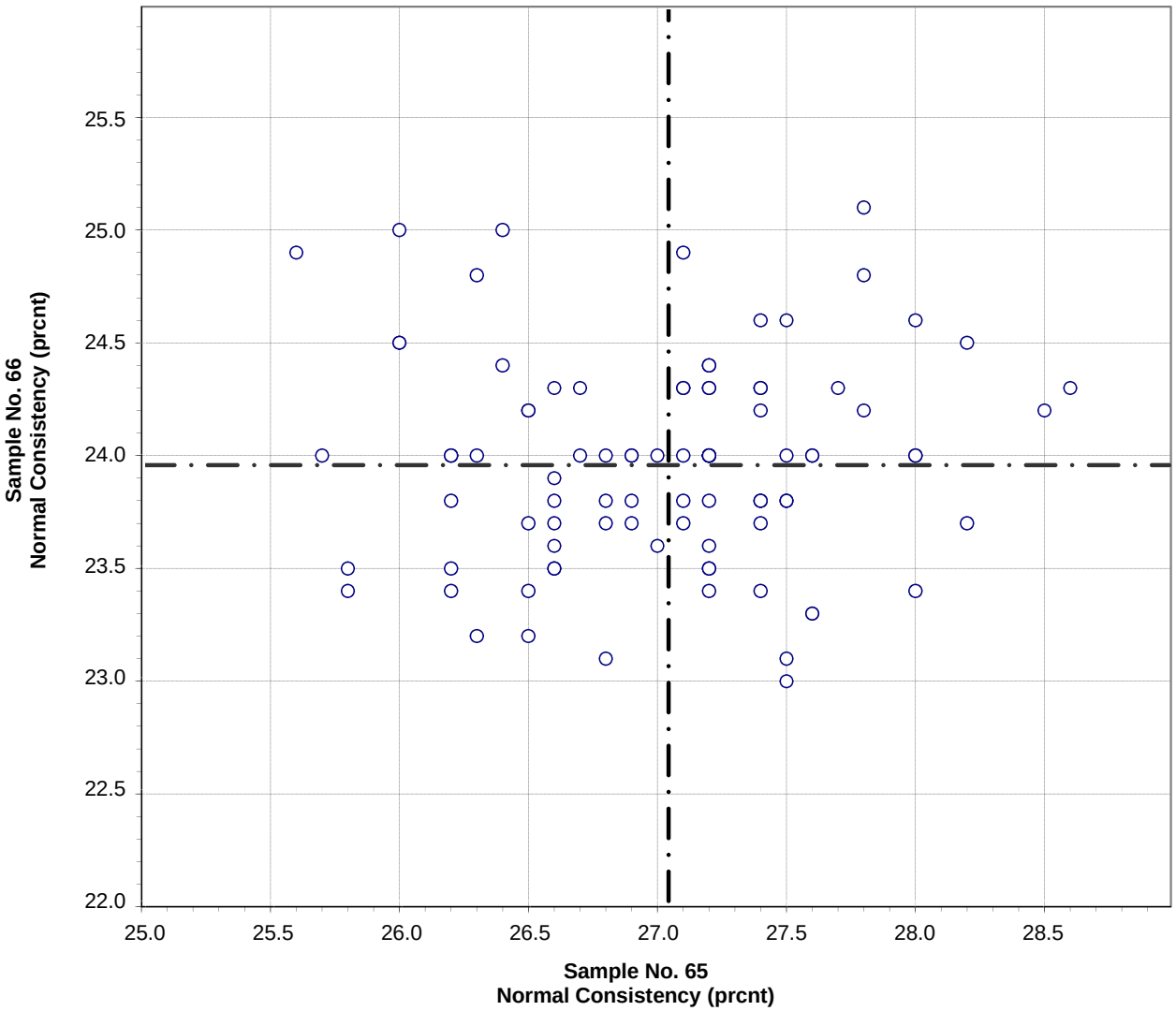
Compressive Strength, Mix Water 169 3 17 2477

Compressive Strength, Flow 14 19 22 22 35 47 105 694

Fineness - Air Permeability 14 2360 2477 10 3247

Fineness - 45µm Sieve 2295 50 51 2360 2476

CCRL Proficiency Sample Program
Normal Consistency - % Water
BLENDED CEMENT Samples No. 65 and No. 66

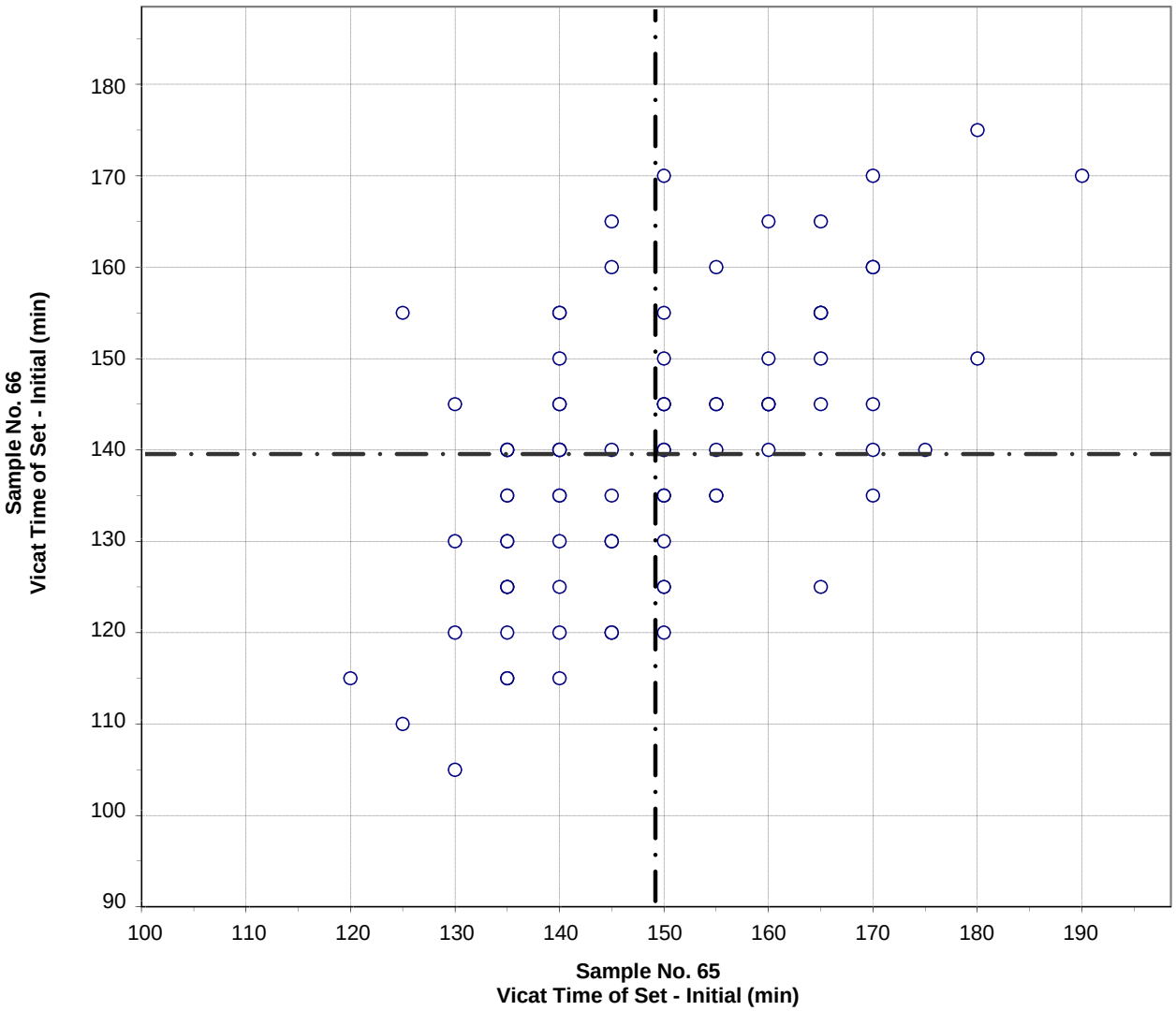


Test No. 110 Normal Consistency - % Water 95 Points

Sample No. 65	Ave	27.0	S.D.	0.6	C.V. 2.3
Sample No. 66	Ave	24.0	S.D.	0.5	C.V. 2.0

Labs eliminated: 42, 2477

CCRL Proficiency Sample Program
Vicat Time of Set - Initial
BLENDED CEMENT Samples No. 65 and No. 66

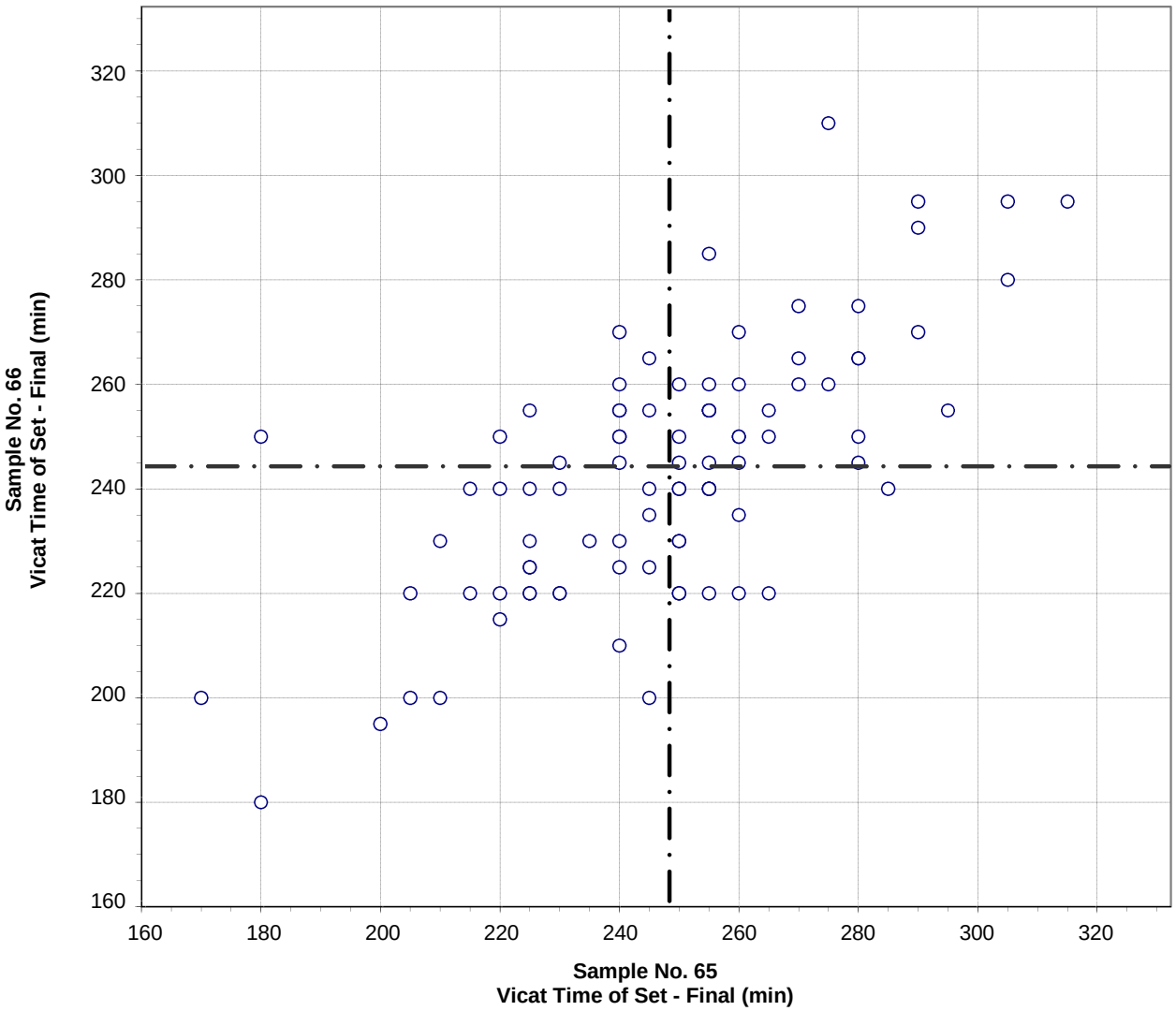


Test No. 120 Vicat Time of Set - Initial 92 Points

Sample No. 65	Ave	149	S.D.	14	C.V. 9.5
Sample No. 66	Ave	139	S.D.	15	C.V. 10.7

Labs eliminated: 39, 124, 605, 3431

CCRL Proficiency Sample Program
Vicat Time of Set - Final
BLENDED CEMENT Samples No. 65 and No. 66

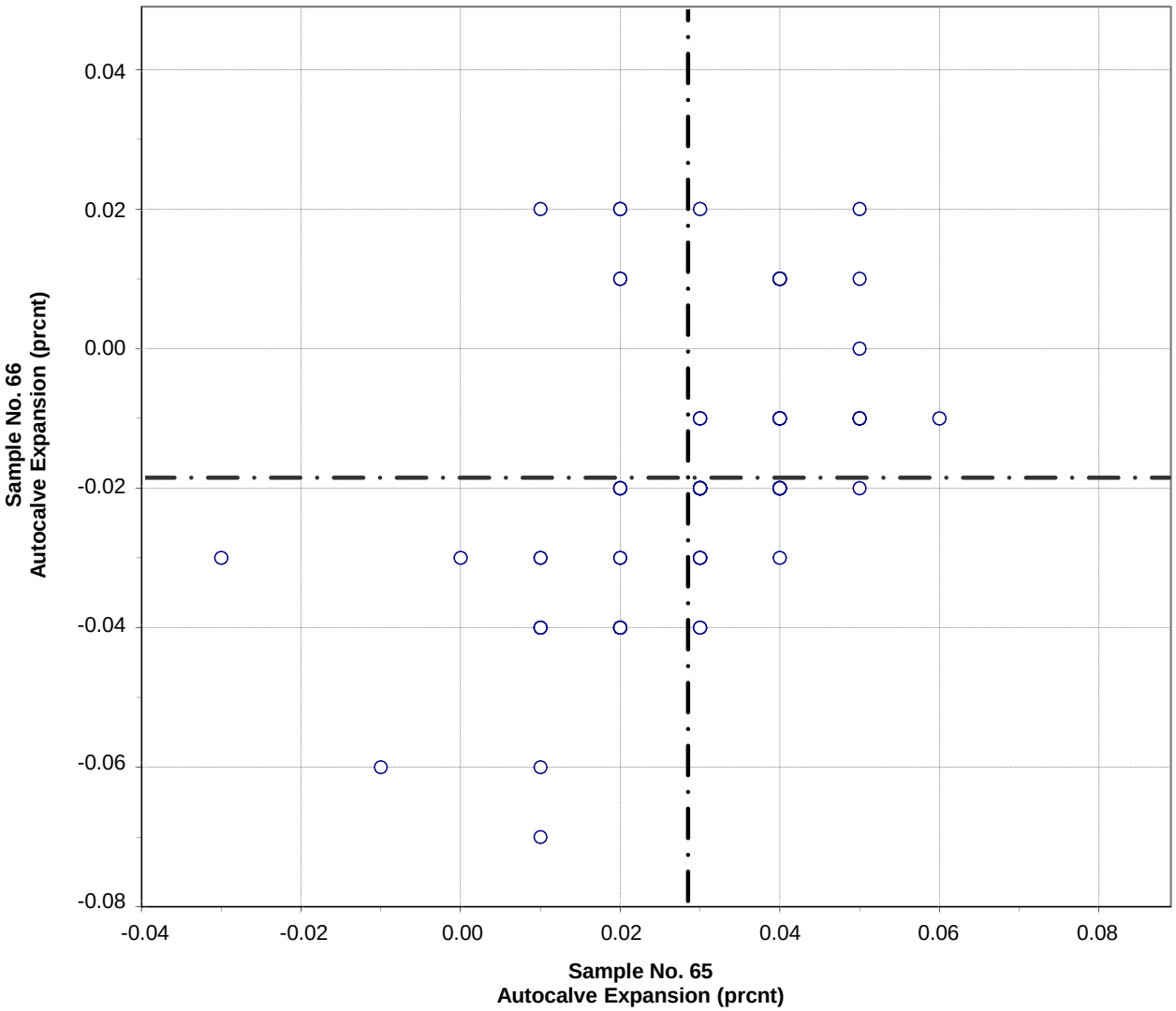


Test No. 121 Vicat Time of Set - Final 91 Points

Sample No. 65	Ave	248	S.D.	28	C.V. 11.1
Sample No. 66	Ave	244	S.D.	25	C.V. 10.0

Labs eliminated: 23, 3503

CCRL Proficiency Sample Program
Autoclave Expansion
BLENDED CEMENT Samples No. 65 and No. 66

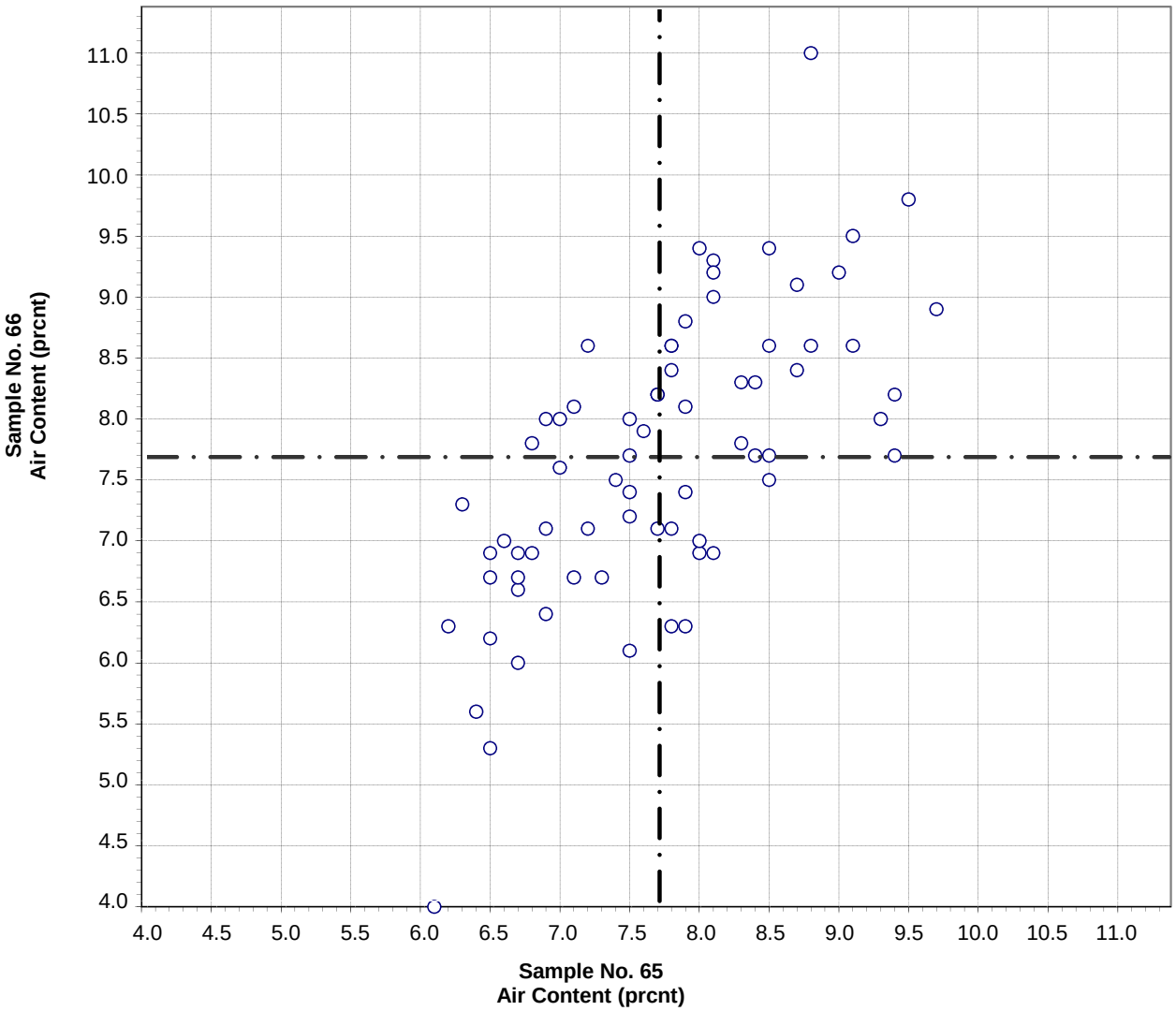


Test No. 160 Autoclave Expansion 80 Points

Sample No. 65 Ave 0.03 S.D. 0.02 C.V. 53.3
Sample No. 66 Ave -0.01 S.D. 0.02 C.V. -105.5

Labs eliminated: 74, 958, 2476, 2, 34, 1773, 3320

CCRL Proficiency Sample Program
Air Content %
BLENDED CEMENT Samples No. 65 and No. 66

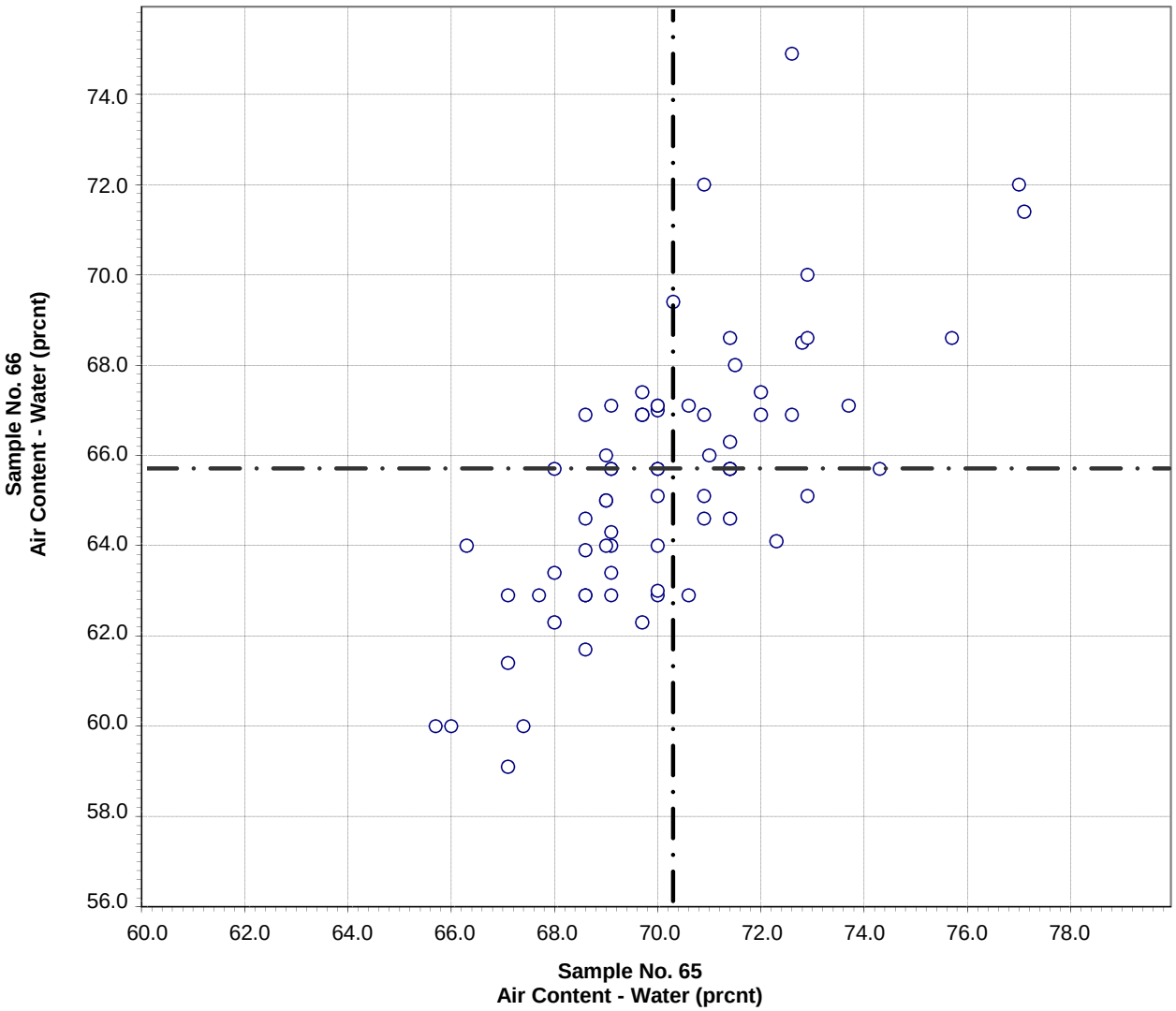


Test No. 170 Air Content % 72 Points

Sample No. 65	Ave	7.7	S.D.	0.9	C.V. 11.8
Sample No. 66	Ave	7.7	S.D.	1.2	C.V. 15.2

Labs eliminated: 1251, 42, 2476

CCRL Proficiency Sample Program
Air Content - % Water
BLENDED CEMENT Samples No. 65 and No. 66



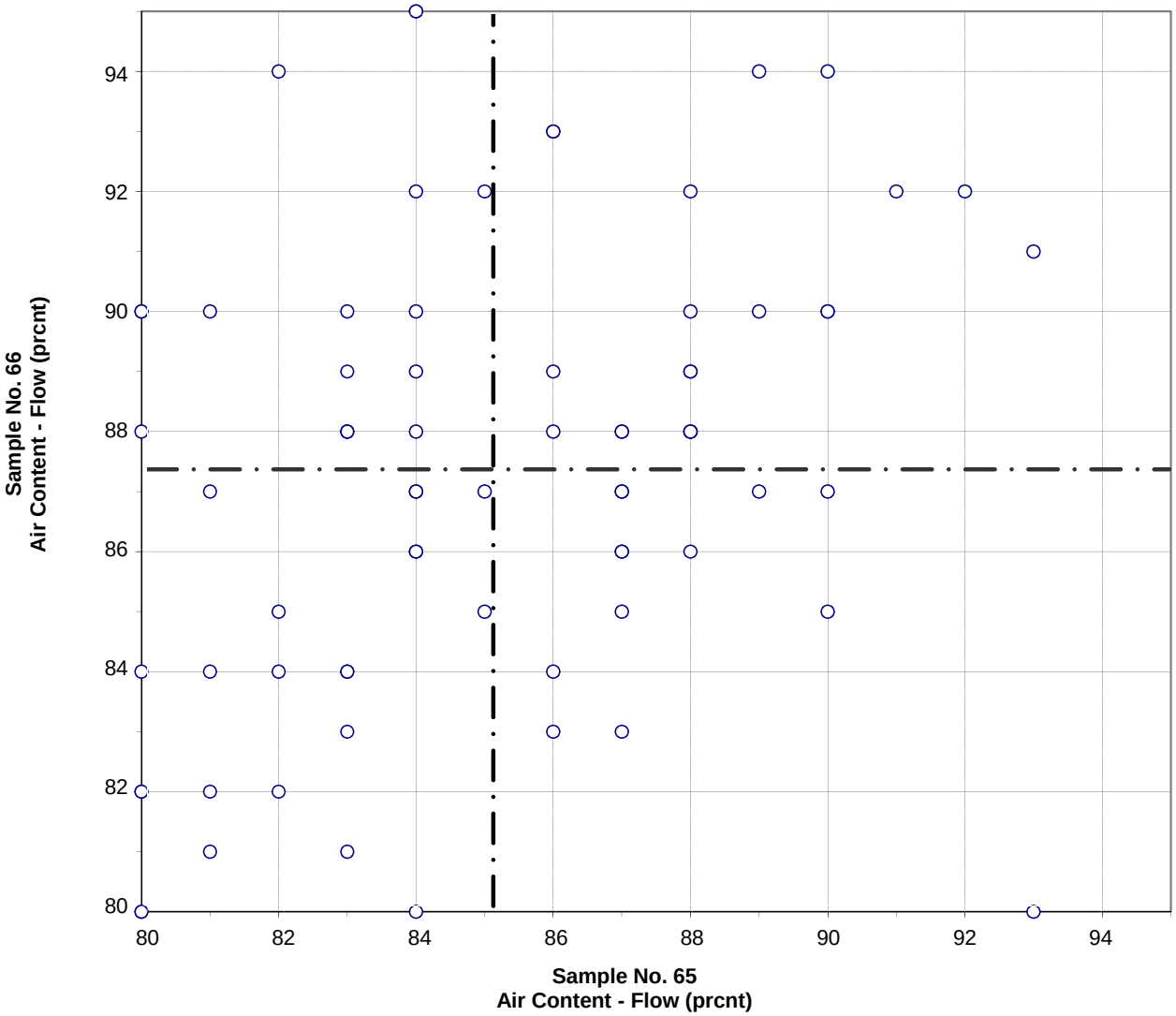
Test No. 180 Air Content - % Water 71 Points

Sample No. 65	Ave	70.3	S.D.	2.3	C.V. 3.3
Sample No. 66	Ave	65.7	S.D.	3.2	C.V. 4.9

Labs eliminated: 169, 2295, 3503

Labs off Diagram: 2251

CCRL Proficiency Sample Program
Air Content - Flow
BLENDED CEMENT Samples No. 65 and No. 66

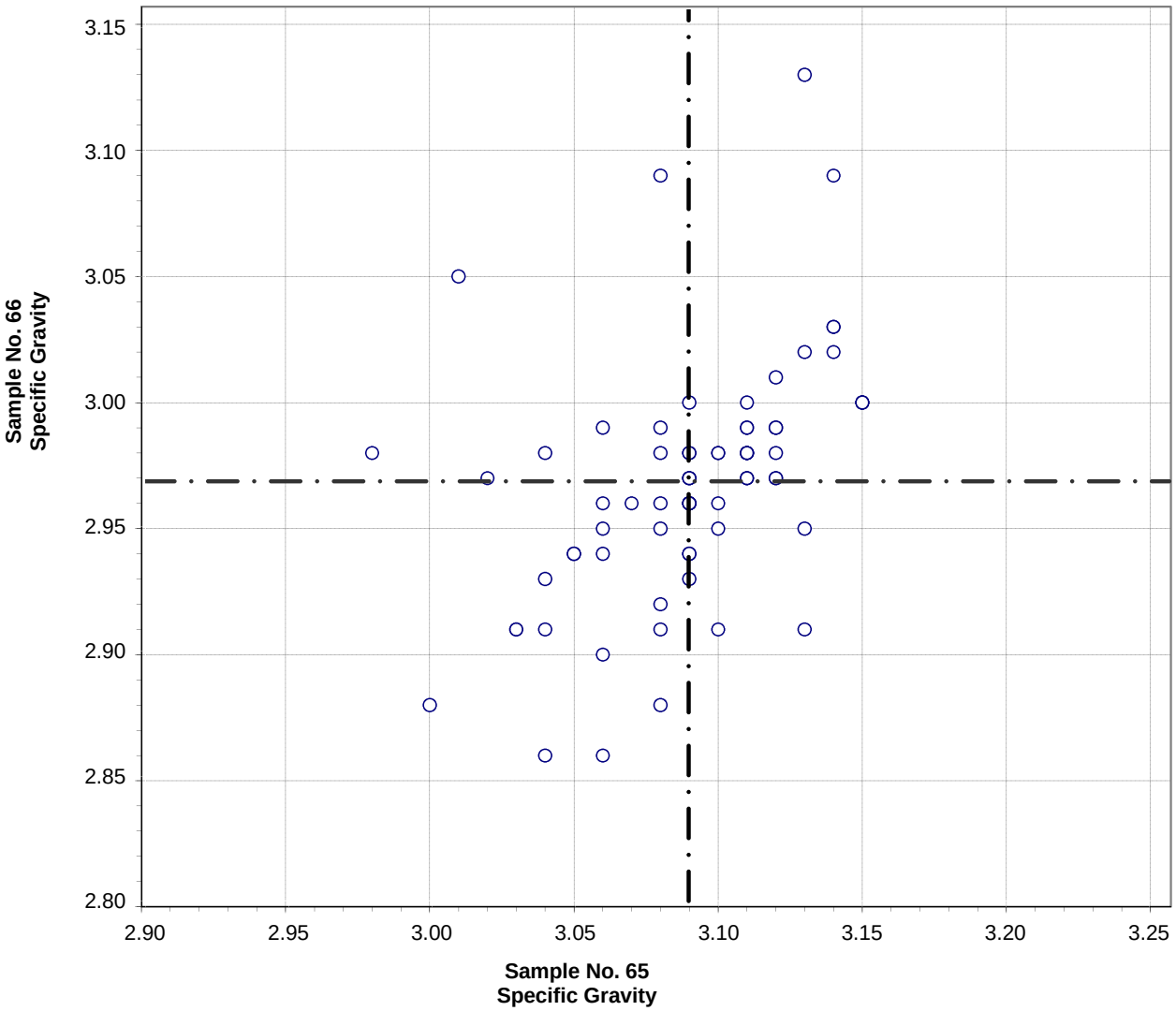


Test No. 190 Air Content - Flow 75 Points

Sample No. 65	Ave	85	S.D.	3.5	C.V. 4.1
Sample No. 66	Ave	87	S.D.	3.8	C.V. 4.4

Labs eliminated: 3503

CCRL Proficiency Sample Program
Specific Gravity
BLENDED CEMENT Samples No. 65 and No. 66

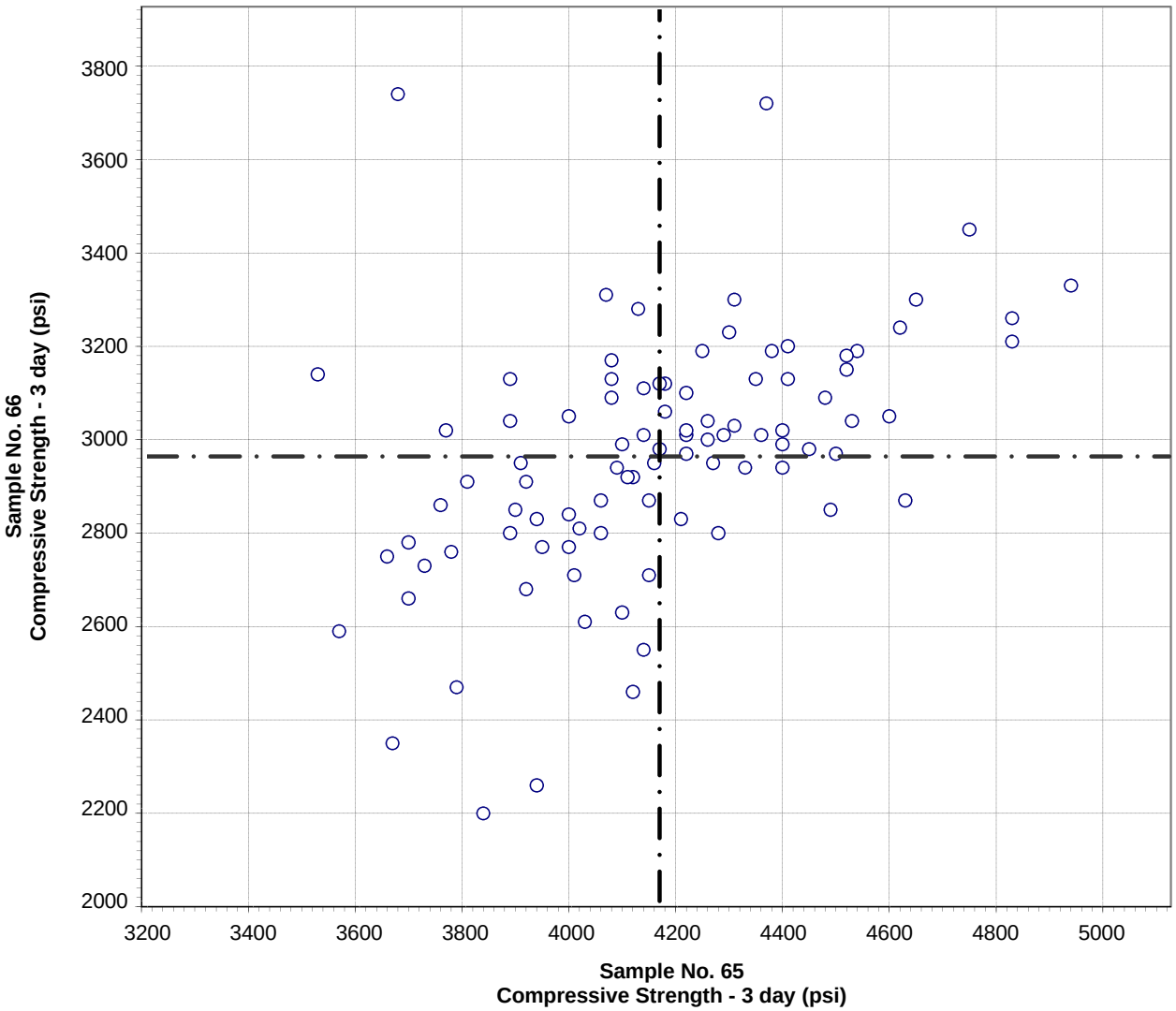


Test No. 310 Specific Gravity 74 Points

Sample No. 65	Ave	3.09	S.D.	0.04	C.V.	1.2
Sample No. 66	Ave	2.97	S.D.	0.05	C.V.	1.6

Labs eliminated: 10, 1799, 1799

CCRL Proficiency Sample Program
Compressive Strength - 3 day
BLENDED CEMENT Samples No. 65 and No. 66

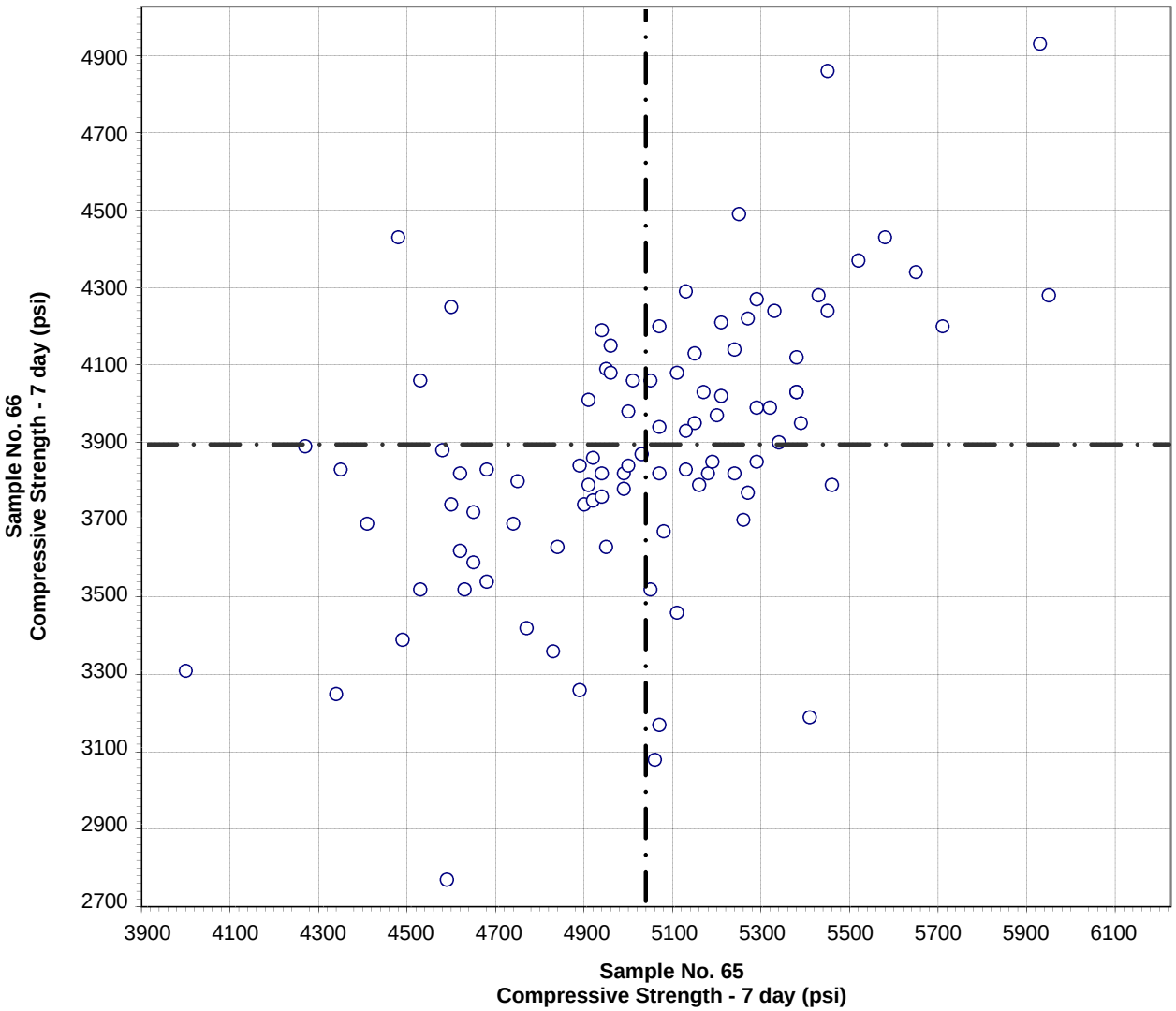


Test No. 200 Compressive Strength - 3 day 95 Points

Sample No. 65	Ave	4166	S.D.	295	C.V.	7.1
Sample No. 66	Ave	2961	S.D.	268	C.V.	9.1

Labs eliminated: 2477, 3503

CCRL Proficiency Sample Program
Compressive Strength - 7 day
BLENDED CEMENT Samples No. 65 and No. 66

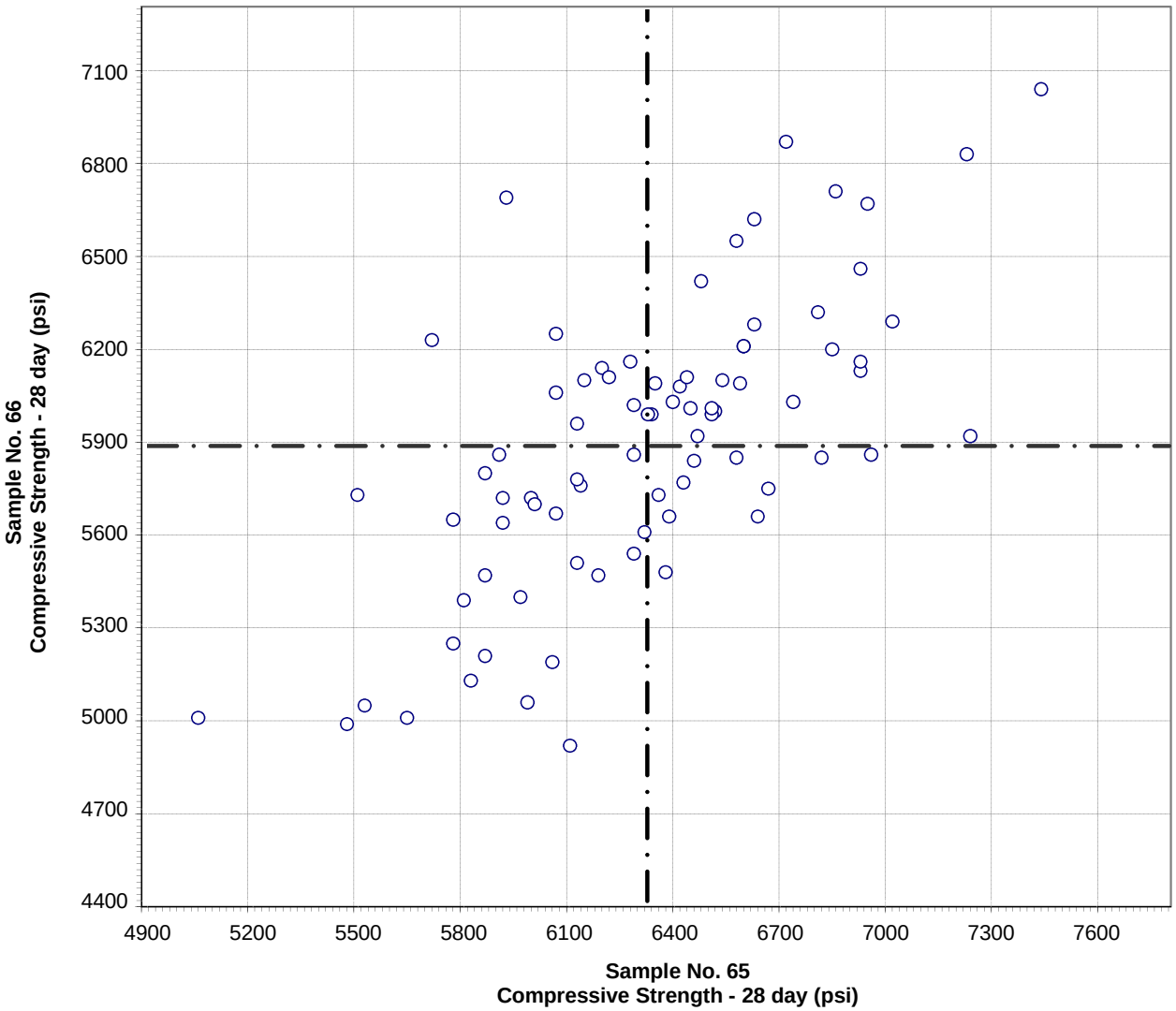


Test No. 210 Compressive Strength - 7 day 96 Points

Sample No. 65	Ave	5035	S.D.	357	C.V.	7.1
Sample No. 66	Ave	3891	S.D.	377	C.V.	9.7

Labs off Diagram: 413

CCRL Proficiency Sample Program
Compressive Strength - 28 day
BLENDED CEMENT Samples No. 65 and No. 66

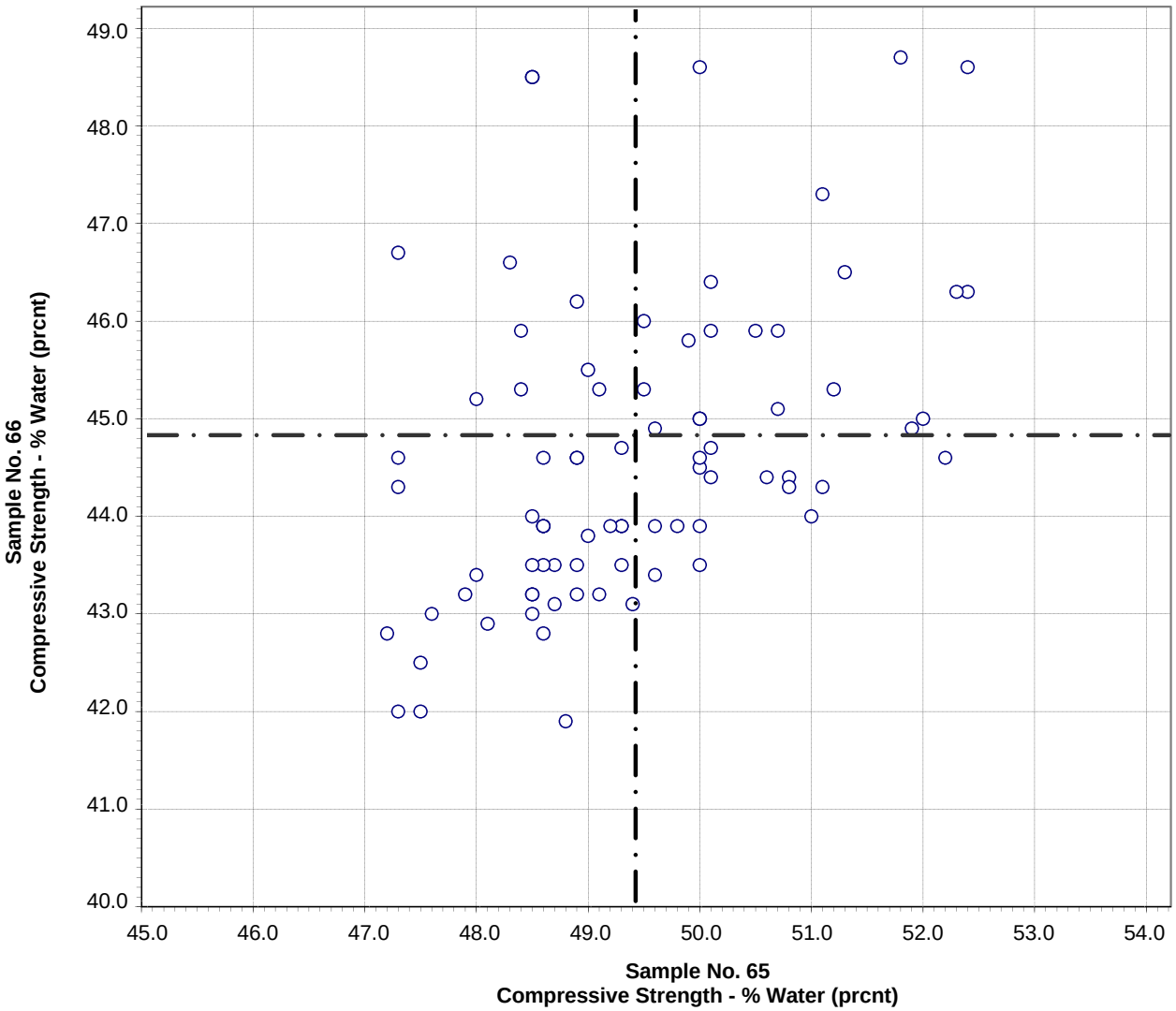


Test No. 211 Compressive Strength - 28 day 82 Points

Sample No. 65	Ave	6322	S.D.	438	C.V. 6.9
Sample No. 66	Ave	5884	S.D.	470	C.V. 8.0

Labs eliminated: 3503

CCRL Proficiency Sample Program
Compressive Strength - % Water
BLENDED CEMENT Samples No. 65 and No. 66



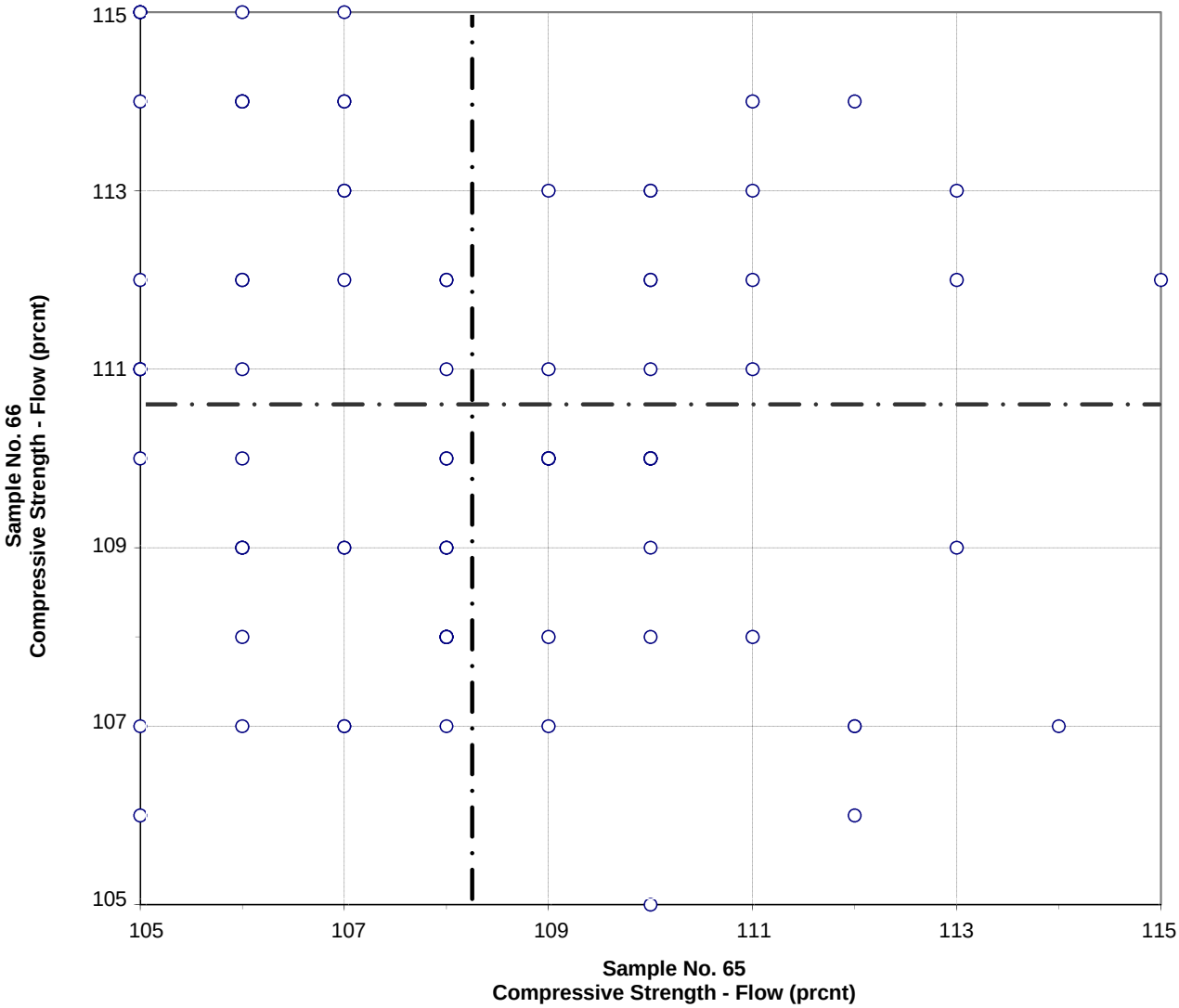
Test No. 220 Compressive Strength - % Water 86 Points

Sample No. 65	Ave	49.4	S.D.	1.3	C.V.	2.7
Sample No. 66	Ave	44.8	S.D.	1.8	C.V.	4.0

Labs eliminated: 169, 3, 17, 2477

Labs off Diagram: 42

CCRL Proficiency Sample Program
Compressive Strength - Flow
BLENDED CEMENT Samples No. 65 and No. 66

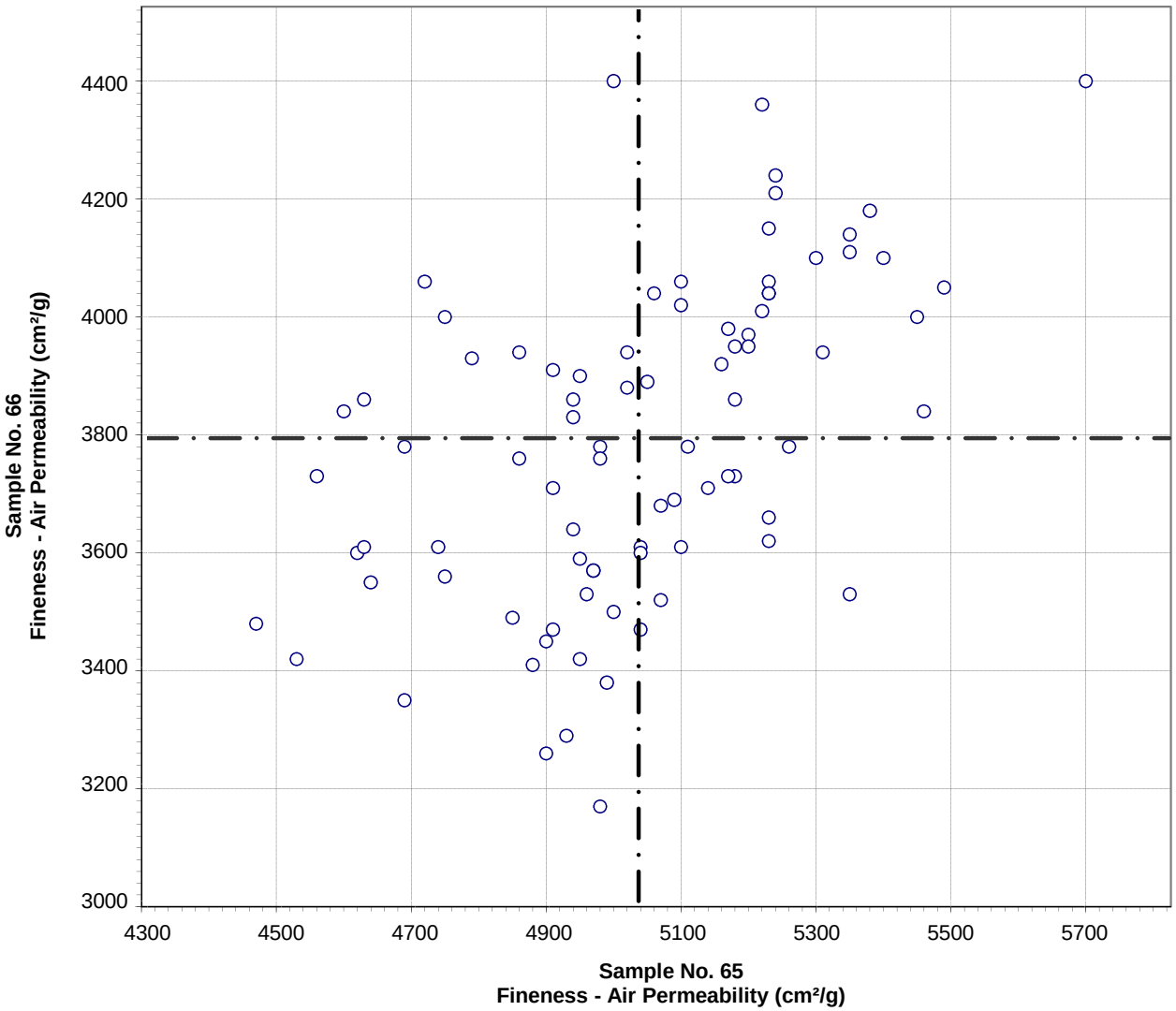


Test No. 230 Compressive Strength - Flow 87 Points

Sample No. 65	Ave	108	S.D.	2	C.V. 2.2
Sample No. 66	Ave	111	S.D.	3	C.V. 2.3

Labs eliminated: 14, 19, 22, 22, 35, 47, 105, 694

CCRL Proficiency Sample Program
Fineness - Air Permeability
BLENDED CEMENT Samples No. 65 and No. 66

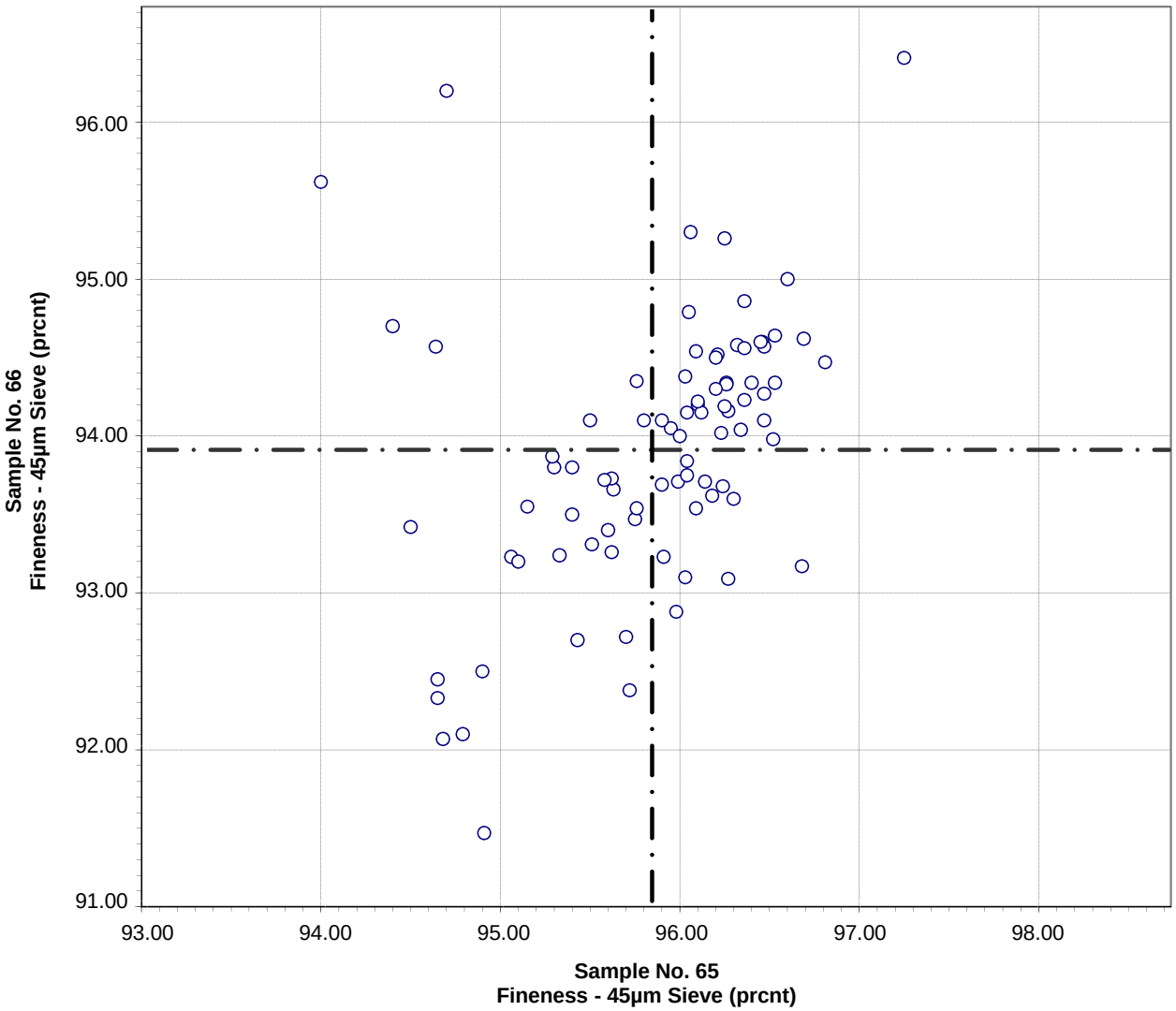


Test No. 270 Fineness - Air Permeability 86 Points

Sample No. 65	Ave	5034	S.D.	241	C.V. 4.8
Sample No. 66	Ave	3792	S.D.	270	C.V. 7.1

Labs eliminated: 14, 2360, 2477, 10, 3247

CCRL Proficiency Sample Program
Fineness - 45µm % Passing
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 281 Fineness - 45µm % Passing 87 Points

Sample No. 65	Ave	95.83	S.D.	0.64	C.V. 0.7
Sample No. 66	Ave	93.90	S.D.	0.84	C.V. 0.9

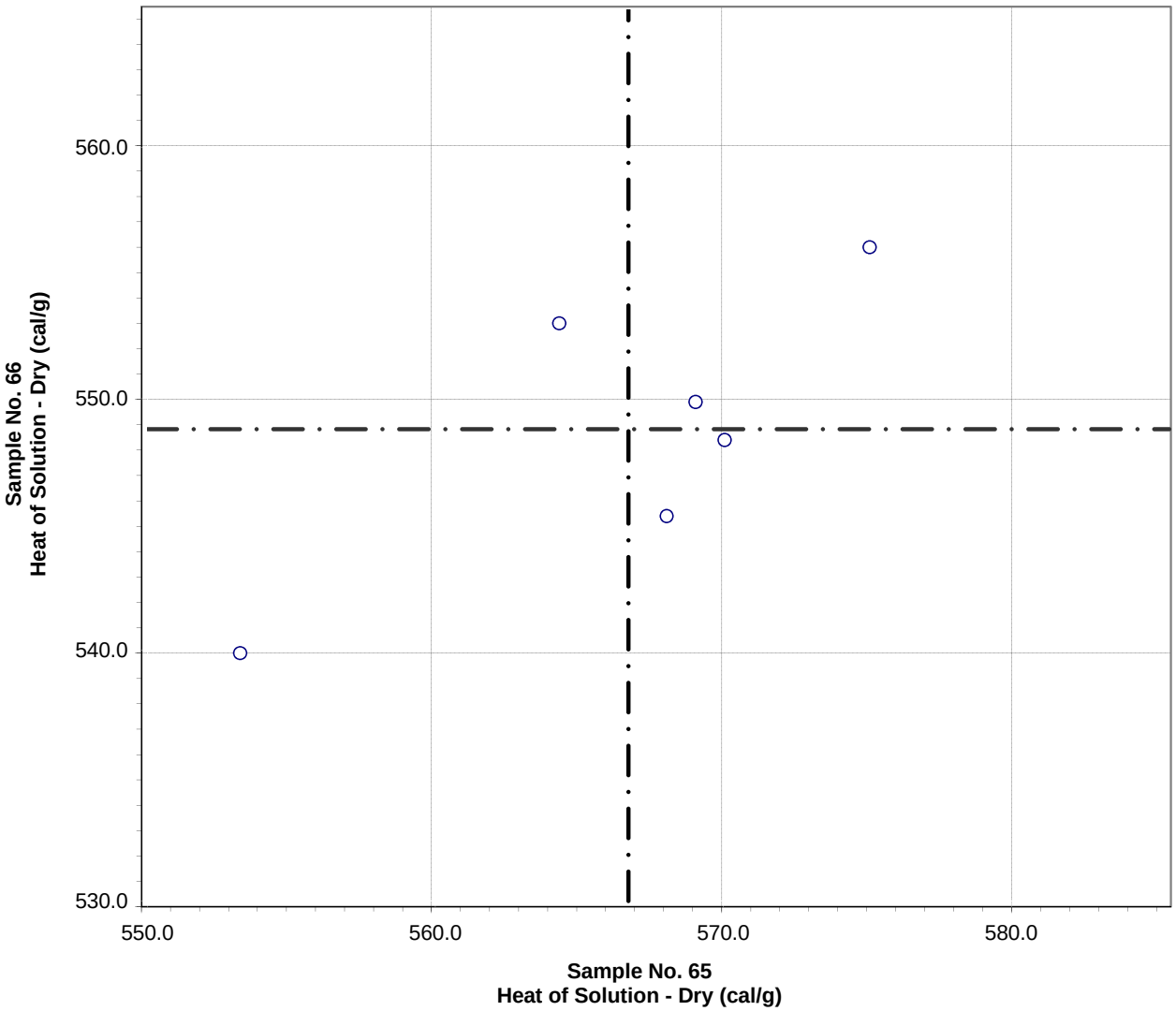
Labs eliminated: 2295, 50, 51, 2360, 2476

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 65 and No. 66
Final Report - Heat of Hydration Results
May 7, 2010

SUMMARY OF RESULTS

		Sample No. 65			Sample No. 66		
Test	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Heat Solution, Dry cal/g	6	566.7	7.4	1.3	548.8	5.7	1.0
Heat Sol, 7 day cal/g	6	490.6	6.7	1.4	480.7	8.0	1.7
Heat Sol, 28 day cal/g	5	481.4	5.5	1.14	471.7	8.8	1.87
Heat Hyd, 7 day cal/g	6	76.2	4.7	6.2	69.0	3.6	5.2
Heat Hyd, 28 day cal/g	3	87.7	2.3	2.7	80.8	3.0	3.8

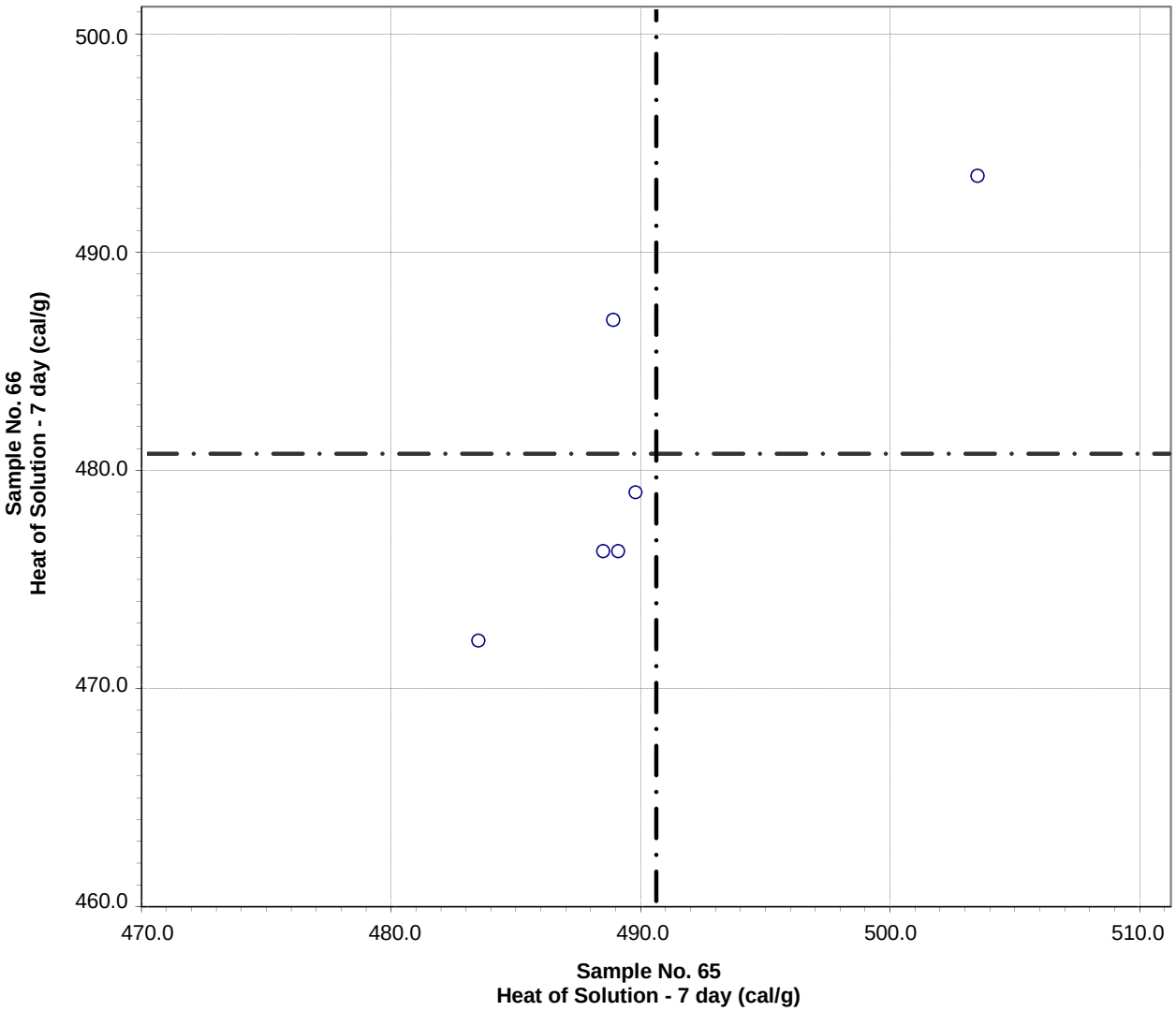
CCRL Proficiency Sample Program
Heat of Solution - Dry Cement
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 291 Heat of Solution - Dry Cement 6 Points

Sample No. 65	Ave	566.7	S.D.	7.4	C.V.	1.3
Sample No. 66	Ave	548.8	S.D.	5.7	C.V.	1.0

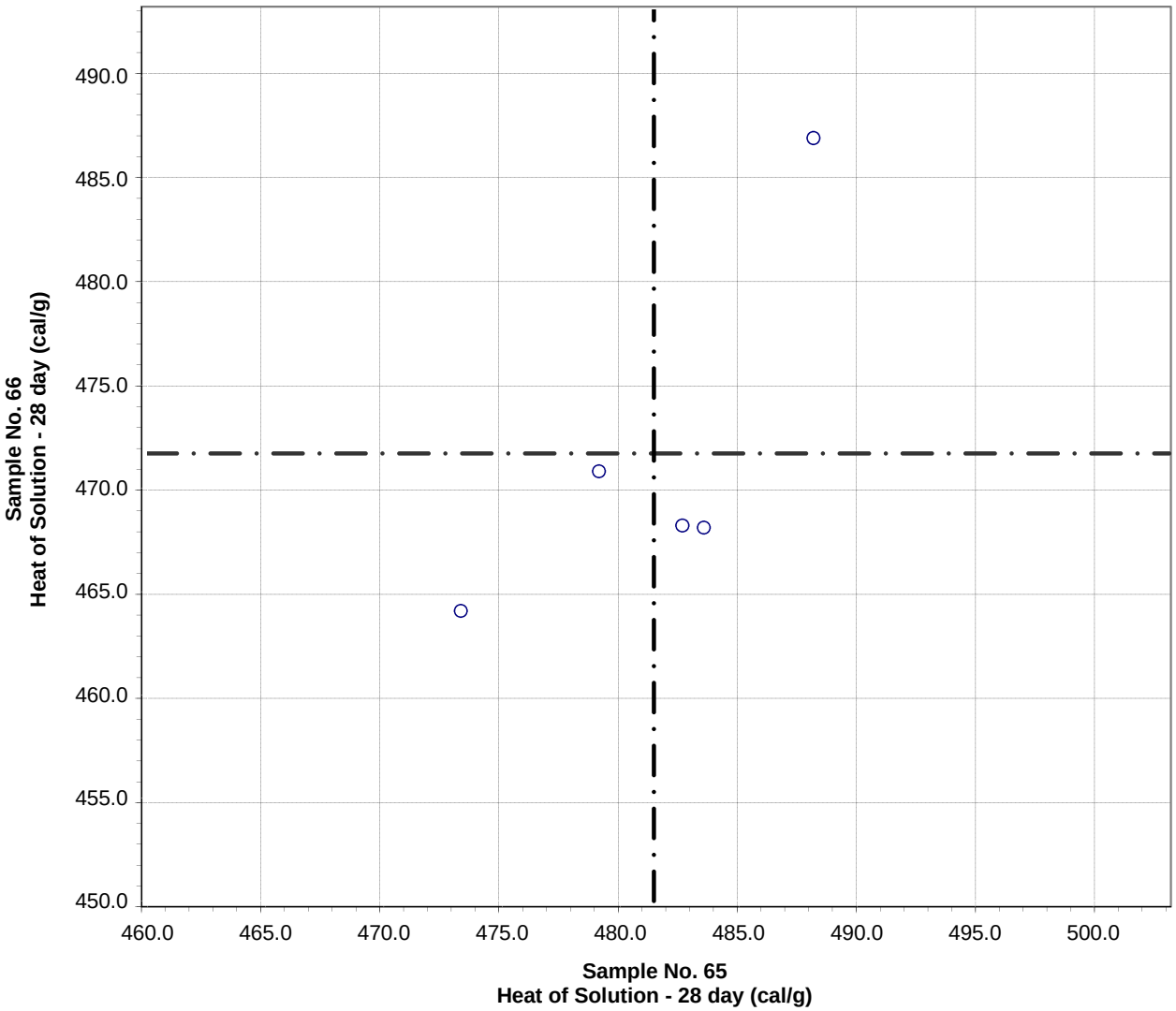
CCRL Proficiency Sample Program
Heat of Solution - 7 day
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 292 Heat of Solution - 7 day 6 Points

Sample No. 65	Ave	490.6	S.D.	6.7	C.V.	1.4
Sample No. 66	Ave	480.7	S.D.	8.0	C.V.	1.7

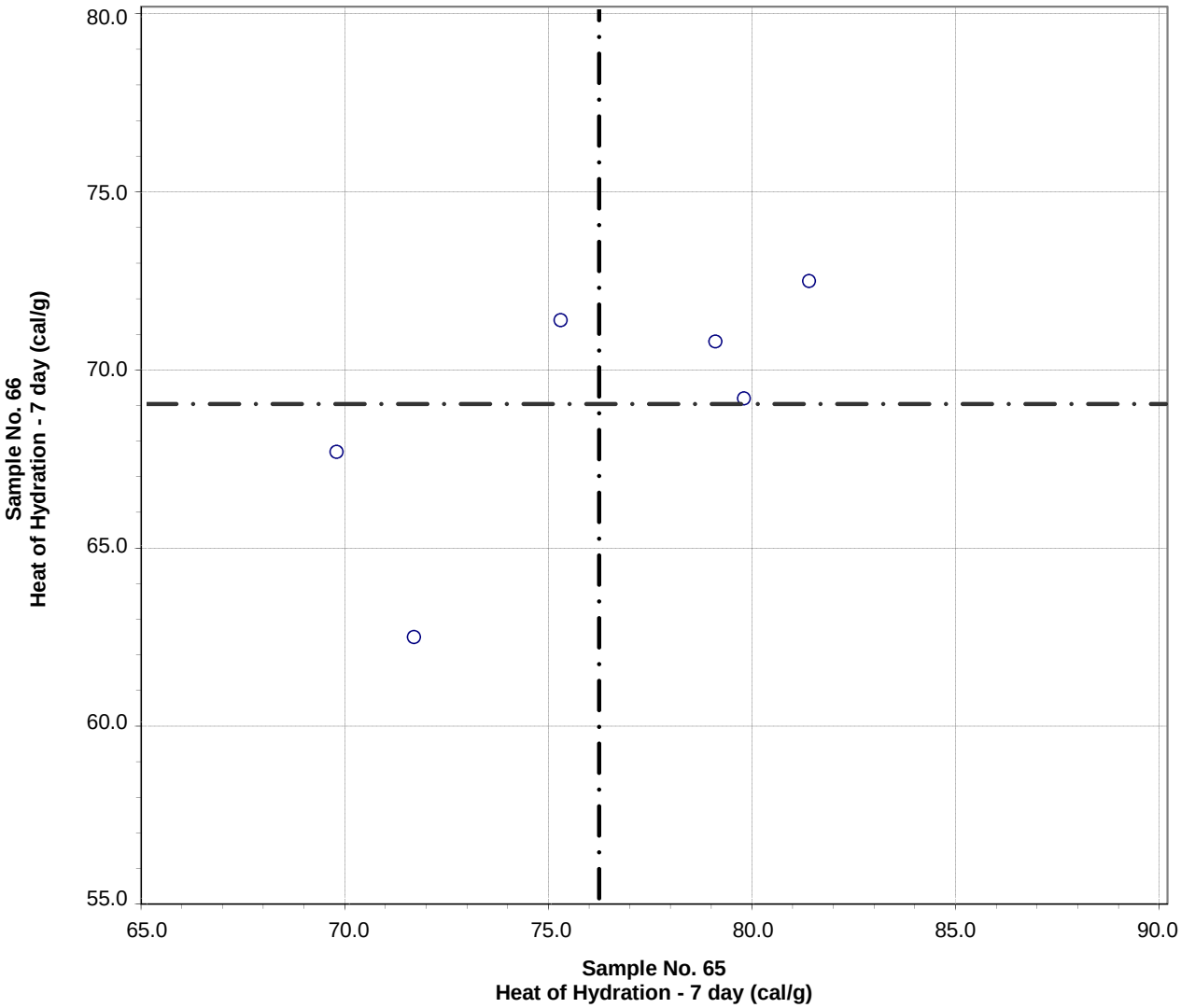
CCRL Proficiency Sample Program
Heat of Solution - 28 day
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 301 Heat of Solution - 28 day 5 Points

Sample No. 65	Ave	481.4	S.D.	5.5	C.V.	1.1
Sample No. 66	Ave	471.7	S.D.	8.8	C.V.	1.9

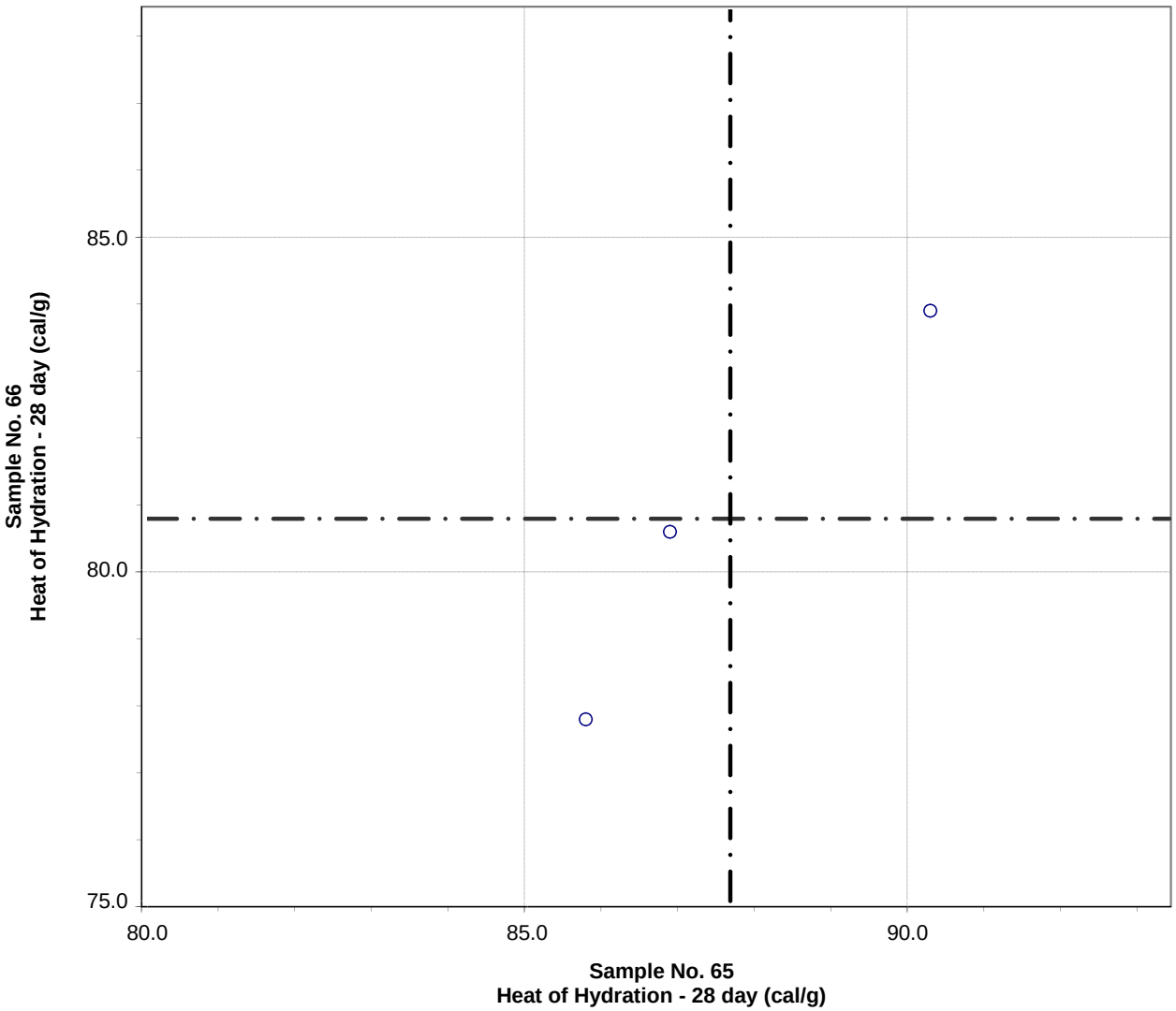
CCRL Proficiency Sample Program
Heat of Hydration - 7 day
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 290 Heat of Hydration - 7 day 6 Points

Sample No. 65	Ave	76.2	S.D.	4.7	C.V. 6.2
Sample No. 66	Ave	69.0	S.D.	3.6	C.V. 5.2

CCRL Proficiency Sample Program
Heat of Hydration - 28 day
BLENDED CEMENT Samples No. 65 and No. 66



Test No. 300 Heat of Hydration - 28 day 3 Points

Sample No. 65	Ave	87.7	S.D.	2.3	C.V.	2.7
Sample No. 66	Ave	80.8	S.D.	3.1	C.V.	3.8