

CEMENT AND CONCRETE REFERENCE LABORATORY
PROFICIENCY SAMPLE PROGRAM

Final Report
Blended Cement Proficiency Samples
Number 75 and Number 76

April 2015



April 27, 2015

To: Participants in the CCRL Blended Cement Proficiency Sample Program

SUBJECT: Final Report on Blended Cement Proficiency Samples No. 75 and No. 76

Following is the final report for the current pair of CCRL **Blended Cement** Proficiency Samples which were distributed in February 2015. Both cements were an ASTM C595 Blended Hydraulic Cement. Sample No 75 was a Type IS (30) and No. 76 was a Type IS (30).

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/>.

Note on SO₃ and Loss on Ignition (LOI) test results: For Type IS cement SO₃ and LOI results should be corrected for Sulfide Sulfur (S). Ratings for uncorrected SO₃ and LOI were not assigned.

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 2016.

Sincerely,

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

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. 75 and No. 76

This letter, and the material included with it, constitutes the final report and summary of results for the current pair of Blended Cement Proficiency Samples, which were distributed in February 2015. 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.

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.*

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, 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. 75 and No. 76

Final Report – Chemical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Silicon Dioxide (percent)							
	88	24.37	1.21	5.0	24.00	1.04	4.3
	*86	24.53	0.60	2.5	24.10	0.56	2.3
	* Labs Eliminated - 24, 1715						
Aluminum Oxide (percent)							
	85	7.33	0.49	6.7	7.96	0.87	10.9
	*78	7.36	0.18	2.5	7.86	0.18	2.3
	* Labs Eliminated - 24, 42, 1715, 3247, 3431, 3504, 3911						
Ferric Oxide (percent)							
	86	1.84	0.24	13.2	2.66	0.14	5.2
	*79	1.80	0.07	3.7	2.67	0.07	2.8
	* Labs Eliminated - 24, 51, 125, 2292, 3431, 3503, 3911						
Calcium Oxide (percent)							
	86	54.88	1.98	3.60	56.97	1.71	2.99
	*80	54.92	0.62	1.13	57.15	0.64	1.13
	* Labs Eliminated - 24, 125, 440, 1715, 2292, 3911						
Magnesium Oxide (percent)							
	86	4.78	0.53	11.1	2.28	0.33	14.6
	*79	4.79	0.16	3.3	2.24	0.11	4.8
	* Labs Eliminated - 24, 50, 1715, 2292, 2363, 2463, 3911						
Sulfur Trioxide - Corrected for S (percent)							
	37	2.81	0.54	19	2.49	0.52	21
	*35	2.89	0.27	9	2.59	0.25	10
	* Labs Eliminated - 25, 101						
Sulfur Trioxide - Uncorrected for S (percent)							
	83	3.18	0.30	9	2.78	0.24	9
	*82	3.19	0.27	8	2.79	0.21	7
	* Labs Eliminated - 24						

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

Final Report – Chemical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Loss on Ignition - Corrected for S (percent)							
	39	2.01	0.47	24	2.28	0.40	17
	*37	1.93	0.30	15	2.21	0.25	11
	* Labs Eliminated - 51, 105						
Loss on Ignition - Uncorrected for S (percent)							
	84	1.79	1.35	75.9	1.93	0.12	6.4
	*80	1.63	0.11	6.5	1.92	0.11	5.5
	* Labs Eliminated - 284, 690, 1715, 2292						
Sodium Oxide (percent)							
	80	0.292	0.067	23	0.134	0.047	35
	*69	0.300	0.037	12	0.127	0.028	22
	* Labs Eliminated - 413, 1251, 1657, 1715, 2292, 2463, 2464, 2490, 3503, 3504, 3911						
Potassium Oxide (percent)							
	84	0.75	0.09	11.6	0.35	0.06	18.5
	*77	0.77	0.03	4.4	0.35	0.02	5.8
	* Labs Eliminated - 24, 50, 1715, 2292, 2466, 3503, 3504						
Titanium Dioxide (percent)							
	62	0.36	0.061	17.1	0.35	0.021	6.0
	*54	0.35	0.011	3.2	0.36	0.011	3.0
	* Labs Eliminated - 10, 24, 47, 54, 125, 2463, 2466, 2490						
Phosphorus Pentoxide (percent)							
	66	0.131	0.034	25.6	0.293	0.037	12.8
	*56	0.125	0.008	6.7	0.297	0.010	3.5
	* Labs Eliminated - 24, 43, 413, 2292, 2466, 3235, 3409, 3504, 3695, 3911						
Zinc Oxide (percent)							
	33	0.046	0.021	46.6	0.045	0.009	19.4
	*31	0.044	0.004	8.2	0.046	0.003	6.5
	* Labs Eliminated - 7, 24						

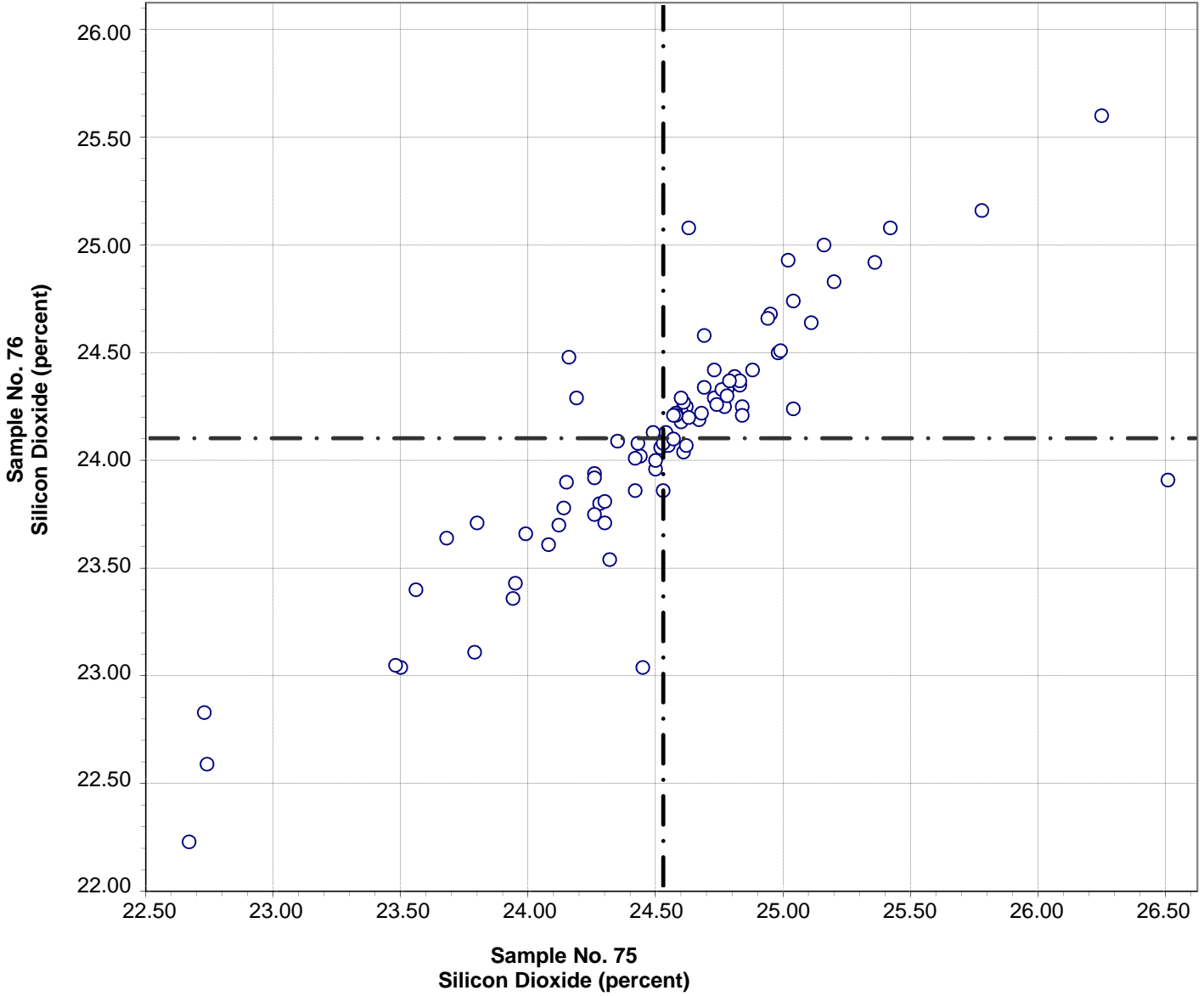
CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

Final Report – Chemical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Manganic Oxide (percent)							
	53	0.143	0.027	18.6	0.148	0.029	19.8
	*48	0.146	0.008	5.2	0.155	0.006	3.8
	* Labs Eliminated - 24, 354, 413, 2466, 3504						
Sulfide Sulfur (percent)							
	24	0.323	0.335	104	0.273	0.285	105
	*22	0.227	0.089	39	0.191	0.071	37
	* Labs Eliminated - 25, 497						
Chloride (percent)							
	32	0.010	0.007	70	0.009	0.004	45
	*30	0.008	0.004	44	0.008	0.003	40
	* Labs Eliminated - 90, 105						
Insoluble Residue (percent)							
	81	0.43	0.27	62	0.21	0.10	47
	*78	0.40	0.10	25	0.20	0.09	45
	* Labs Eliminated - 148, 246, 1715						
Chromium Oxide (percent)							
	31	0.010	0.003	32	0.012	0.003	26
	*29	0.009	0.002	18	0.013	0.002	18
	* Labs Eliminated - 24, 2463						

**CCRL Proficiency Sample Program
Silicon Dioxide
BLENDED CEMENT Samples No. 75 and No. 76**

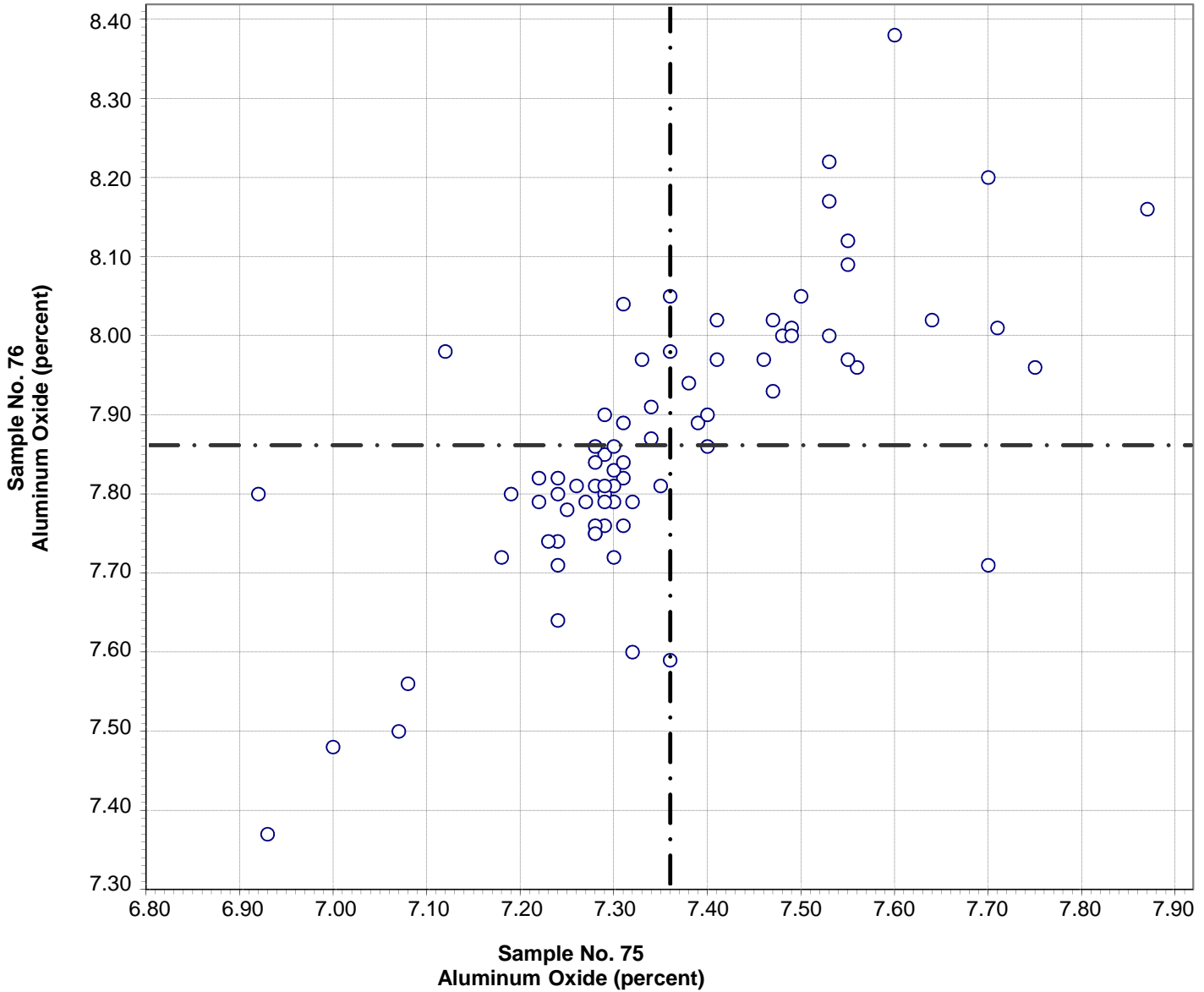


Test No. 10 Silicon Dioxide 86 Points

Sample No. 75	Ave 24.53	S.D. 0.60	C.V. 2.5
Sample No. 76	Ave 24.10	S.D. 0.56	C.V. 2.3

Labs Eliminated: 24, 1715

**CCRL Proficiency Sample Program
Aluminum Oxide
BLENDED CEMENT Samples No. 75 and No. 76**



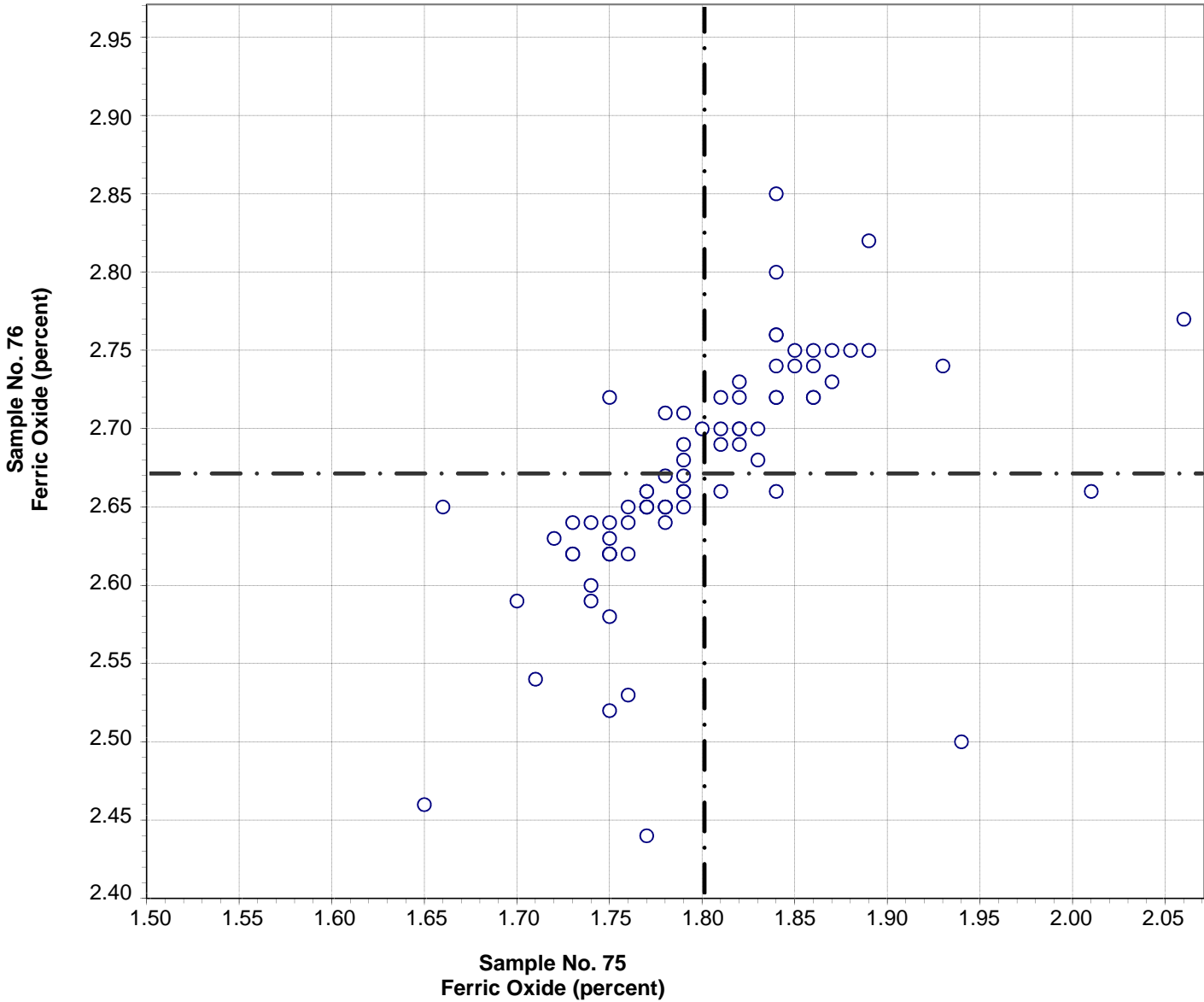
Test No. 21 Aluminum Oxide 77 Points

Sample No. 75	Ave 7.36	S.D. 0.18	C.V. 2.5
Sample No. 76	Ave 7.86	S.D. 0.18	C.V. 2.3

Labs Eliminated: 24, 42, 1715, 3247, 3431, 3504, 3911

Labs off Diagram: 2292

**CCRL Proficiency Sample Program
 Ferric Oxide
 BLENDED CEMENT Samples No. 75 and No. 76**

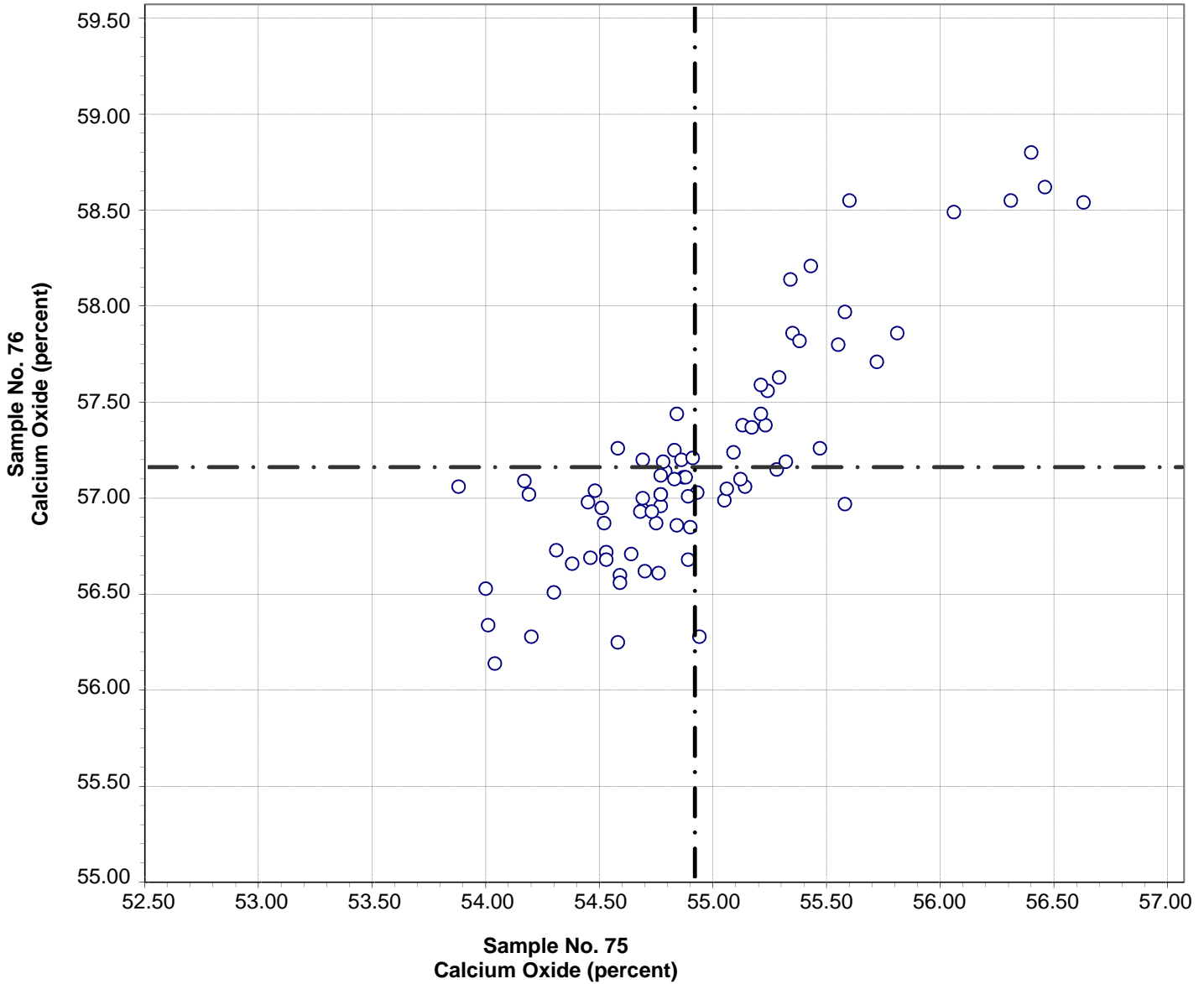


Test No. 30 Ferric Oxide 79 Points

Sample No. 75	Ave 1.80	S.D. 0.07	C.V. 3.7
Sample No. 76	Ave 2.67	S.D. 0.07	C.V. 2.8

Labs Eliminated: 24, 51, 125, 2292, 3431, 3503, 3911

**CCRL Proficiency Sample Program
Calcium Oxide
BLENDED CEMENT Samples No. 75 and No. 76**



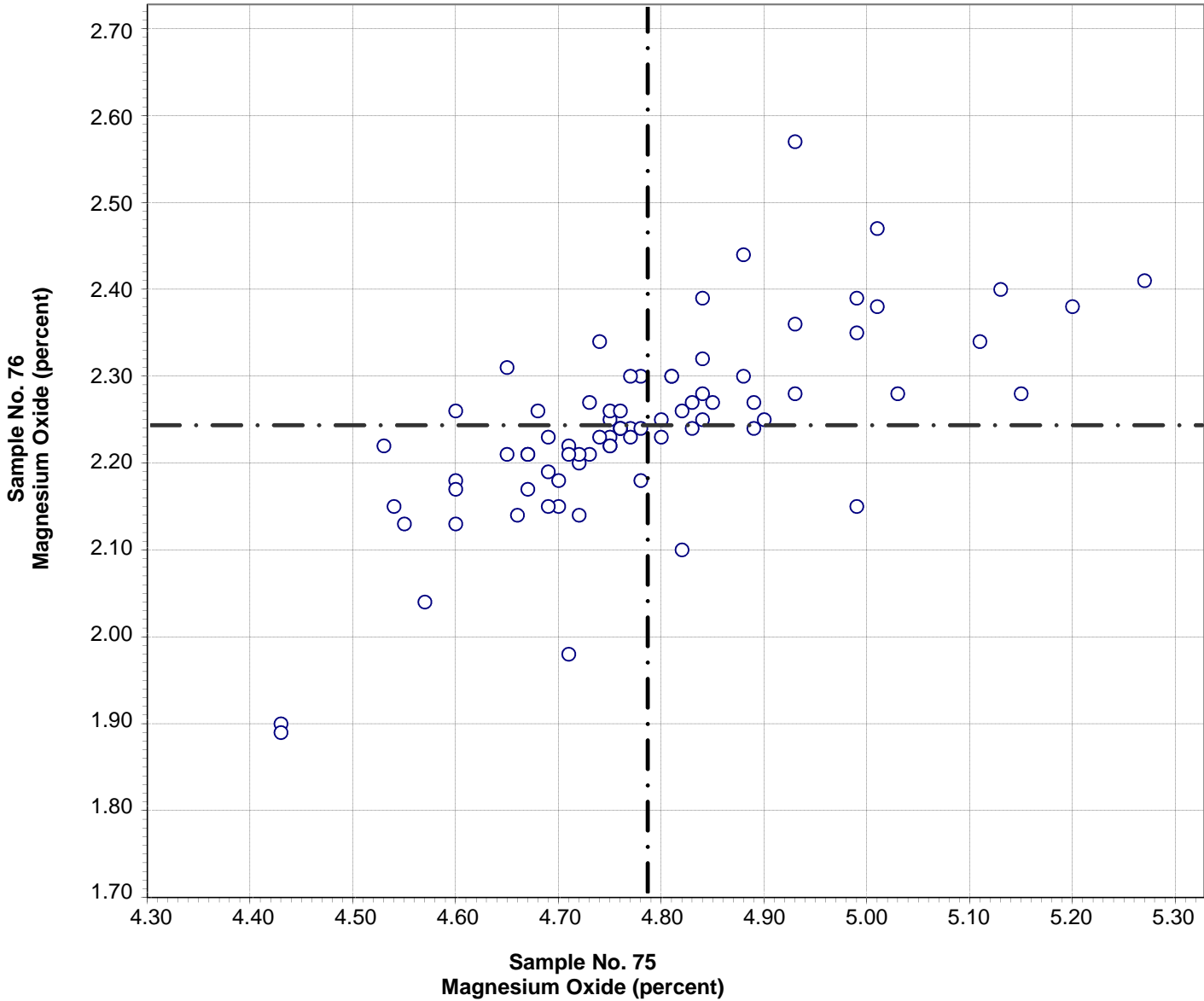
Test No. 40 Calcium Oxide 79 Points

Sample No. 75	Ave 54.92	S.D. 0.62	C.V. 1.13
Sample No. 76	Ave 57.15	S.D. 0.64	C.V. 1.13

Labs Eliminated: 24, 125, 440, 1715, 2292, 3911

Labs off Diagram: 74

**CCRL Proficiency Sample Program
Magnesium Oxide
BLENDED CEMENT Samples No. 75 and No. 76**

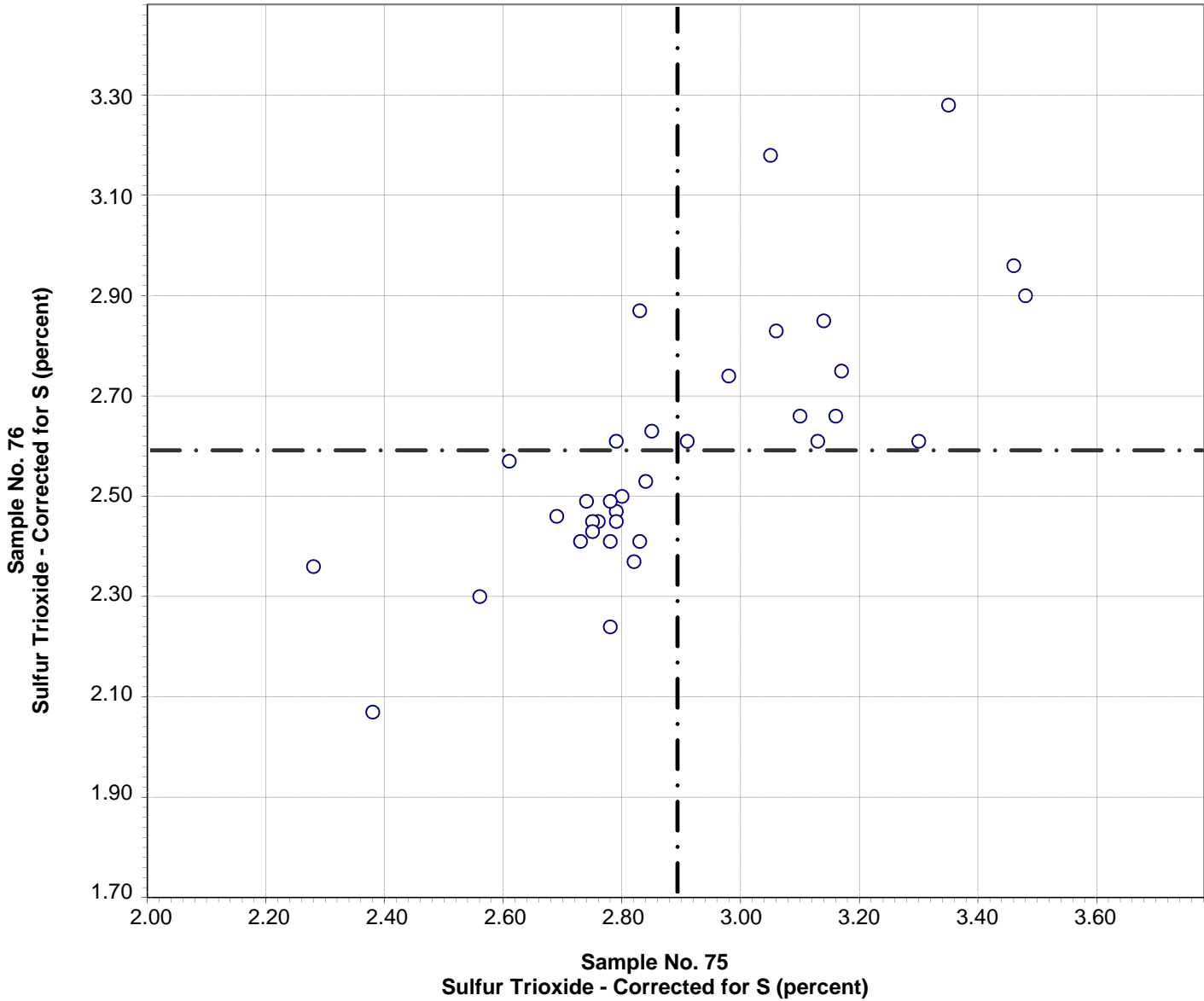


Test No. 50 Magnesium Oxide 79 Points

Sample No. 75	Ave 4.79	S.D. 0.16	C.V. 3.3
Sample No. 76	Ave 2.24	S.D. 0.11	C.V. 4.8

Labs Eliminated: 24, 50, 1715, 2292, 2363, 2463, 3911

**CCRL Proficiency Sample Program
Sulfur Trioxide - Corrected for S
BLENDED CEMENT Samples No. 75 and No. 76**

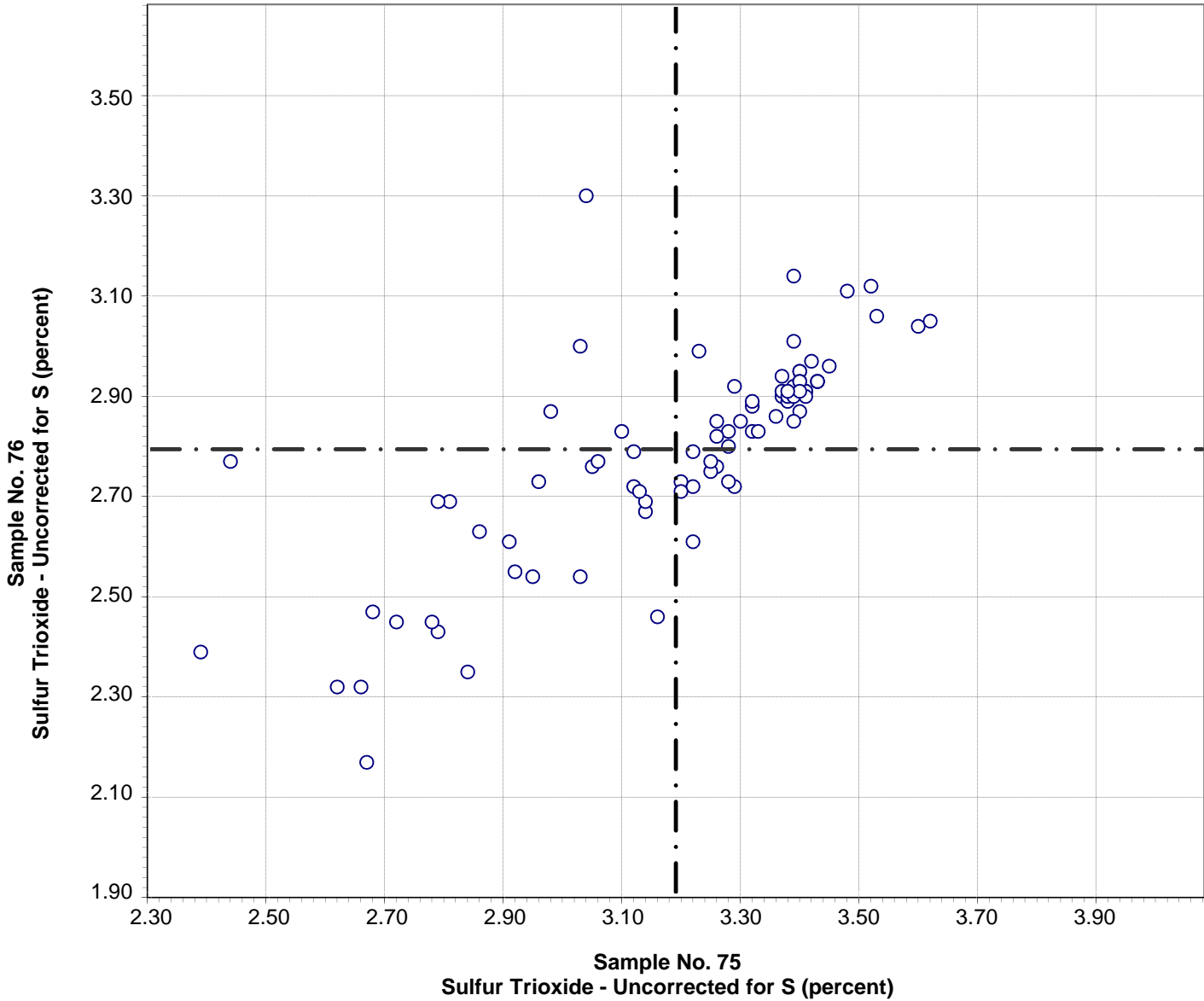


Test No. 61 Sulfur Trioxide - Corrected for S 35 Points

Sample No. 75	Ave 2.89	S.D. 0.27	C.V. 9
Sample No. 76	Ave 2.59	S.D. 0.25	C.V. 10

Labs Eliminated: 25, 101

**CCRL Proficiency Sample Program
Sulfur Trioxide - Uncorrected for S
BLENDED CEMENT Samples No. 75 and No. 76**

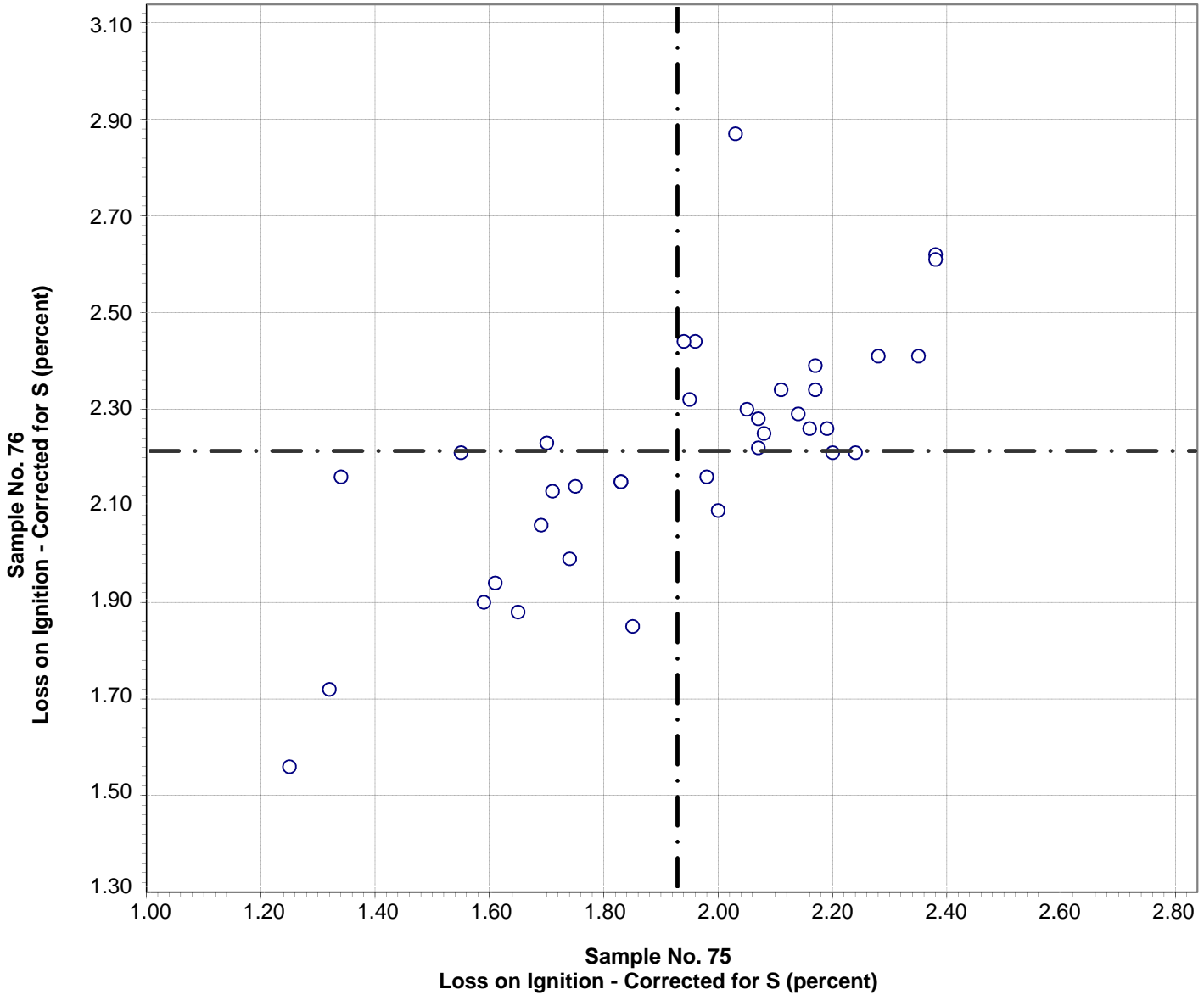


Test No. 62 Sulfur Trioxide - Uncorrected for S 82 Points

Sample No. 75	Ave 3.19	S.D. 0.27	C.V. 8
Sample No. 76	Ave 2.79	S.D. 0.21	C.V. 7

Labs Eliminated: 24

**CCRL Proficiency Sample Program
Loss on Ignition - Corrected for S
BLENDED CEMENT Samples No. 75 and No. 76**

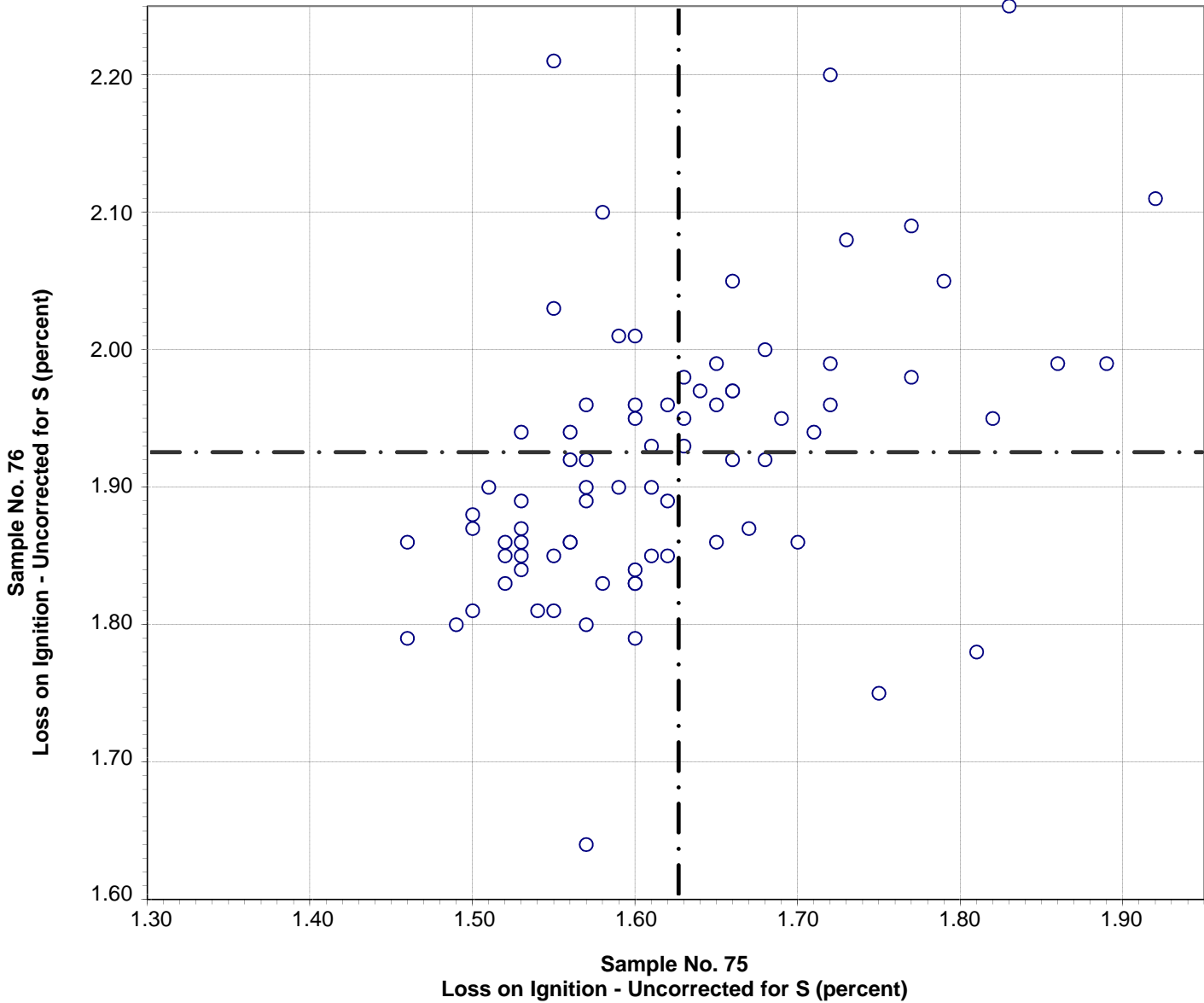


Test No. 71 Loss on Ignition - Corrected for S 37 Points

Sample No. 75	Ave 1.93	S.D. 0.30	C.V. 15
Sample No. 76	Ave 2.21	S.D. 0.25	C.V. 11

Labs Eliminated: 51, 105

**CCRL Proficiency Sample Program
Loss on Ignition - Uncorrected for S
BLENDED CEMENT Samples No. 75 and No. 76**



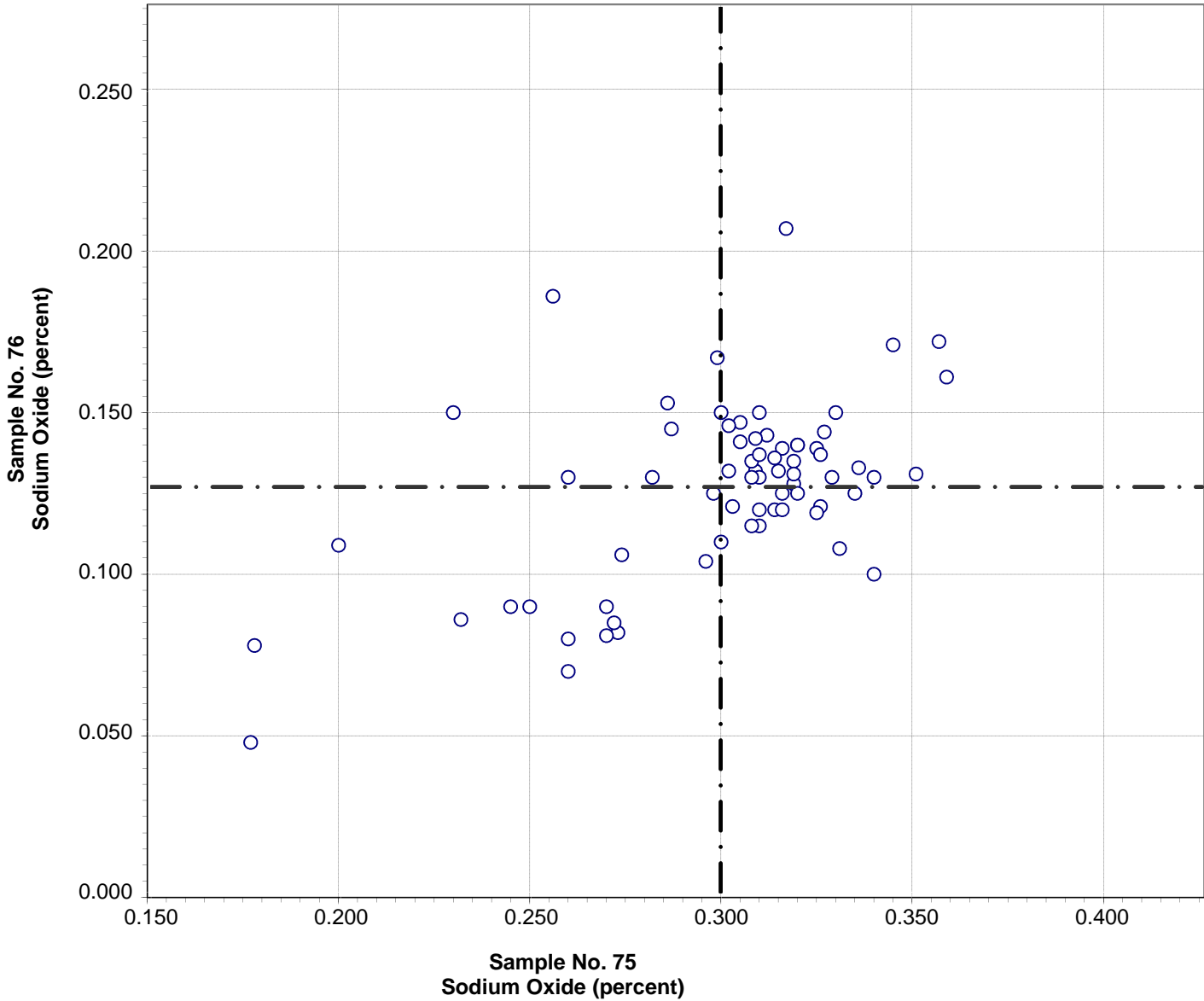
Test No. 72 Loss on Ignition - Uncorrected for S 79 Points

Sample No. 75	Ave 1.63	S.D. 0.11	C.V. 6.5
Sample No. 76	Ave 1.92	S.D. 0.11	C.V. 5.5

Labs Eliminated: 284, 690, 1715, 2292

Labs off Diagram: 209

**CCRL Proficiency Sample Program
Sodium Oxide
BLENDED CEMENT Samples No. 75 and No. 76**

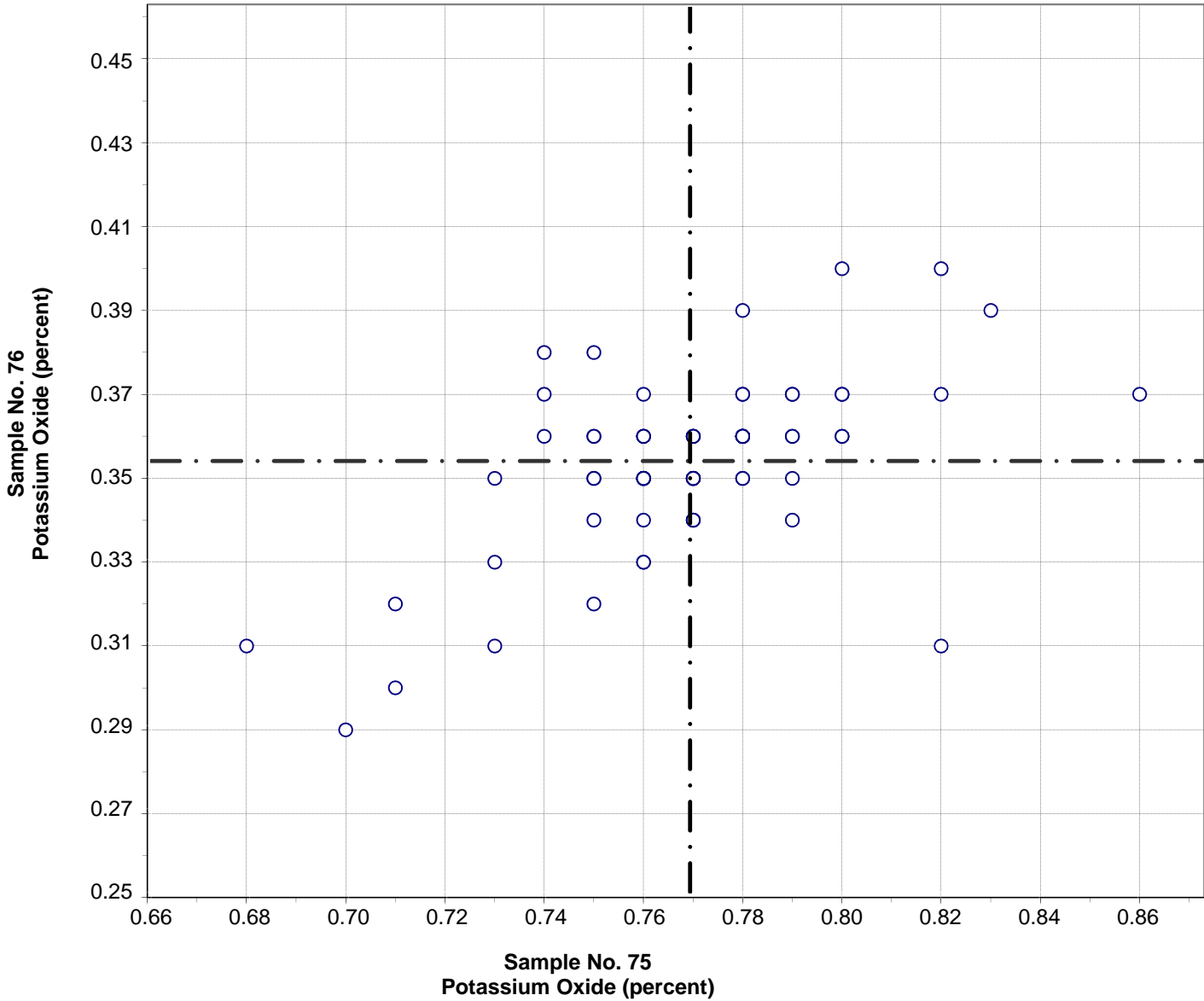


Test No. 90 Sodium Oxide 69 Points

Sample No. 75	Ave 0.300	S.D. 0.037	C.V. 12
Sample No. 76	Ave 0.127	S.D. 0.028	C.V. 22

Labs Eliminated: 413, 1251, 1657, 1715, 2292, 2463, 2464, 2490, 3503, 3504, 3911

**CCRL Proficiency Sample Program
Potassium Oxide
BLENDED CEMENT Samples No. 75 and No. 76**



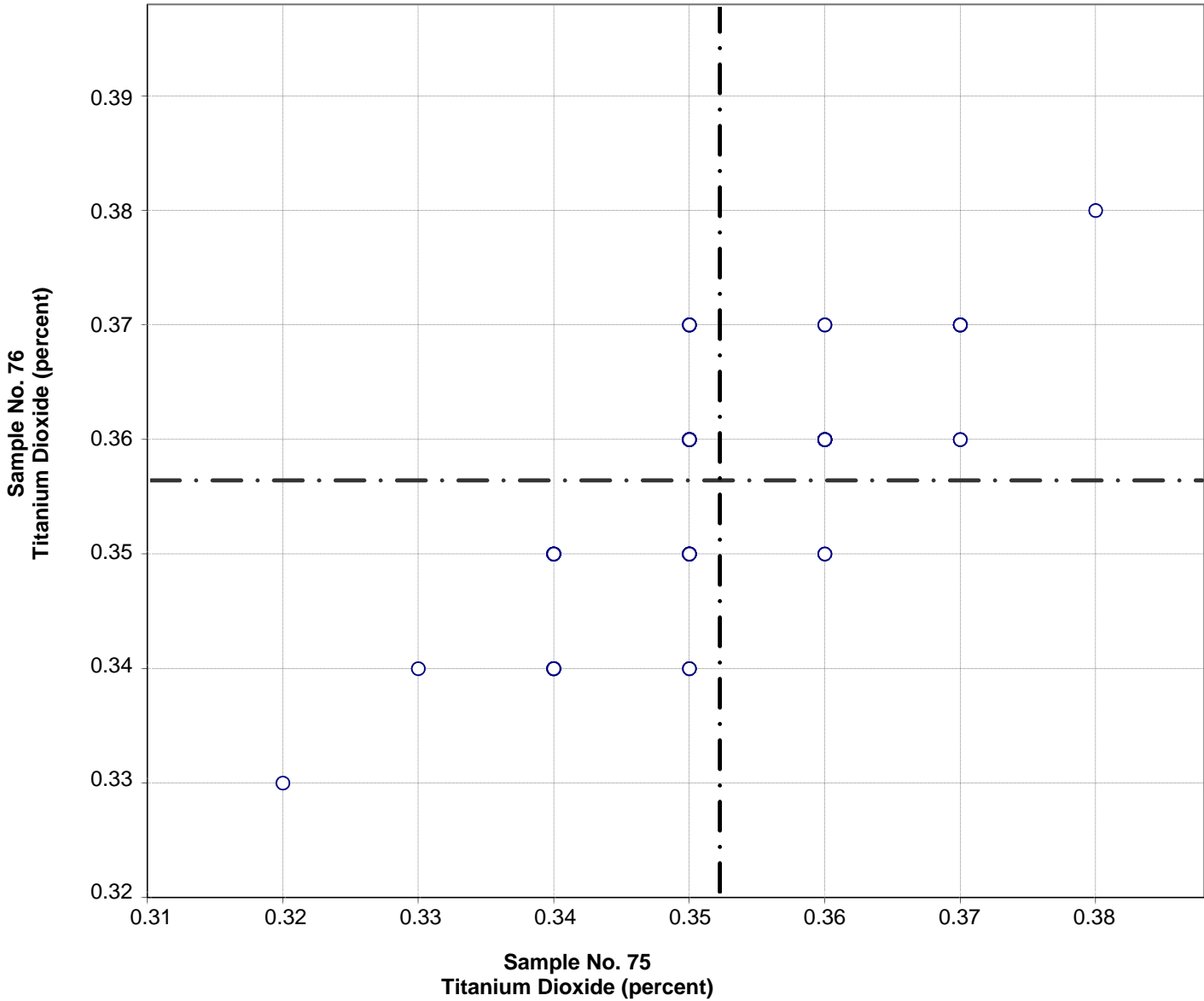
Test No. 100 Potassium Oxide 75 Points

Sample No. 75 Ave 0.77 S.D. 0.03 C.V. 4.4
 Sample No. 76 Ave 0.35 S.D. 0.02 C.V. 5.8

Labs Eliminated: 24, 50, 1715, 2292, 2466, 3503, 3504

Labs off Diagram: 975, 3911

**CCRL Proficiency Sample Program
Titanium Dioxide
BLENDED CEMENT Samples No. 75 and No. 76**

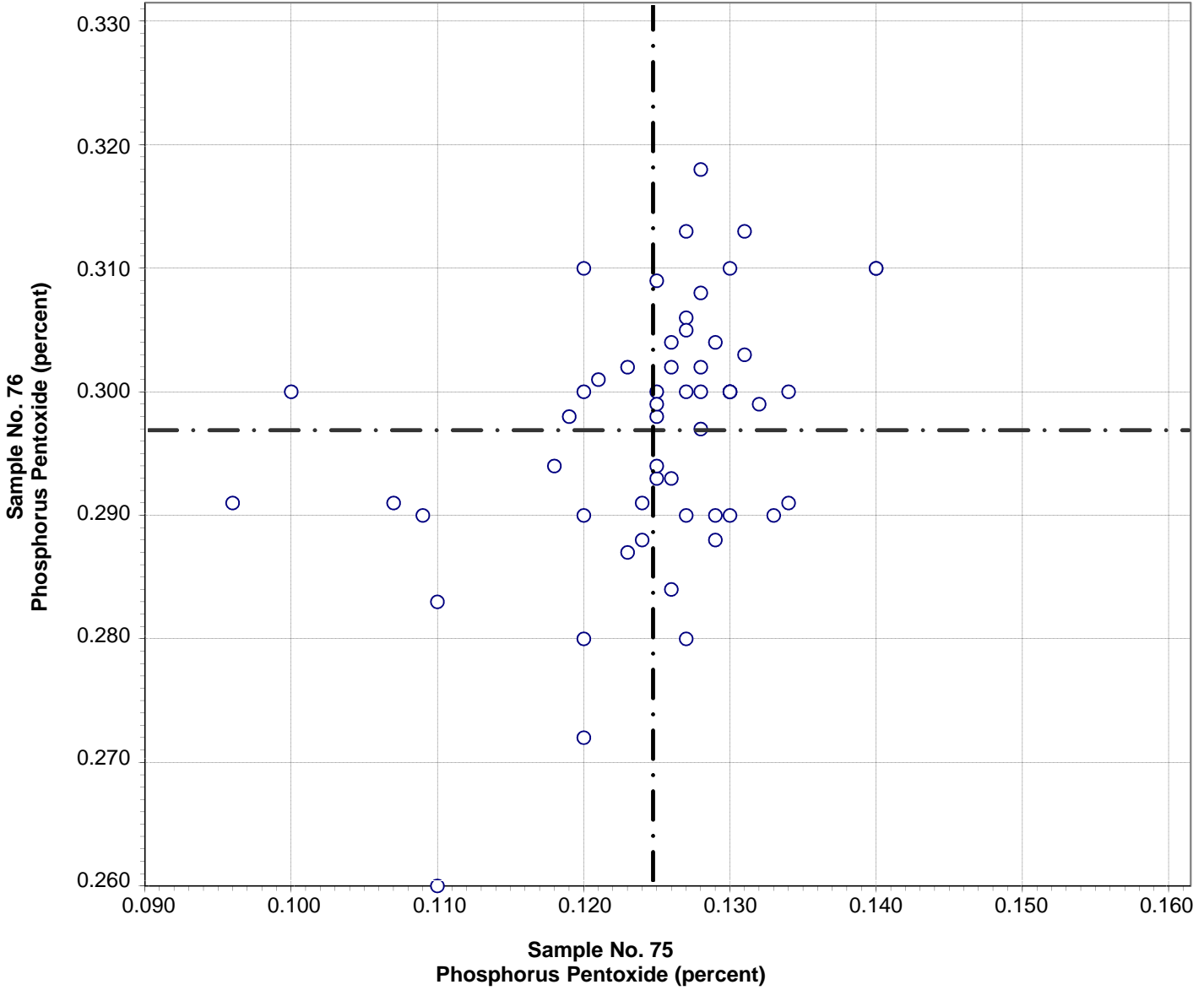


Test No. 103 Titanium Dioxide 54 Points

Sample No. 75	Ave 0.35	S.D. 0.011	C.V. 3.2
Sample No. 76	Ave 0.36	S.D. 0.011	C.V. 3.0

Labs Eliminated: 10, 24, 47, 54, 125, 2463, 2466, 2490

**CCRL Proficiency Sample Program
Phosphorus Pentoxide
BLENDED CEMENT Samples No. 75 and No. 76**

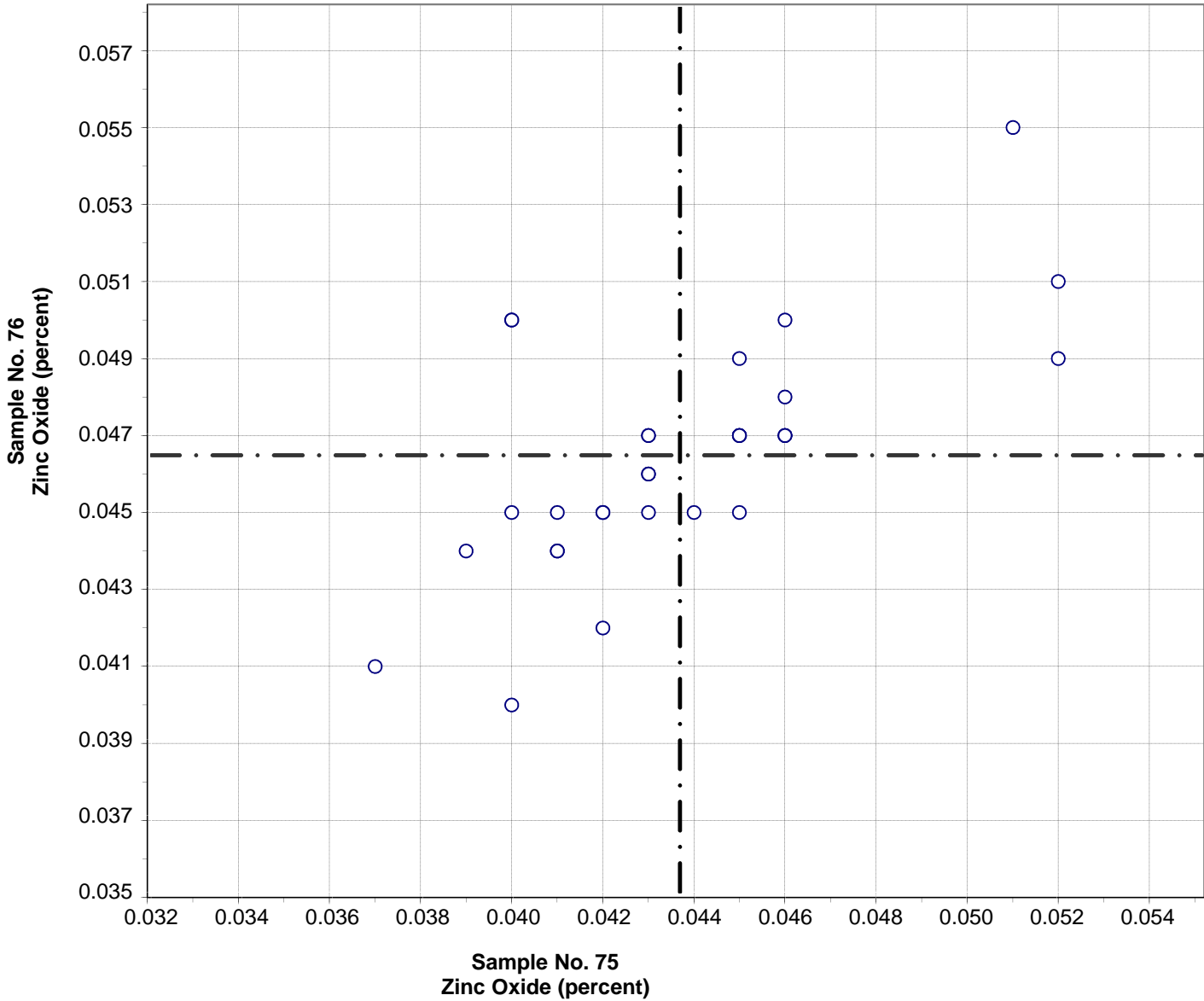


Test No. 102 Phosphorus Pentoxide 56 Points

Sample No. 75	Ave 0.125	S.D. 0.008	C.V. 6.7
Sample No. 76	Ave 0.297	S.D. 0.010	C.V. 3.5

Labs Eliminated: 24, 43, 413, 2292, 2466, 3235, 3409, 3504, 3695, 3911

**CCRL Proficiency Sample Program
Zinc Oxide
BLENDED CEMENT Samples No. 75 and No. 76**

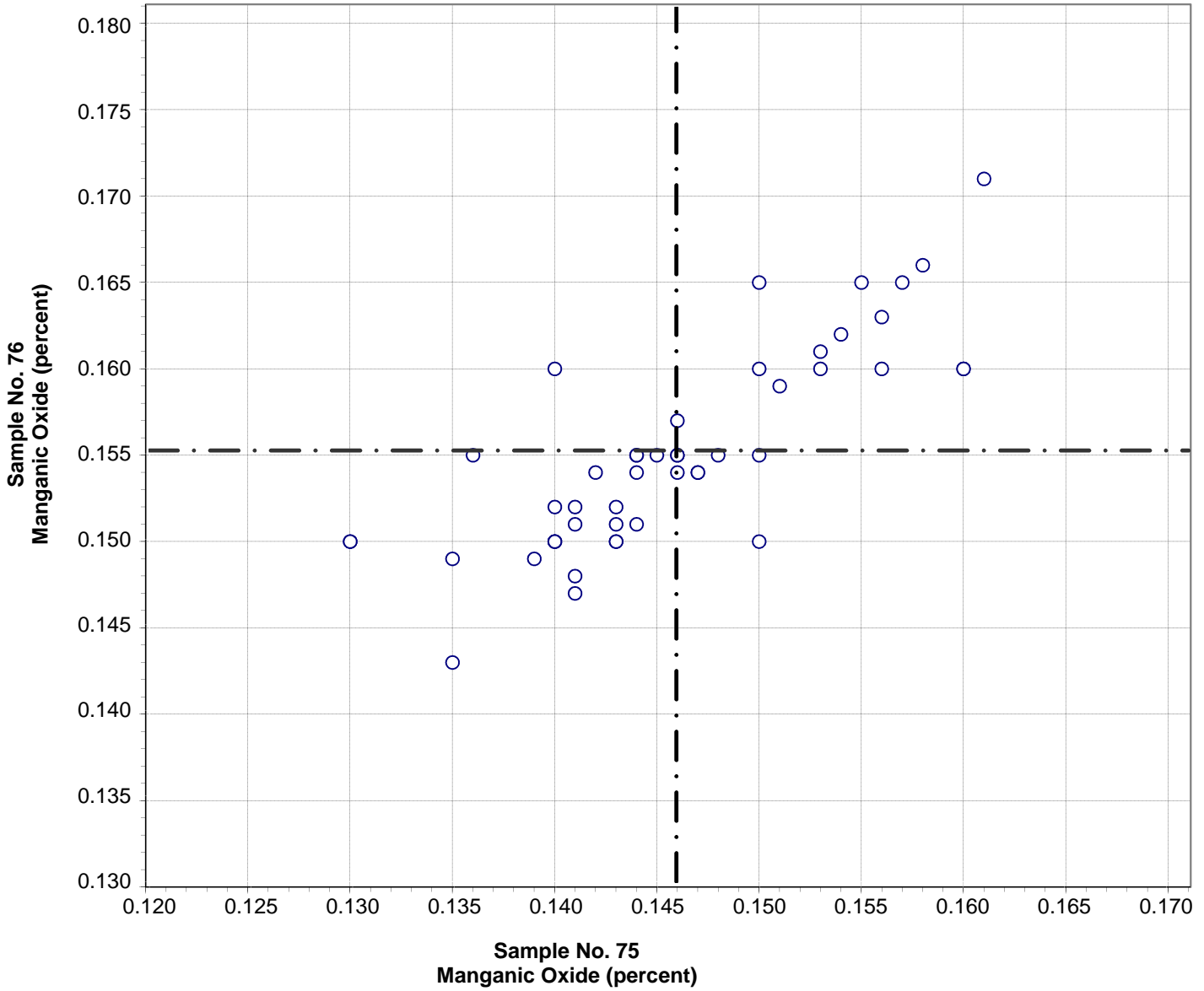


Test No. 99 Zinc Oxide 31 Points

Sample No. 75	Ave 0.044	S.D. 0.004	C.V. 8.2
Sample No. 76	Ave 0.046	S.D. 0.003	C.V. 6.5

Labs Eliminated: 7, 24

**CCRL Proficiency Sample Program
Manganic Oxide
BLENDED CEMENT Samples No. 75 and No. 76**

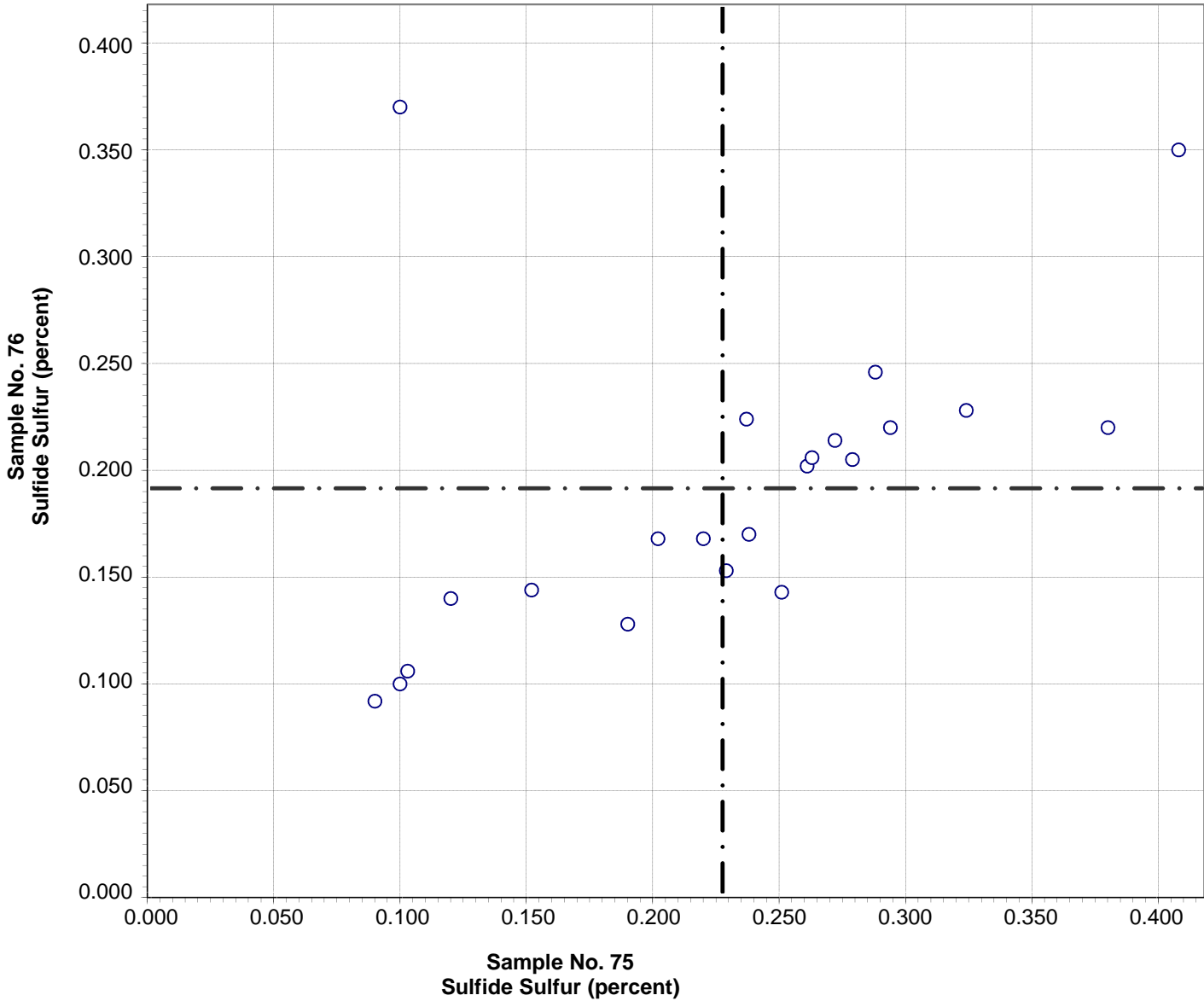


Test No. 101 Manganic Oxide 48 Points

Sample No. 75	Ave 0.146	S.D. 0.008	C.V. 5.2
Sample No. 76	Ave 0.155	S.D. 0.006	C.V. 3.8

Labs Eliminated: 24, 354, 413, 2466, 3504

**CCRL Proficiency Sample Program
Sulfide Sulfur
BLENDED CEMENT Samples No. 75 and No. 76**

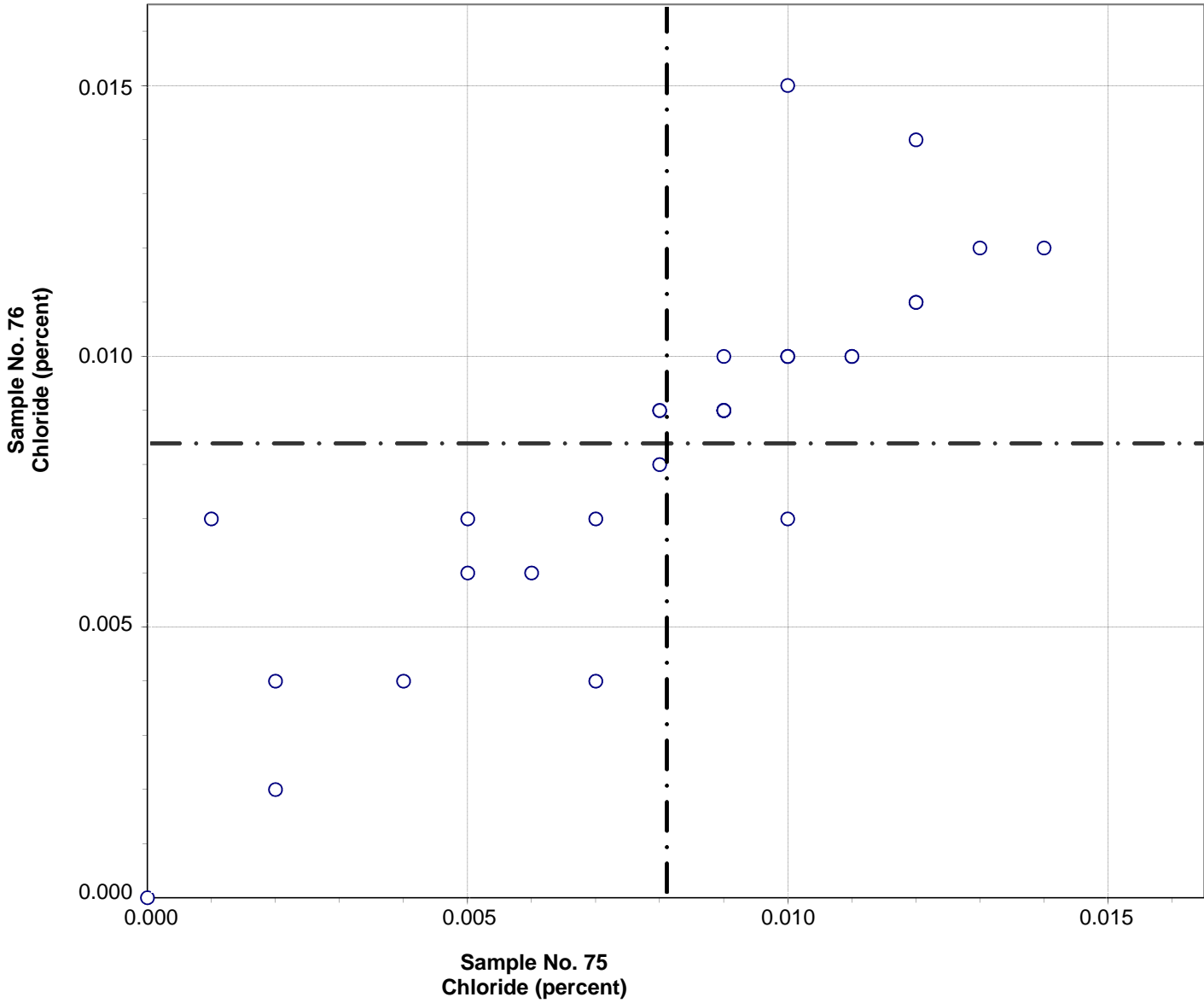


Test No. 65 Sulfide Sulfur 22 Points

Sample No. 75	Ave 0.227	S.D. 0.089	C.V. 39
Sample No. 76	Ave 0.191	S.D. 0.071	C.V. 37

Labs Eliminated: 25, 497

**CCRL Proficiency Sample Program
Chloride
BLENDED CEMENT Samples No. 75 and No. 76**

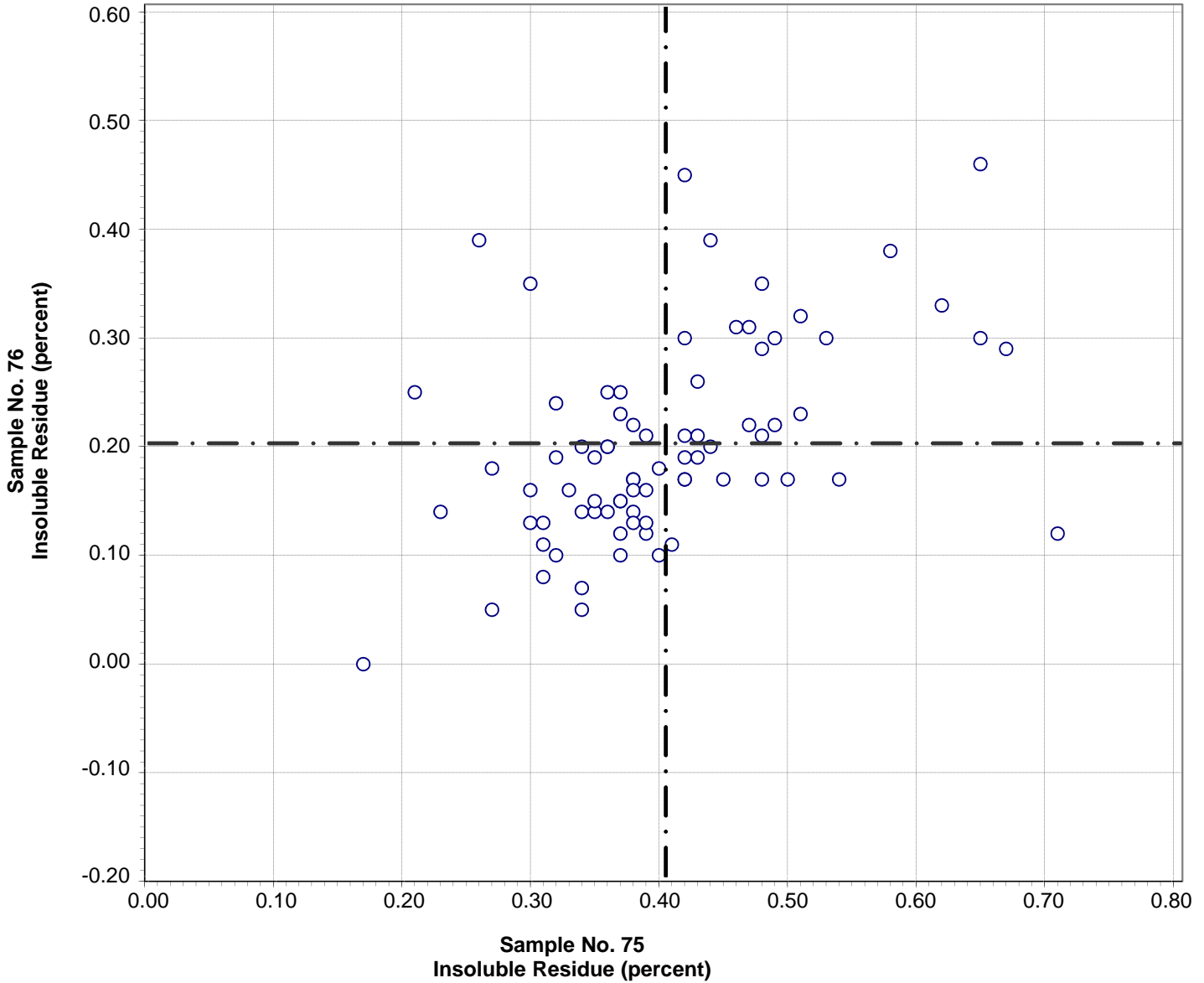


Test No. 104 Chloride 30 Points

Sample No. 75	Ave 0.008	S.D. 0.004	C.V. 44
Sample No. 76	Ave 0.008	S.D. 0.003	C.V. 40

Labs Eliminated: 90, 105

**CCRL Proficiency Sample Program
Insoluble Residue
BLENDED CEMENT Samples No. 75 and No. 76**

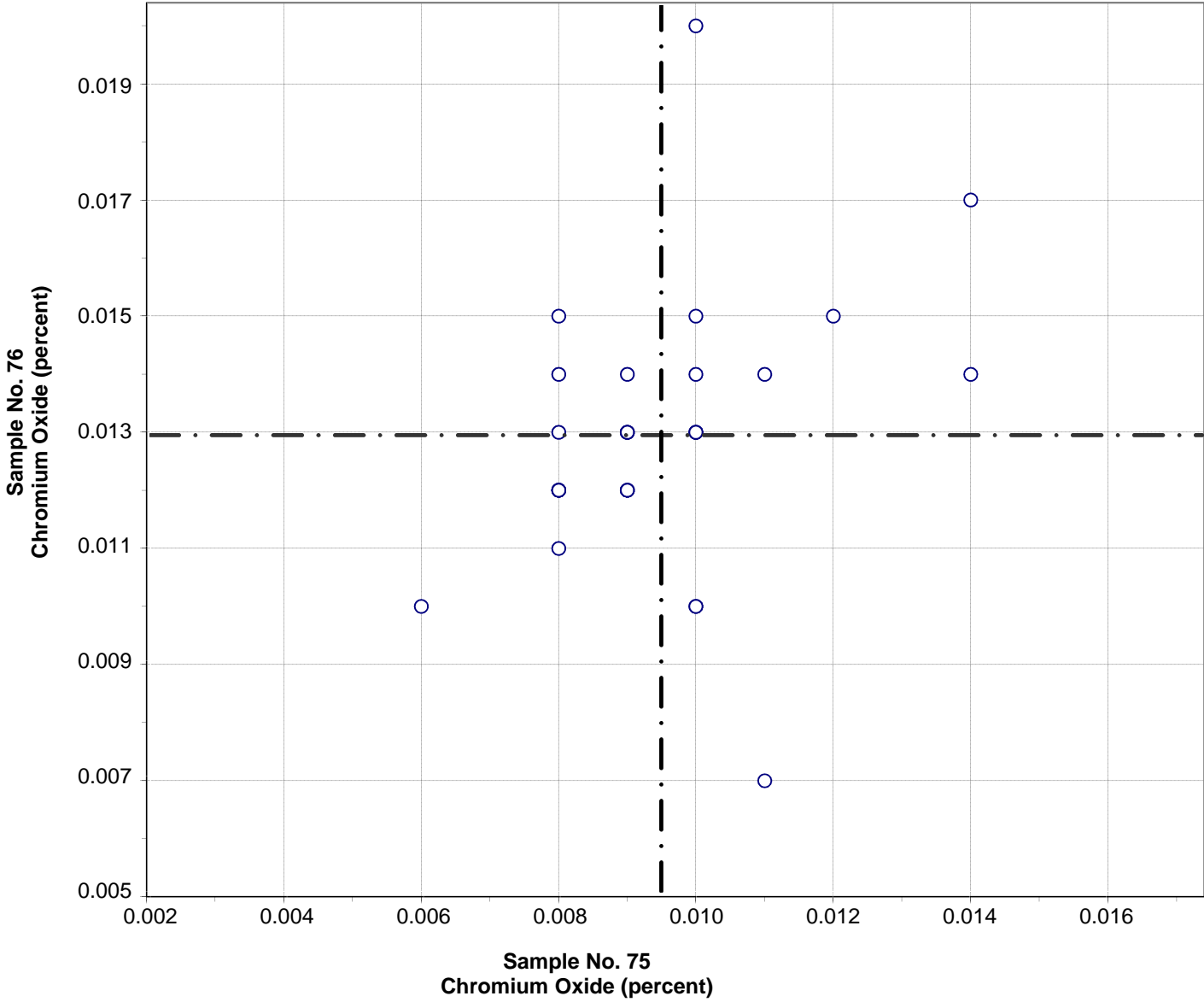


Test No. 80 Insoluble Residue 78 Points

Sample No. 75	Ave 0.40	S.D. 0.10	C.V. 25
Sample No. 76	Ave 0.20	S.D. 0.09	C.V. 45

Labs Eliminated: 148, 246, 1715

**CCRL Proficiency Sample Program
Chromium Oxide
BLENDED CEMENT Samples No. 75 and No. 76**



Test No. 105 Chromium Oxide 29 Points

Sample No. 75	Ave 0.009	S.D. 0.002	C.V. 18
Sample No. 76	Ave 0.013	S.D. 0.002	C.V. 18

Labs Eliminated: 24, 2463

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

Final Report – Physical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Normal Consistency - % Water (percent)							
	97	27.1	2.8	10.4	28.3	3.0	10.4
	*93	27.3	0.6	2.2	28.6	0.6	2.1
	* Labs Eliminated - 24, 1715, 2477, 3504						
Vicat Time of Set - Initial (min)							
	97	138	16	11.8	157	19	12.2
	*94	137	14	10.4	157	15	9.5
	* Labs Eliminated - 9, 74, 3695						
Vicat Time of Set - Final (min)							
	91	258	40	15	276	44	16
	*89	256	36	14	275	40	14
	* Labs Eliminated - 9, 23						
Autoclave Expansion (percent)							
	85	0.04	0.05	137	-0.01	0.05	234
	*80	0.04	0.02	52	-0.03	0.03	137
	* Labs Eliminated - 413, 2490, 3235, 3297, 3911						
Air Content % (percent)							
	80	8.0	1.6	20	6.4	1.4	22
	*79	7.9	1.2	15	6.3	1.4	22
	* Labs Eliminated - 3233						
Air Content - % Water (percent)							
	80	67.7	11.0	16.2	68.2	11.1	16.3
	*78	69.4	2.2	3.1	69.9	2.5	3.5
	* Labs Eliminated - 2466, 3233						
Air Content - Flow (percent)							
	80	88	3.8	4.3	88	4.2	4.8
	*78	88	3.8	4.3	88	3.6	4.1
	* Labs Eliminated - 441, 3413						

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

Final Report – Physical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Specific Gravity							
	79	3.02	0.05	1.6	3.02	0.05	1.8
	*74	3.02	0.03	1.0	3.02	0.03	0.9
	* Labs Eliminated - 25, 70, 74, 690, 691						
Compressive Strength - 3 day (psi)							
	98	3469	368	10.6	3050	351	11.5
	*95	3490	260	7.4	3074	263	8.6
	* Labs Eliminated - 24, 51, 2352						
Compressive Strength - 7 day (psi)							
	97	5008	472	9.4	4141	438	10.6
	*96	5039	368	7.3	4168	354	8.5
	* Labs Eliminated - 2352						
Compressive Strength - 28 day (psi)							
	88	6842	488	7.1	6662	562	8.4
	*87	6861	457	6.7	6687	514	7.7
	* Labs Eliminated - 38						
Compressive Strength - % Water (percent)							
	90	47.9	3.4	7.2	48.2	3.3	6.8
	*86	48.3	1.0	2.1	48.5	1.2	2.4
	* Labs Eliminated - 691, 694, 3503, 3912						
Compressive Strength - Flow (percent)							
	92	110	5.6	5.1	110	5.7	5.2
	*87	110	2.6	2.3	110	2.6	2.4
	* Labs Eliminated - 47, 441, 694, 3910, 3911						
Fineness - Air Permeability (cm²/g)							
	93	4725	428	9.1	4342	397	9.1
	*86	4716	233	4.9	4304	261	6.1
	* Labs Eliminated - 3, 14, 51, 441, 2477, 3059, 3413						

CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

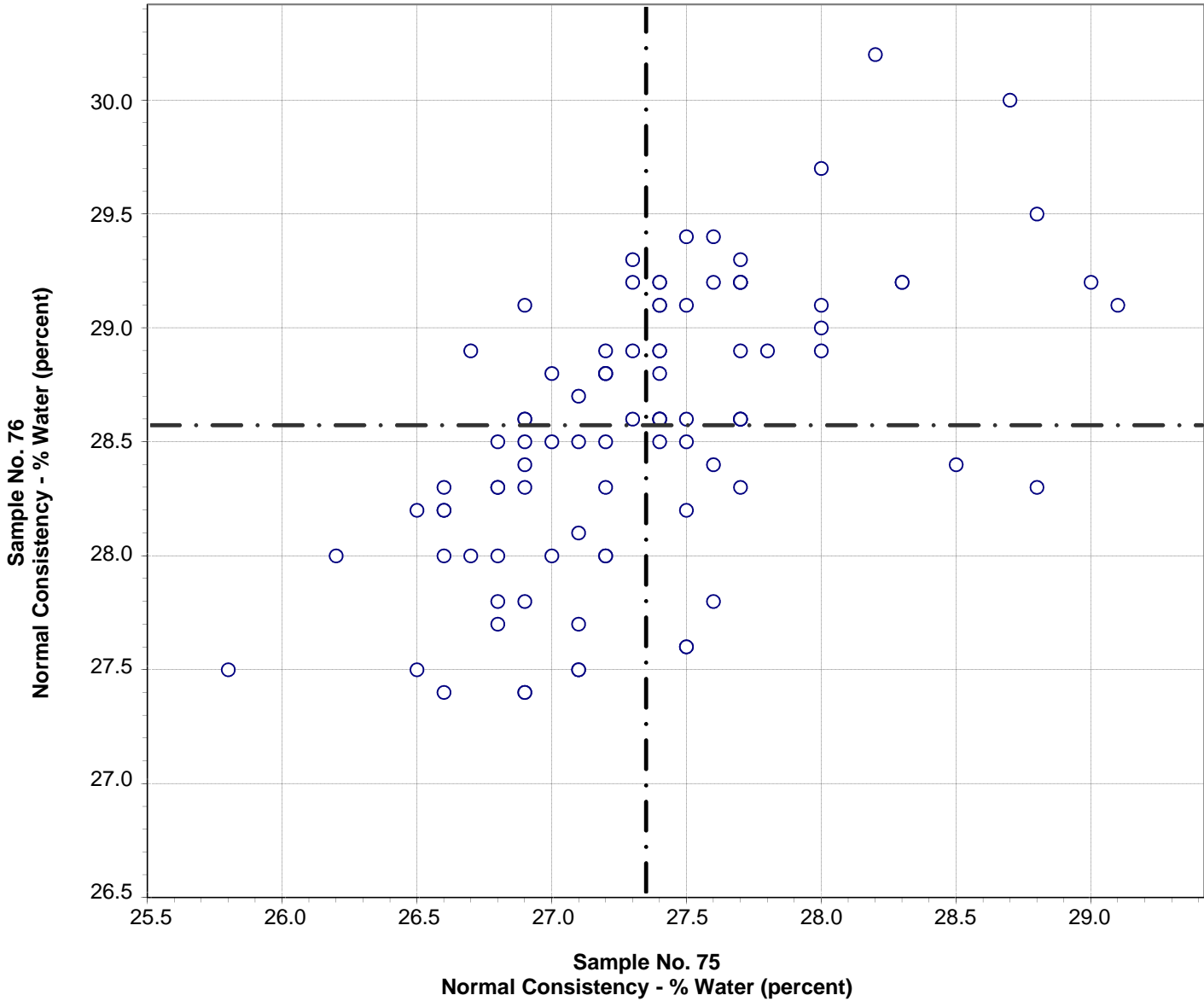
Final Report – Physical Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Fineness - 45µm % Passing (percent)							
	92	97.73	0.37	0.38	97.01	1.16	1.20
	*91	97.75	0.34	0.34	97.08	0.93	0.96

* Labs Eliminated - 3910

CCRL Proficiency Sample Program
Normal Consistency - % Water
BLENDED CEMENT Samples No. 75 and No. 76

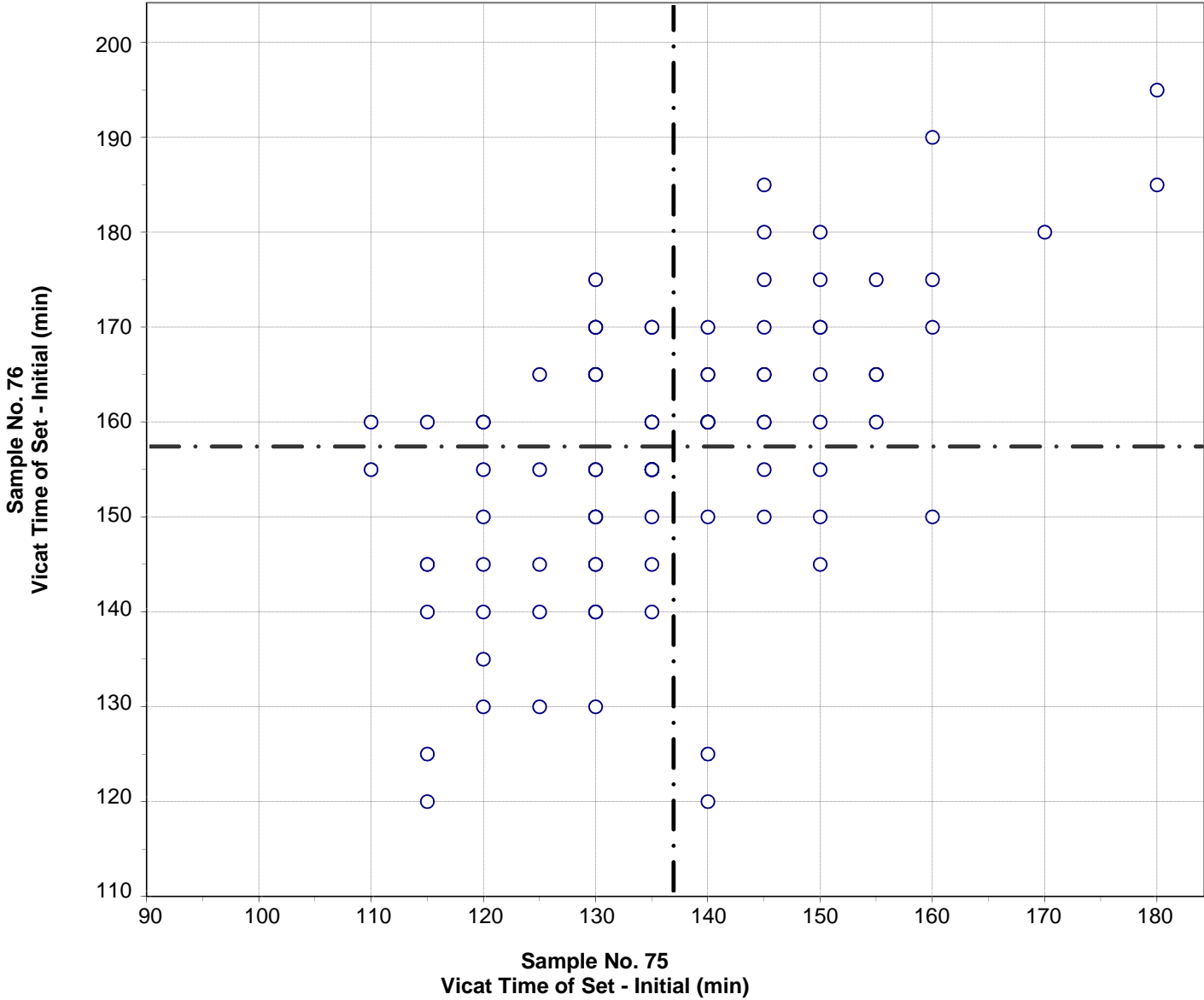


Test No. 110 Normal Consistency - % Water 93 Points

Sample No. 75	Ave 27.3	S.D. 0.6	C.V. 2.2
Sample No. 76	Ave 28.6	S.D. 0.6	C.V. 2.1

Labs Eliminated: 24, 1715, 2477, 3504

**CCRL Proficiency Sample Program
 Vicat Time of Set - Initial
 BLENDED CEMENT Samples No. 75 and No. 76**

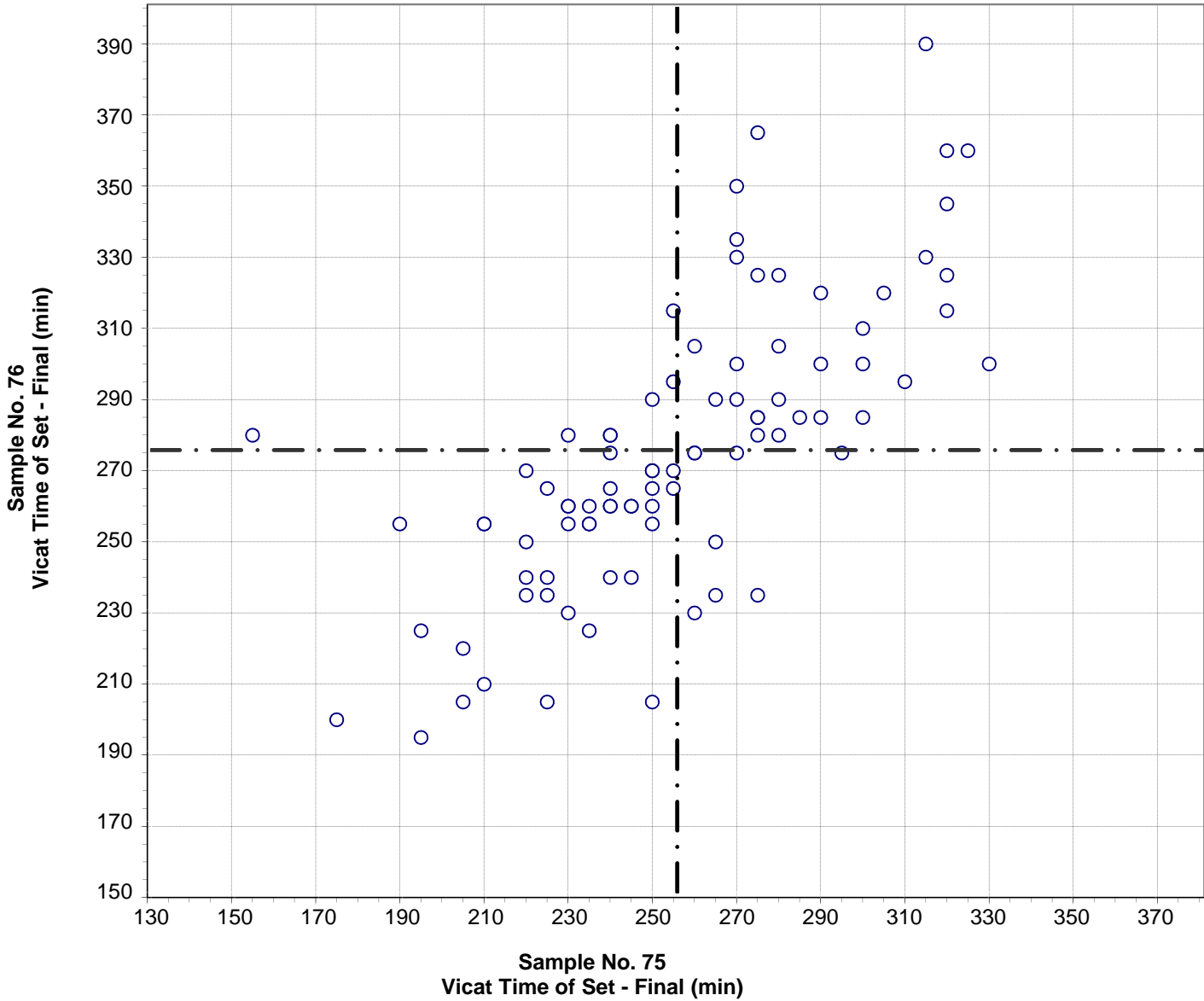


Test No. 120 Vicat Time of Set - Initial 94 Points

Sample No. 75	Ave 137	S.D. 14	C.V. 10.4
Sample No. 76	Ave 157	S.D. 15	C.V. 9.5

Labs Eliminated: 9, 74, 3695

**CCRL Proficiency Sample Program
 Vicat Time of Set - Final
 BLENDED CEMENT Samples No. 75 and No. 76**

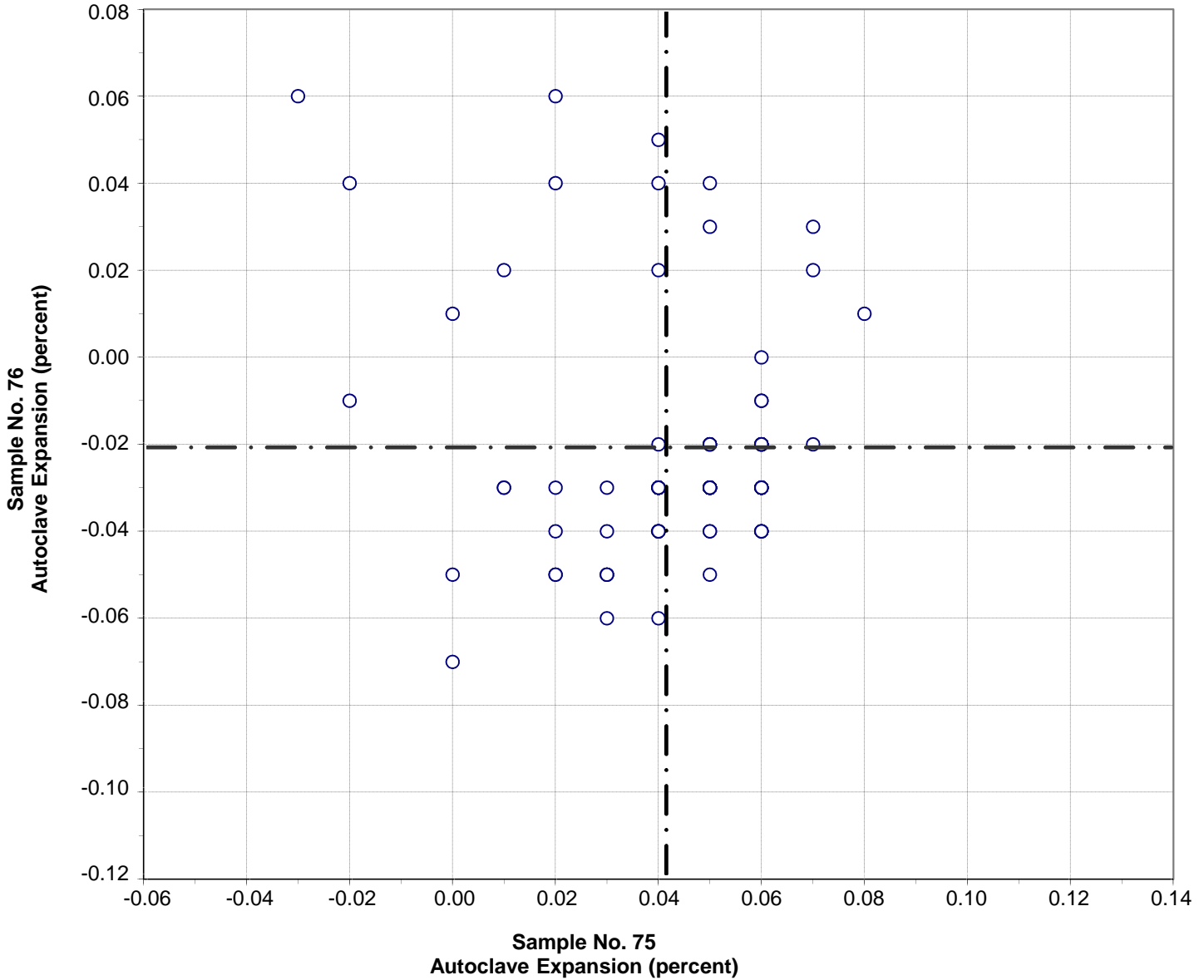


Test No. 121 Vicat Time of Set - Final 89 Points

Sample No. 75	Ave 256	S.D. 36	C.V. 14
Sample No. 76	Ave 275	S.D. 40	C.V. 14

Labs Eliminated: 9, 23

**CCRL Proficiency Sample Program
Autoclave Expansion
BLENDED CEMENT Samples No. 75 and No. 76**

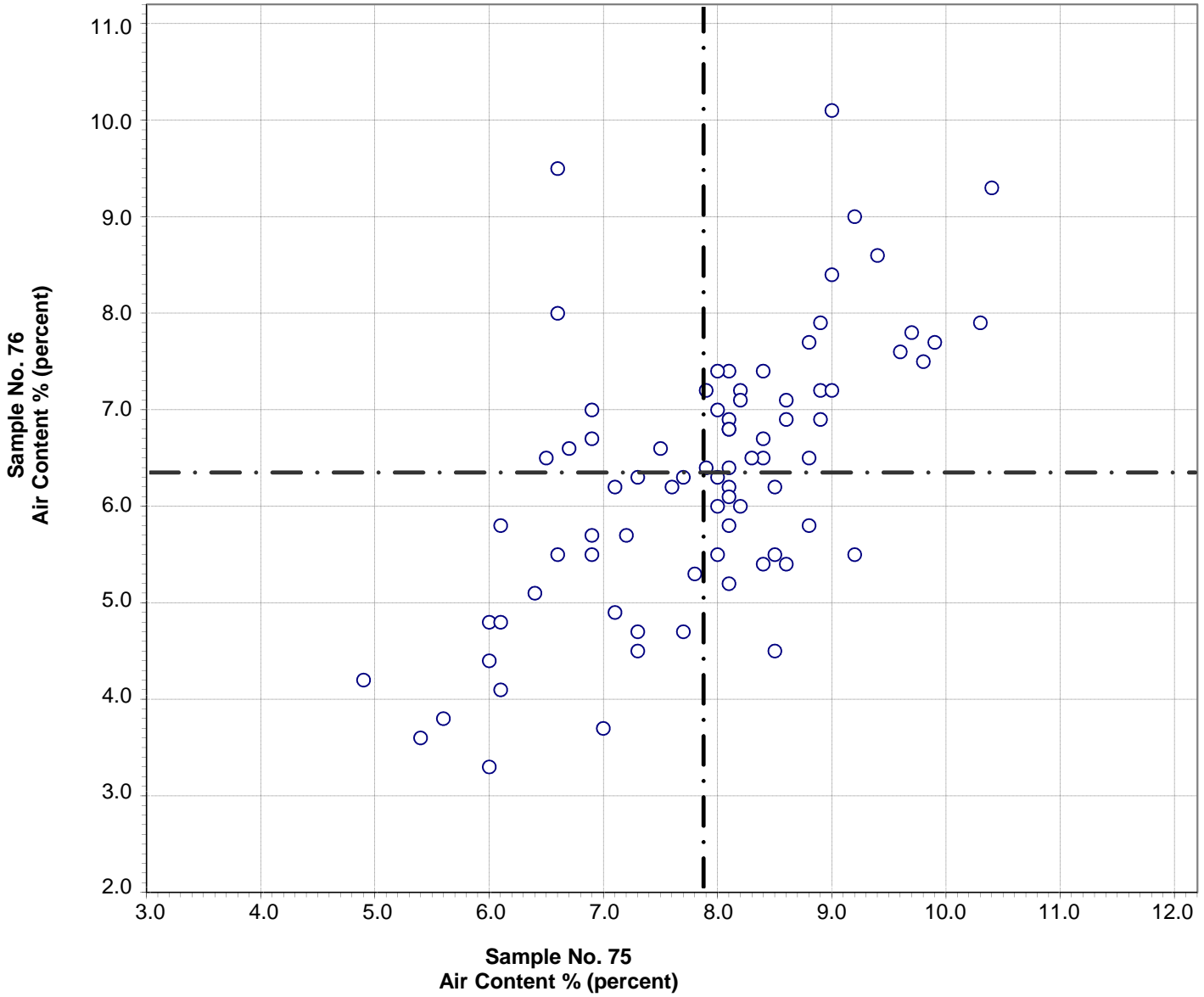


Test No. 160 Autoclave Expansion 80 Points

Sample No. 75	Ave 0.04	S.D. 0.02	C.V. 52
Sample No. 76	Ave -0.03	S.D. 0.03	C.V. 137

Labs Eliminated: 413, 2490, 3235, 3297, 3911

CCRL Proficiency Sample Program
Air Content %
BLENDED CEMENT Samples No. 75 and No. 76

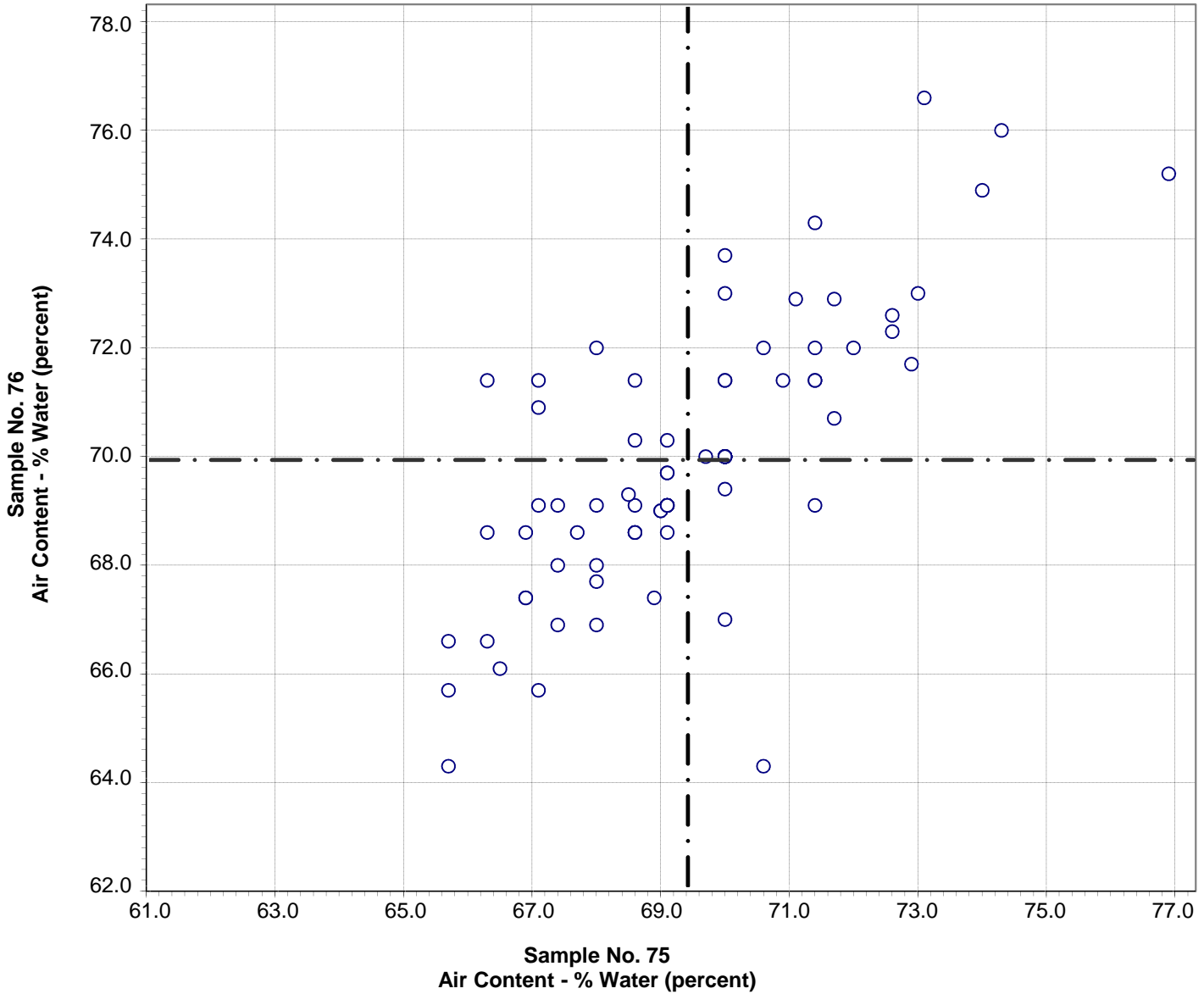


Test No. 170 Air Content % 79 Points

Sample No. 75	Ave 7.9	S.D. 1.2	C.V. 15
Sample No. 76	Ave 6.3	S.D. 1.4	C.V. 22

Labs Eliminated: 3233

CCRL Proficiency Sample Program
Air Content - % Water
BLENDED CEMENT Samples No. 75 and No. 76

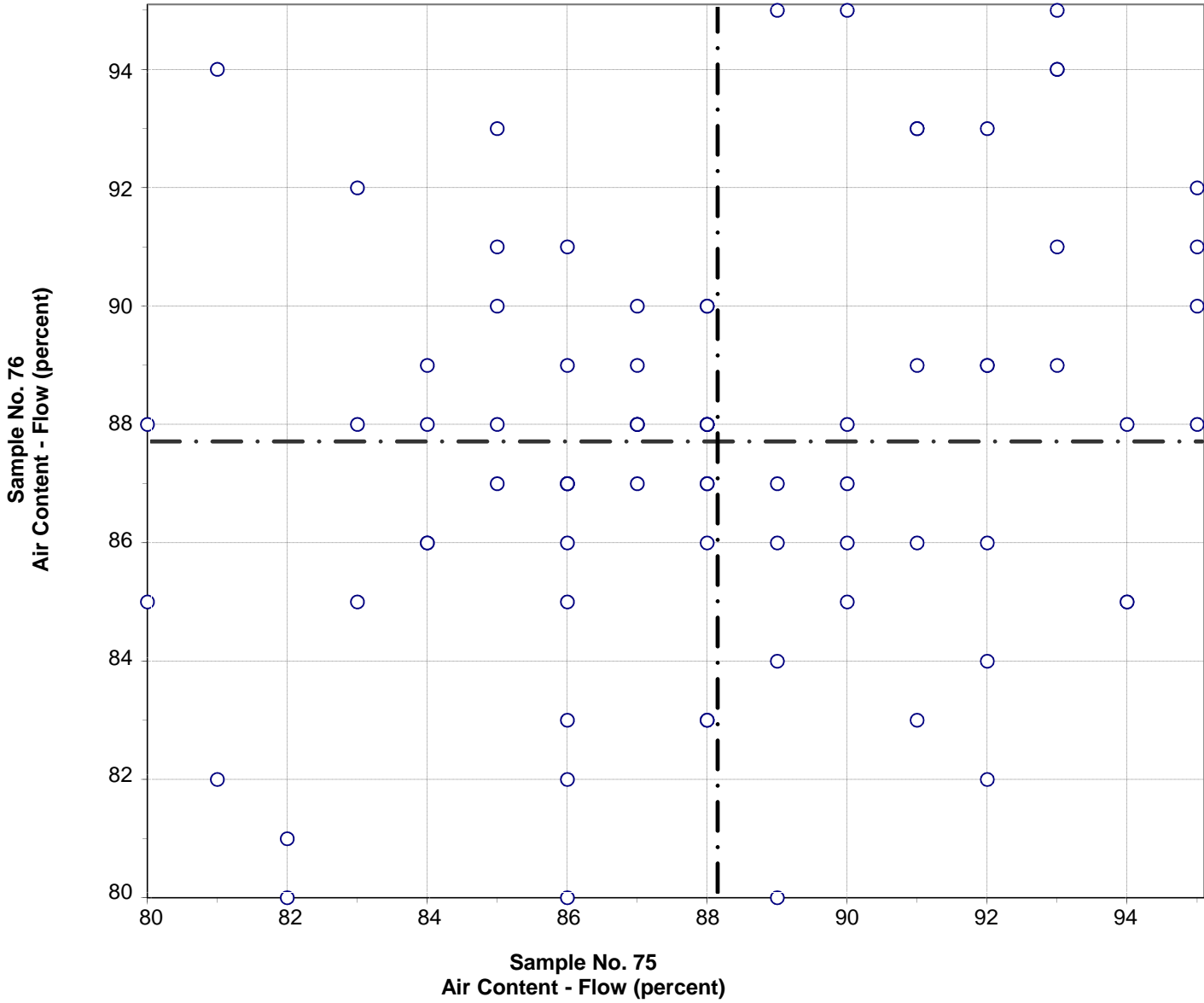


Test No. 180 Air Content - % Water 78 Points

Sample No. 75	Ave 69.4	S.D. 2.2	C.V. 3.1
Sample No. 76	Ave 69.9	S.D. 2.5	C.V. 3.5

Labs Eliminated: 2466, 3233

**CCRL Proficiency Sample Program
Air Content - Flow
BLENDED CEMENT Samples No. 75 and No. 76**

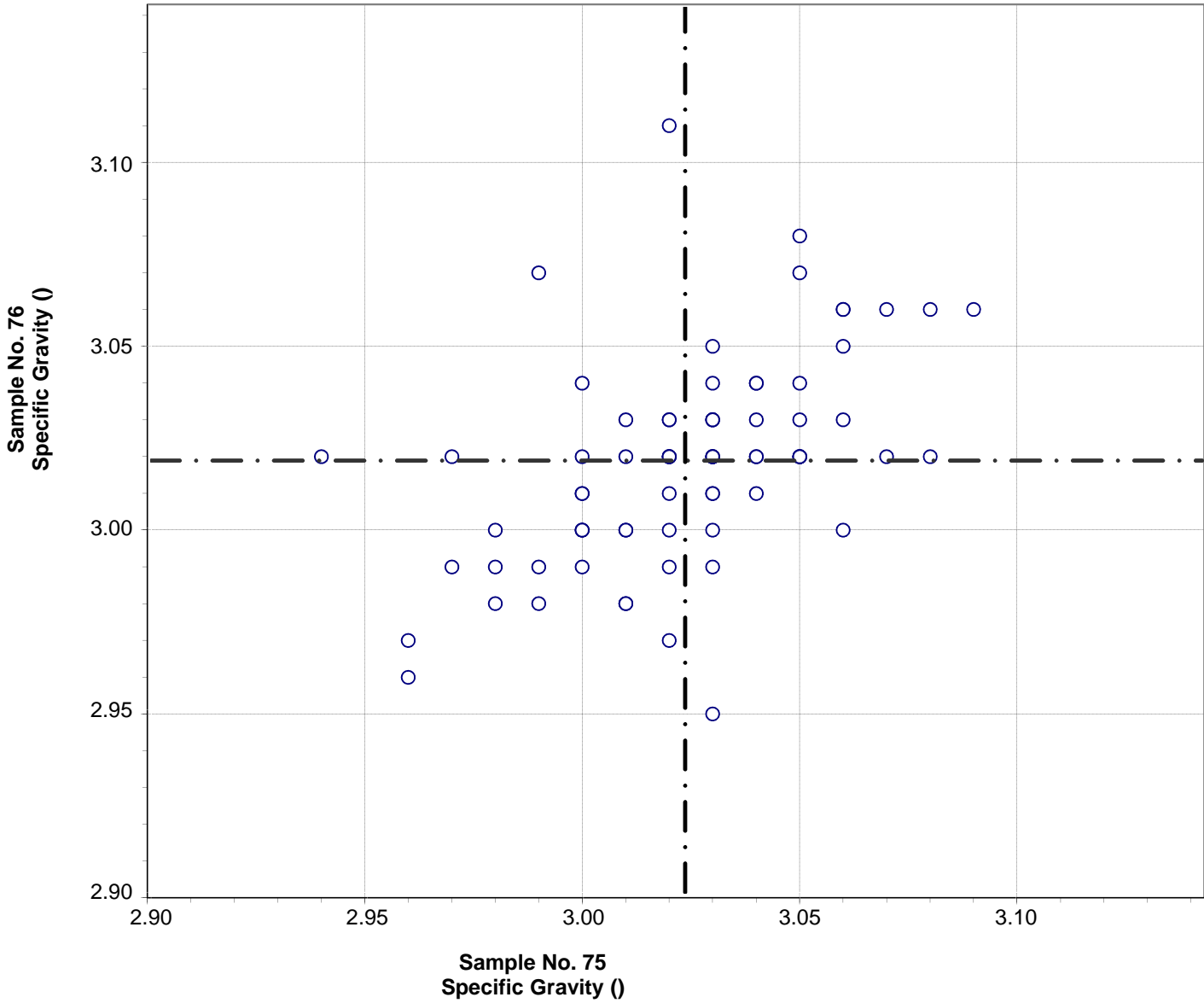


Test No. 190 Air Content - Flow 78 Points

Sample No. 75	Ave 88	S.D. 3.8	C.V. 4.3
Sample No. 76	Ave 88	S.D. 3.6	C.V. 4.1

Labs Eliminated: 441, 3413

**CCRL Proficiency Sample Program
Specific Gravity
BLENDED CEMENT Samples No. 75 and No. 76**

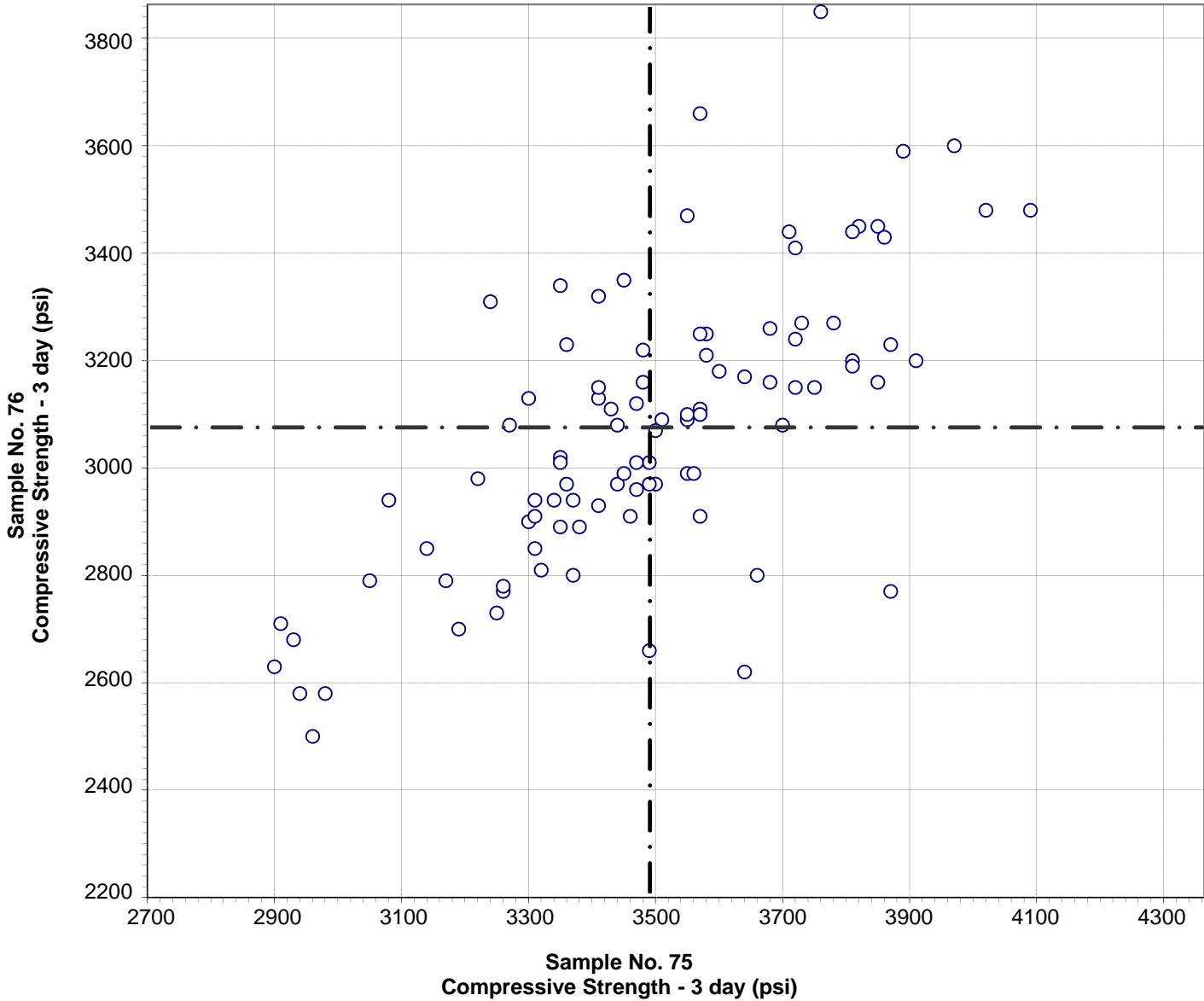


Test No. 310 Specific Gravity 74 Points

Sample No. 75	Ave 3.02	S.D. 0.03	C.V. 1.0
Sample No. 76	Ave 3.02	S.D. 0.03	C.V. 0.9

Labs Eliminated: 25, 70, 74, 690, 691

**CCRL Proficiency Sample Program
Compressive Strength - 3 day
BLENDED CEMENT Samples No. 75 and No. 76**

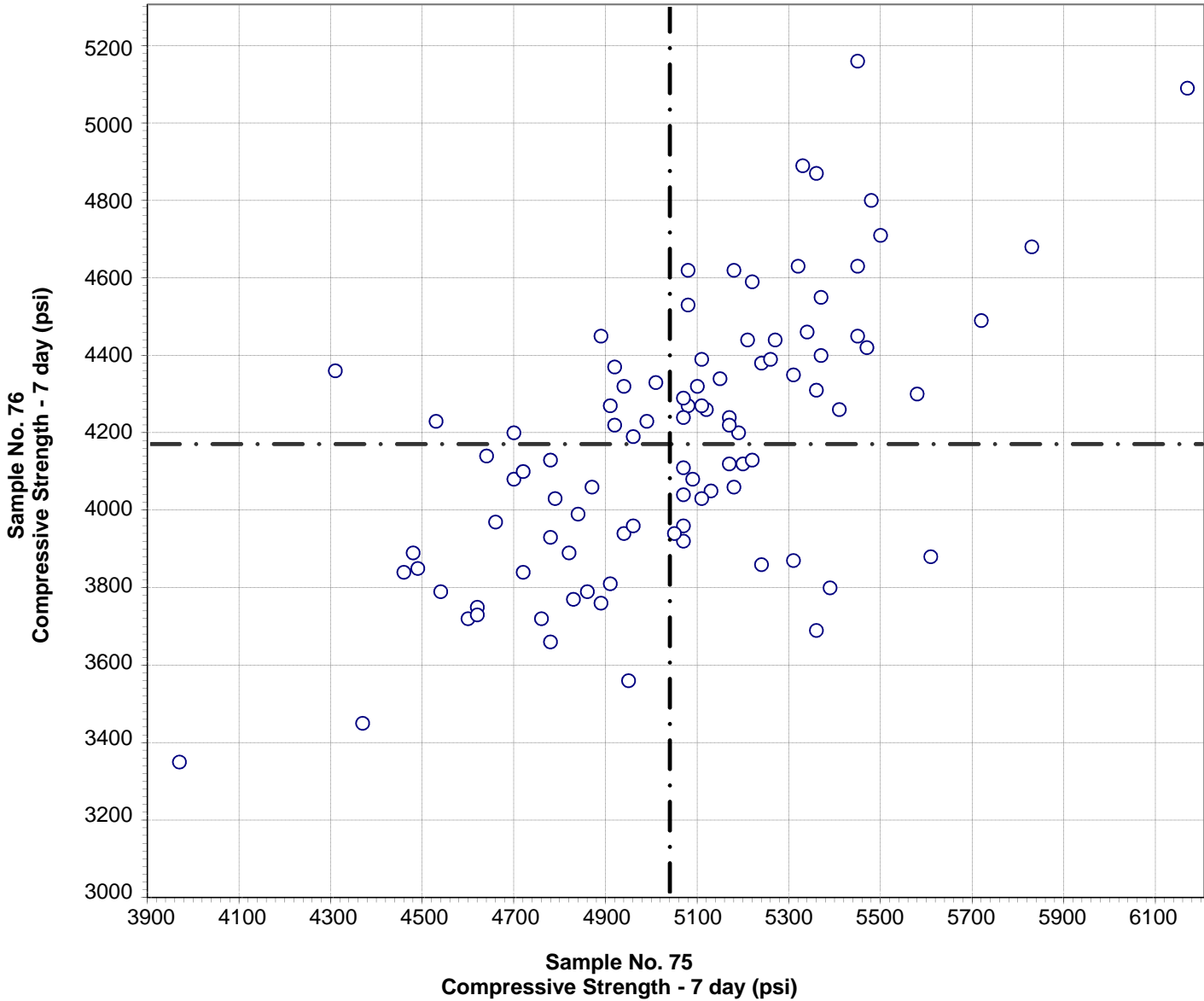


Test No. 200 Compressive Strength - 3 day 95 Points

Sample No. 75	Ave 3490	S.D. 260	C.V. 7.4
Sample No. 76	Ave 3074	S.D. 263	C.V. 8.6

Labs Eliminated: 24, 51, 2352

**CCRL Proficiency Sample Program
Compressive Strength - 7 day
BLENDED CEMENT Samples No. 75 and No. 76**



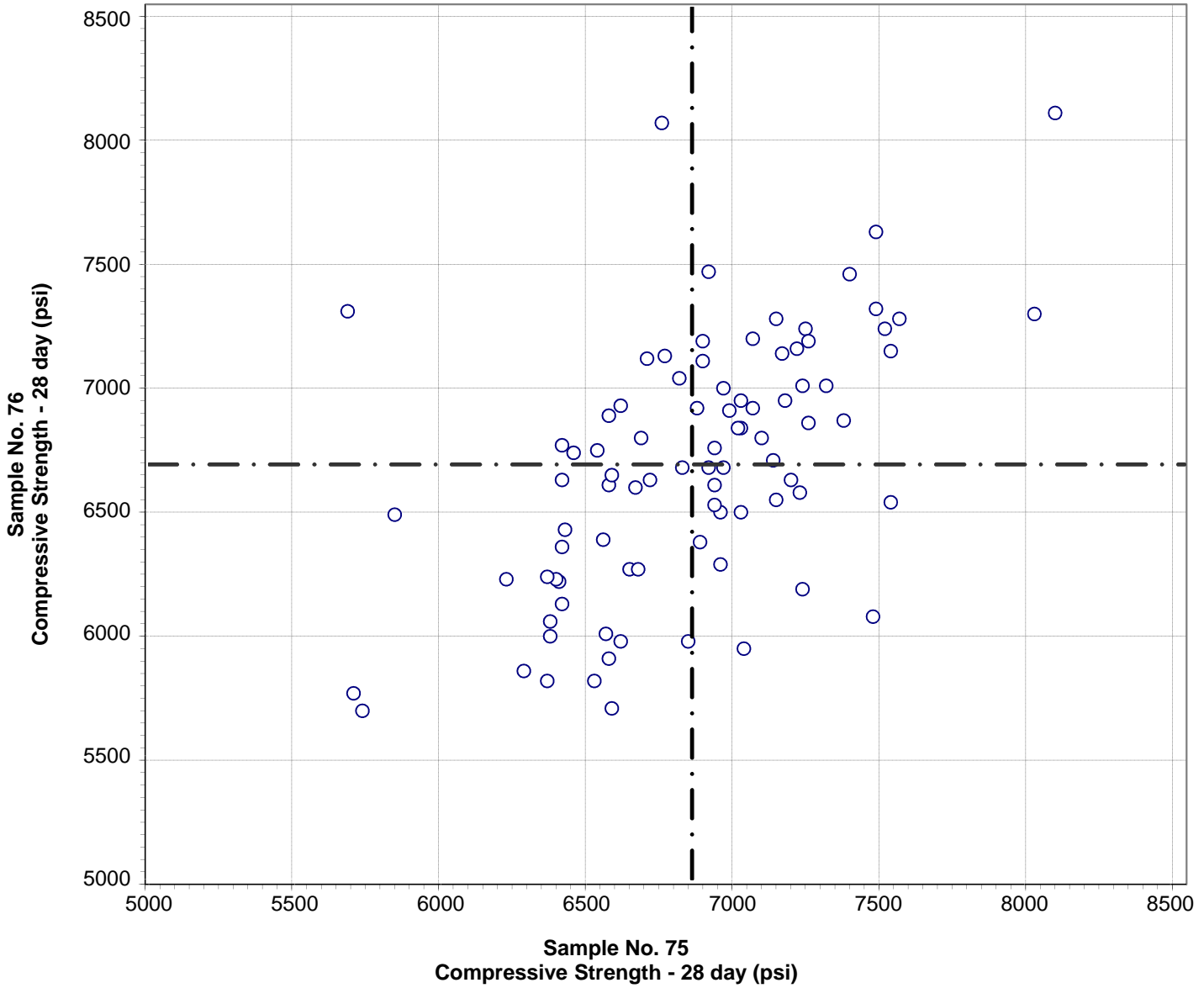
Test No. 210 Compressive Strength - 7 day 95 Points

Sample No. 75	Ave 5039	S.D. 368	C.V. 7.3
Sample No. 76	Ave 4168	S.D. 354	C.V. 8.5

Labs Eliminated: 2352

Labs off Diagram: 51

**CCRL Proficiency Sample Program
Compressive Strength - 28 day
BLENDED CEMENT Samples No. 75 and No. 76**

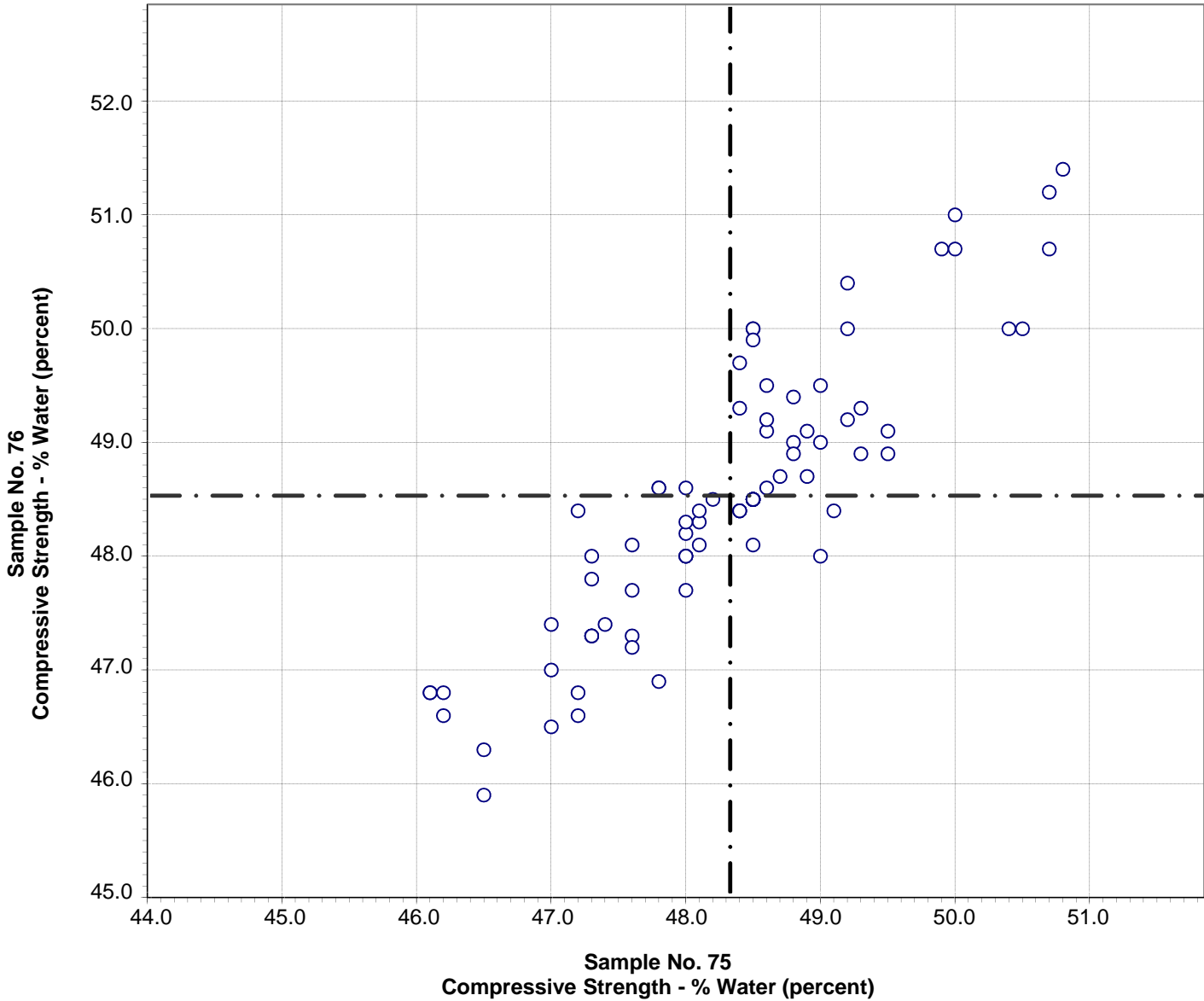


Test No. 211 Compressive Strength - 28 day 87 Points

Sample No. 75	Ave 6861	S.D. 457	C.V. 6.7
Sample No. 76	Ave 6687	S.D. 514	C.V. 7.7

Labs Eliminated: 38

**CCRL Proficiency Sample Program
Compressive Strength - % Water
BLENDED CEMENT Samples No. 75 and No. 76**

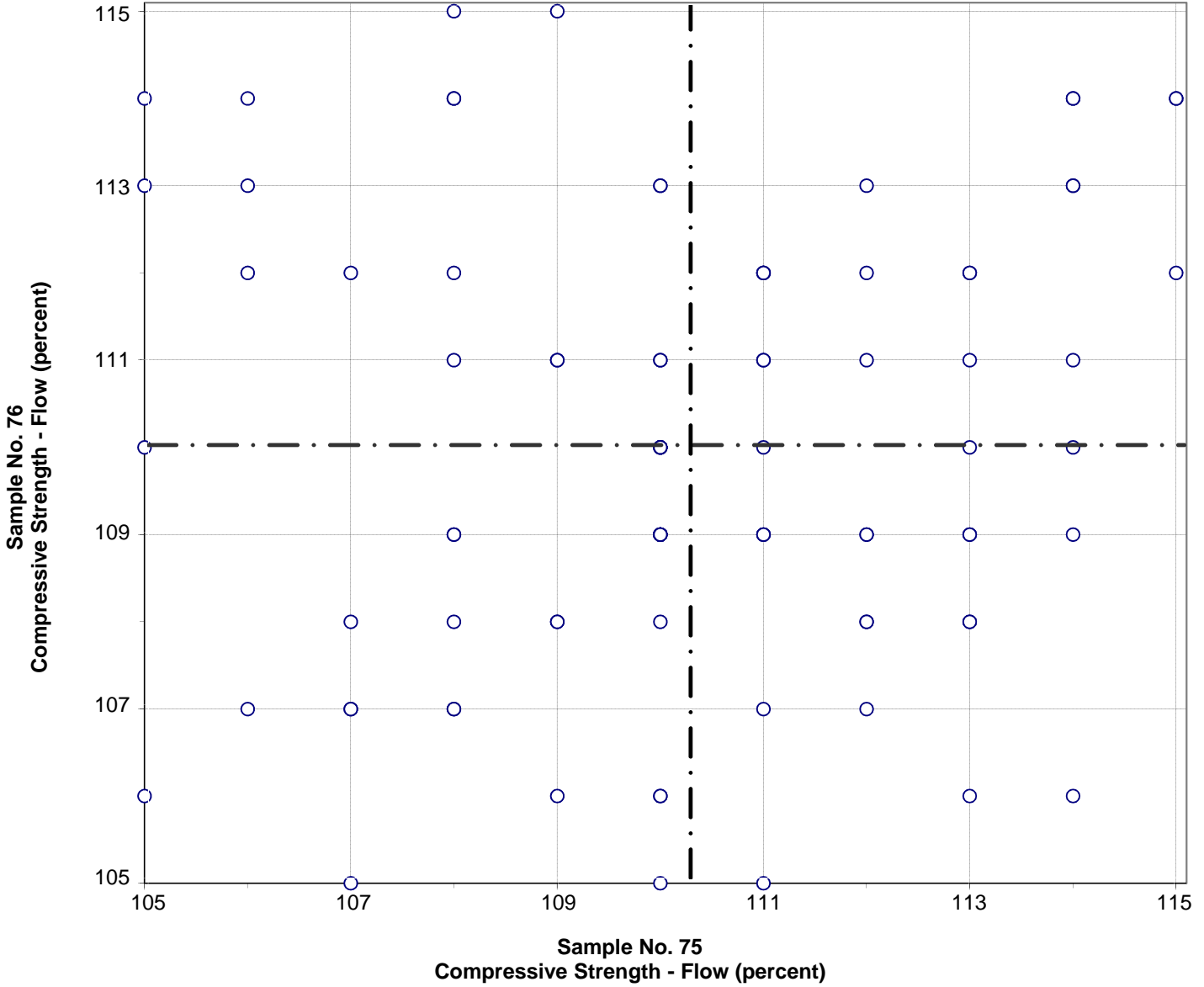


Test No. 220 Compressive Strength - % Water 86 Points

Sample No. 75	Ave 48.3	S.D. 1.0	C.V. 2.1
Sample No. 76	Ave 48.5	S.D. 1.2	C.V. 2.4

Labs Eliminated: 691, 694, 3503, 3912

**CCRL Proficiency Sample Program
Compressive Strength - Flow
BLENDED CEMENT Samples No. 75 and No. 76**

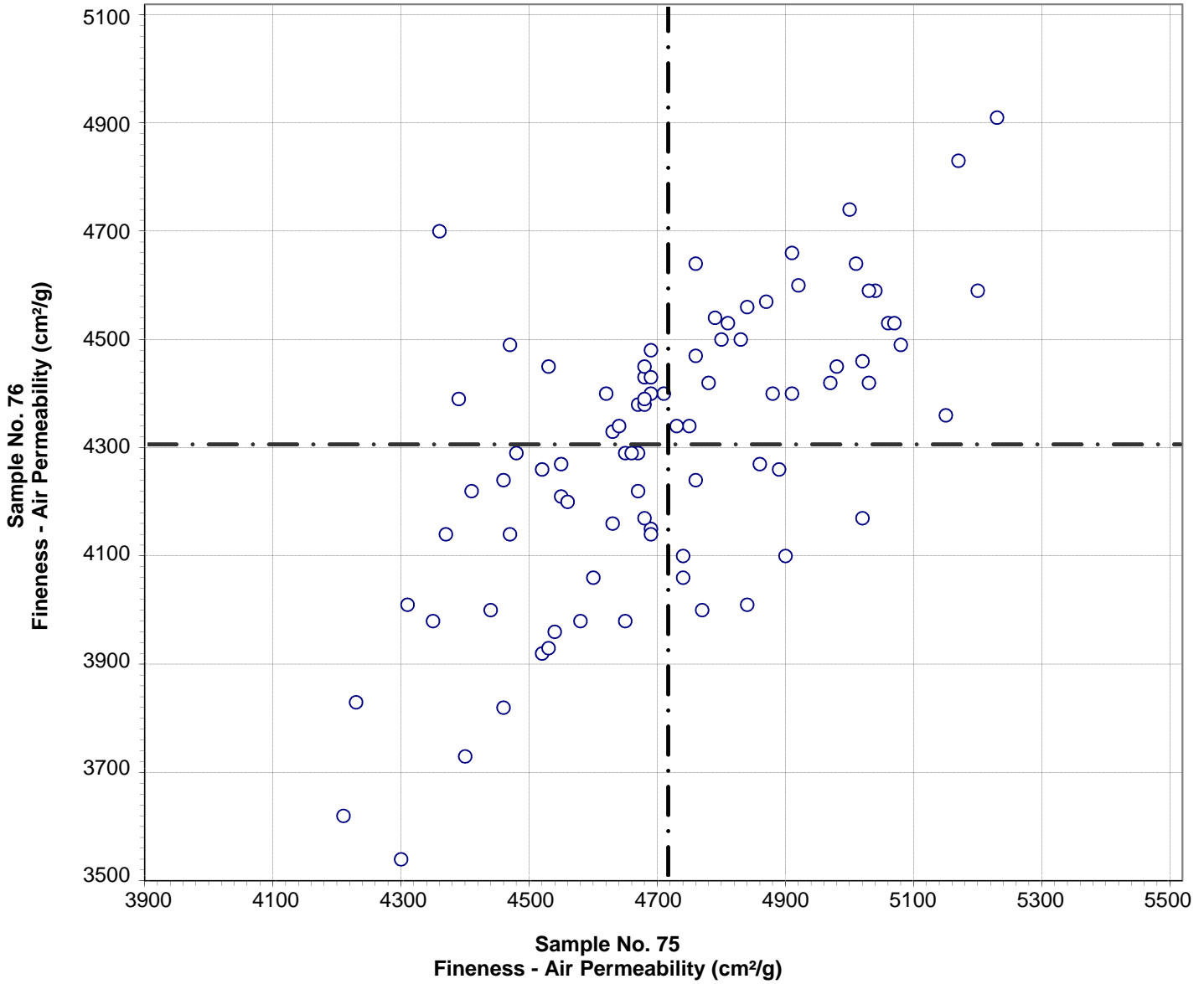


Test No. 230 Compressive Strength - Flow 87 Points

Sample No. 75	Ave 110	S.D. 2.6	C.V. 2.3
Sample No. 76	Ave 110	S.D. 2.6	C.V. 2.4

Labs Eliminated: 47, 441, 694, 3910, 3911

**CCRL Proficiency Sample Program
Fineness - Air Permeability
BLENDED CEMENT Samples No. 75 and No. 76**

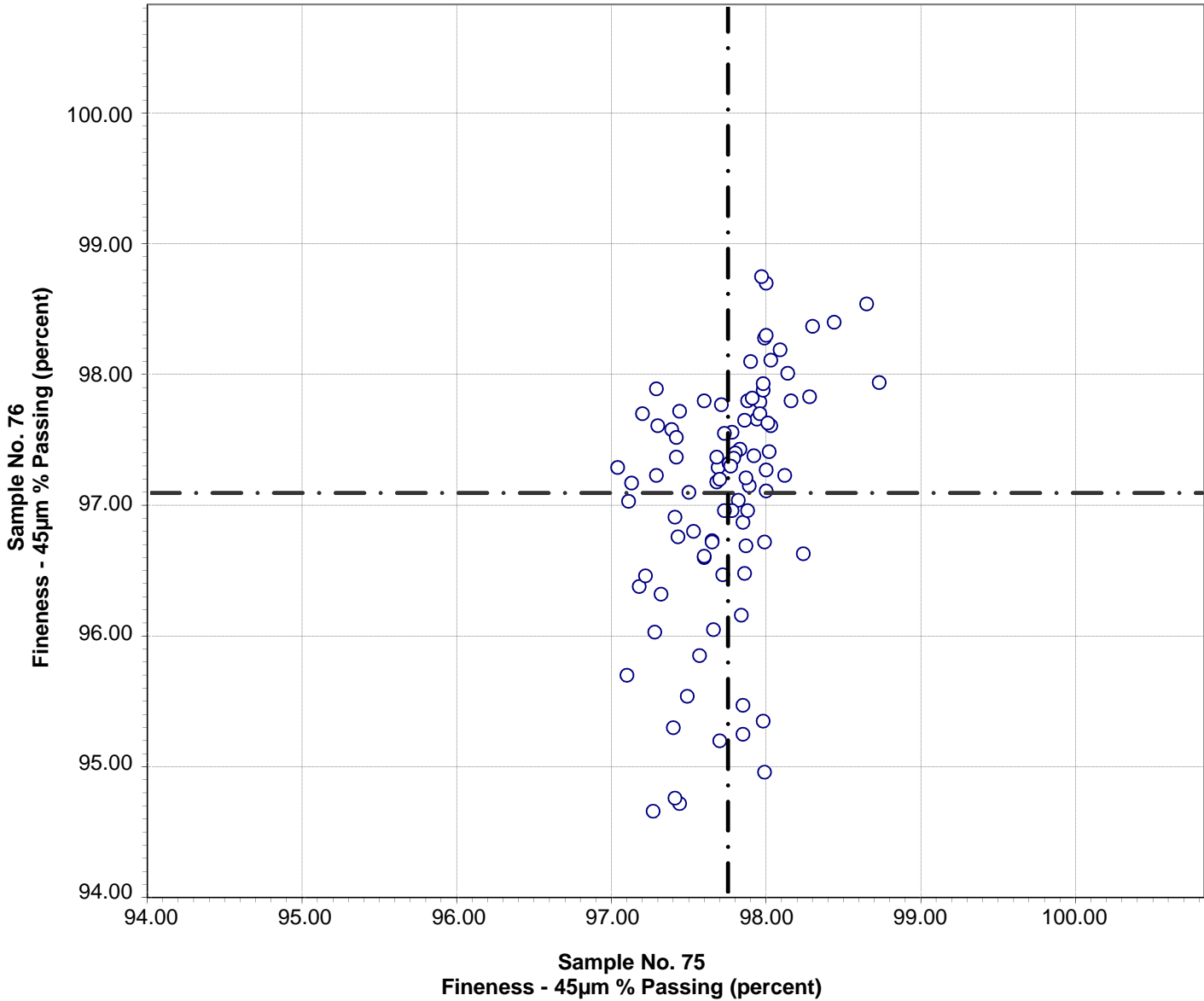


Test No. 270 Fineness - Air Permeability 86 Points

Sample No. 75	Ave 4716	S.D. 233	C.V. 4.9
Sample No. 76	Ave 4304	S.D. 261	C.V. 6.1

Labs Eliminated: 3, 14, 51, 441, 2477, 3059, 3413

CCRL Proficiency Sample Program
Fineness - 45µm % Passing
BLENDED CEMENT Samples No. 75 and No. 76



Test No. 281 Fineness - 45µm % Passing 91 Points

Sample No. 75	Ave 97.75	S.D. 0.34	C.V. 0.34
Sample No. 76	Ave 97.08	S.D. 0.93	C.V. 0.96

Labs Eliminated: 3910

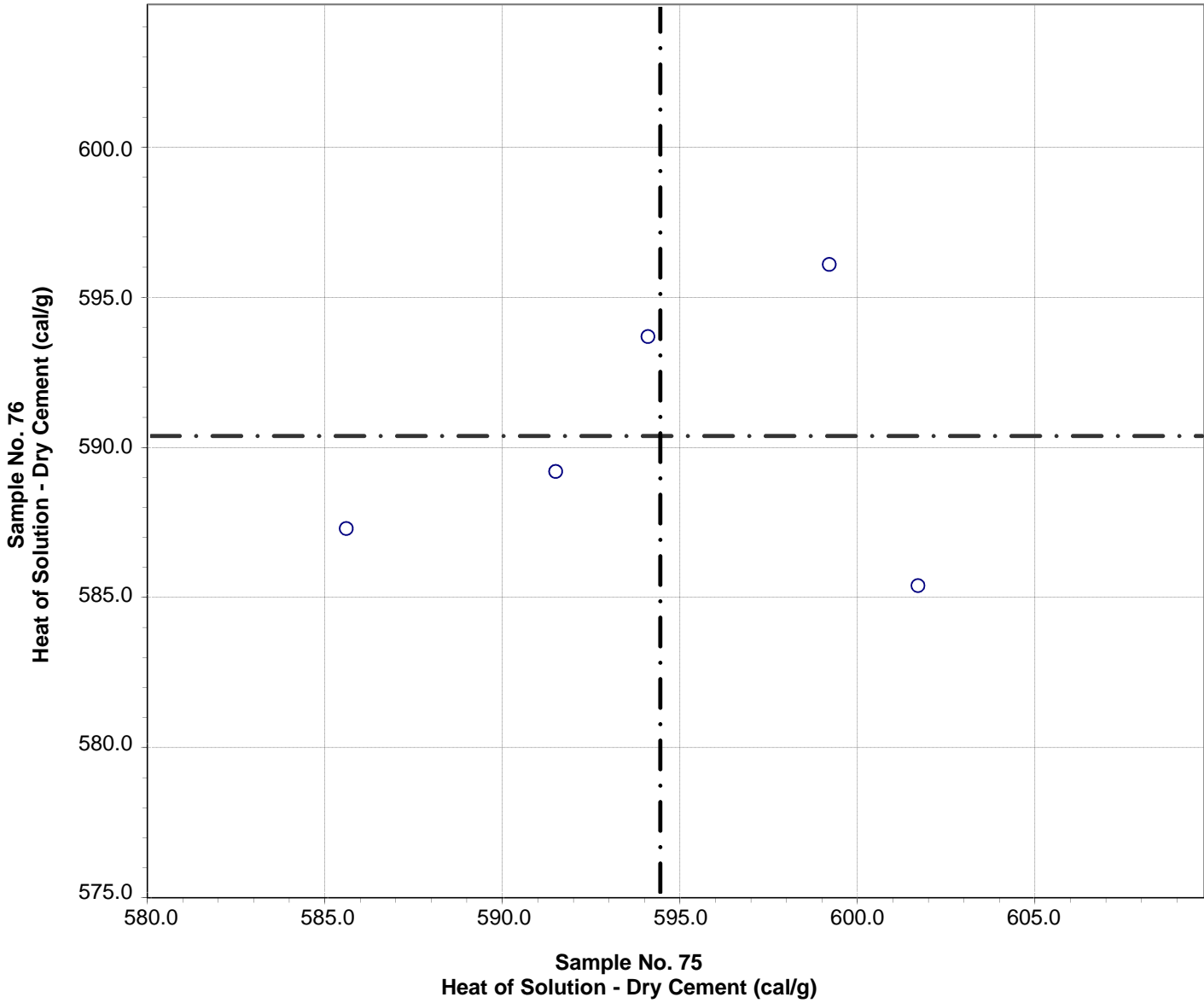
CCRL PROFICIENCY SAMPLE PROGRAM
Blended Cement Proficiency Samples No. 75 and No. 76

Final Report – Heat of Hydration Results
April 27, 2015

SUMMARY OF RESULTS

Test (unit)	Sample No.75				Sample No. 76		
	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Heat of Solution - Dry Cement (cal/g)							
	5	594.4	6.4	1.1	590.3	4.5	0.8
	No Labs Eliminated for This Test						
Heat of Solution - 7 day (cal/g)							
	5	516.3	3.1	0.6	518.6	5.7	1.1
	No Labs Eliminated for This Test						
Heat of Solution - 28 day (cal/g)							
	4	504.0	3.8	0.76	500.1	3.5	0.70
	No Labs Eliminated for This Test						
Heat of Hydration - 7 day (cal/g)							
	6	77.2	4.7	6.1	71.0	7.0	9.8
	No Labs Eliminated for This Test						
Heat of Hydration - 28 day (cal/g)							
	5	89.7	7.3	8.2	87.8	8.6	9.8
	No Labs Eliminated for This Test						

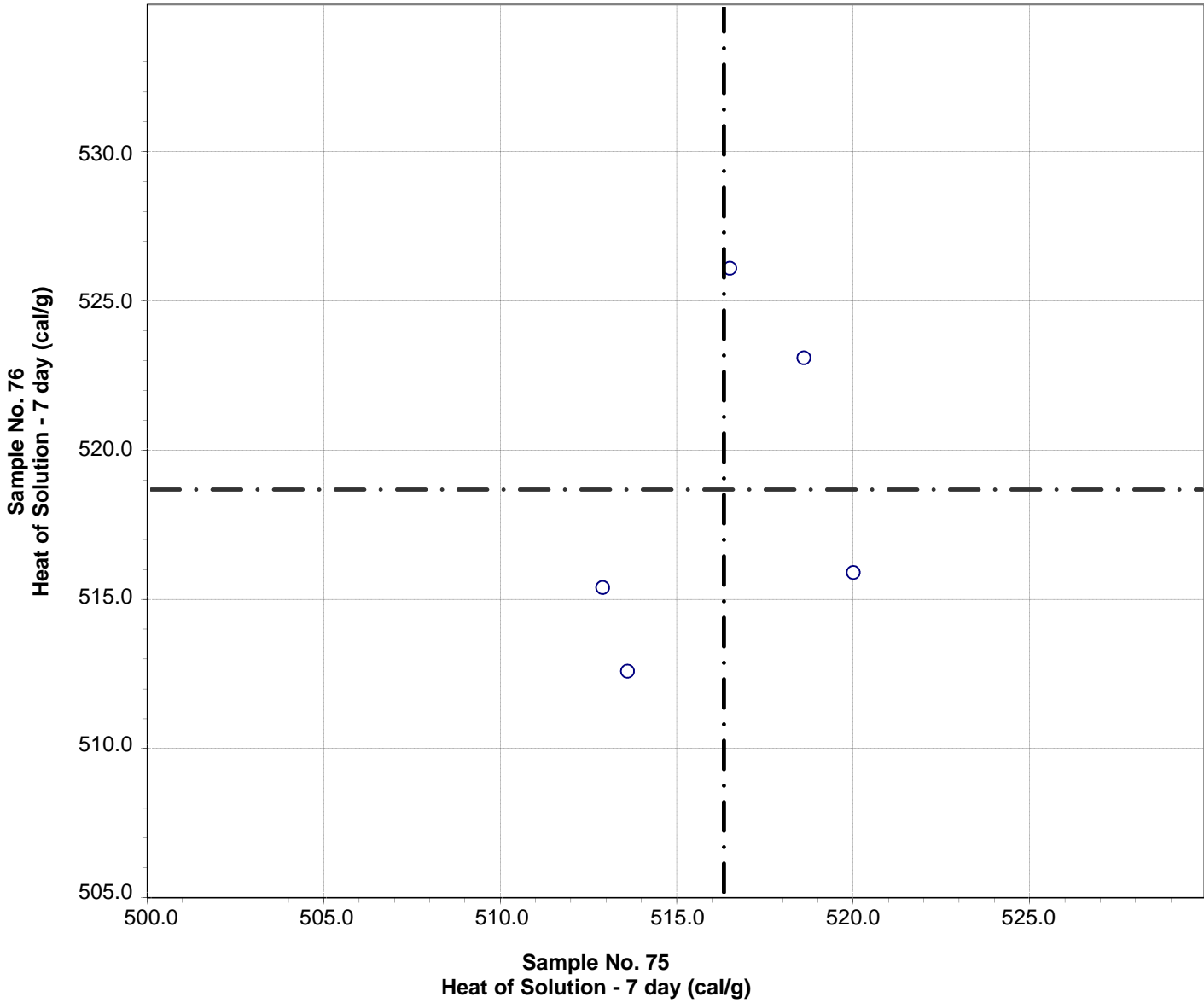
CCRL Proficiency Sample Program
Heat of Solution - Dry Cement
BLENDED CEMENT Samples No. 75 and No. 76



Test No. 291 Heat of Solution - Dry Cement 5 Points

Sample No. 75	Ave 594.4	S.D. 6.4	C.V. 1.1
Sample No. 76	Ave 590.3	S.D. 4.5	C.V. 0.8

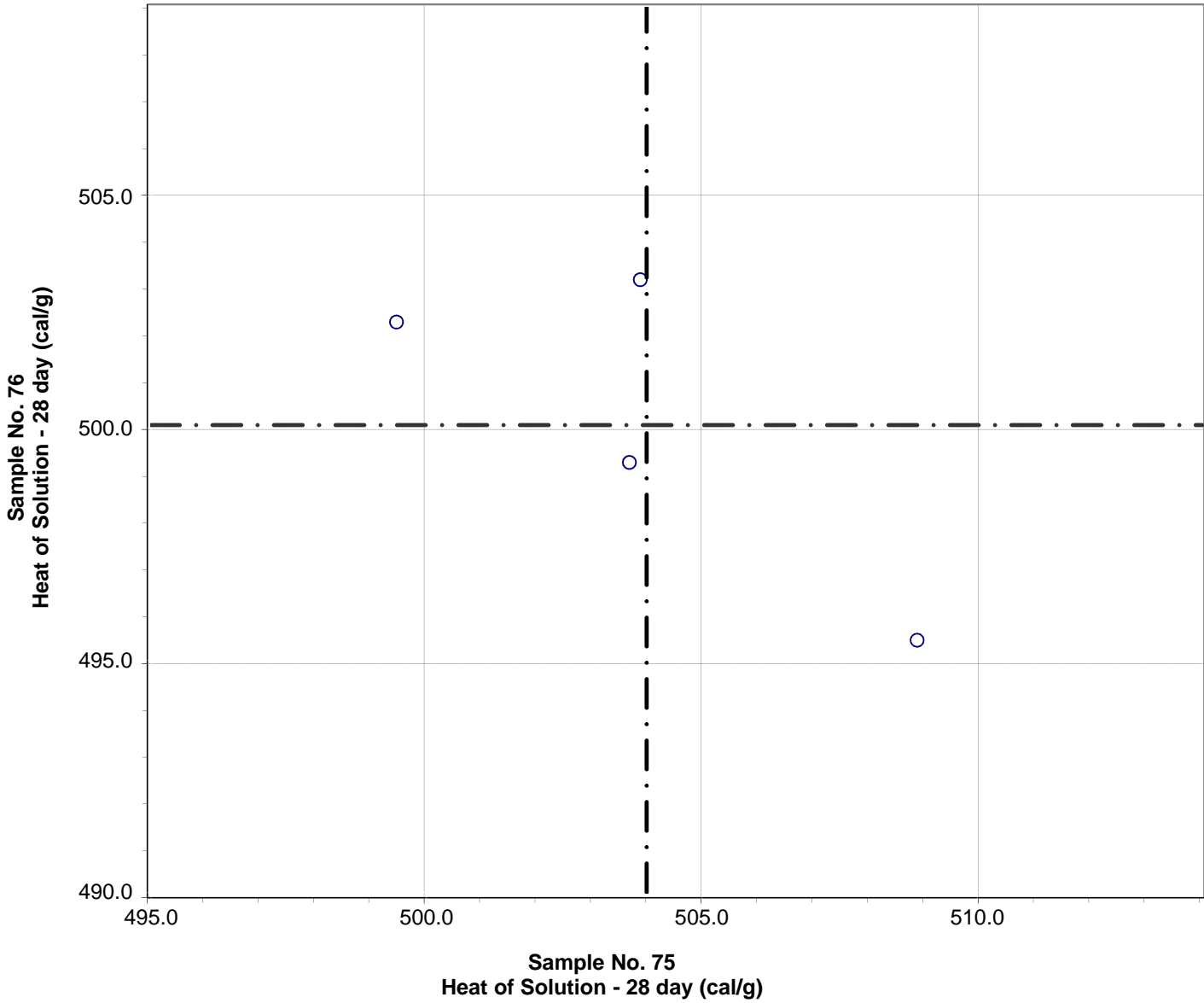
CCRL Proficiency Sample Program
Heat of Solution - 7 day
BLENDED CEMENT Samples No. 75 and No. 76



Test No. 292 Heat of Solution - 7 day 5 Points

Sample No. 75	Ave 516.3	S.D. 3.1	C.V. 0.6
Sample No. 76	Ave 518.6	S.D. 5.7	C.V. 1.1

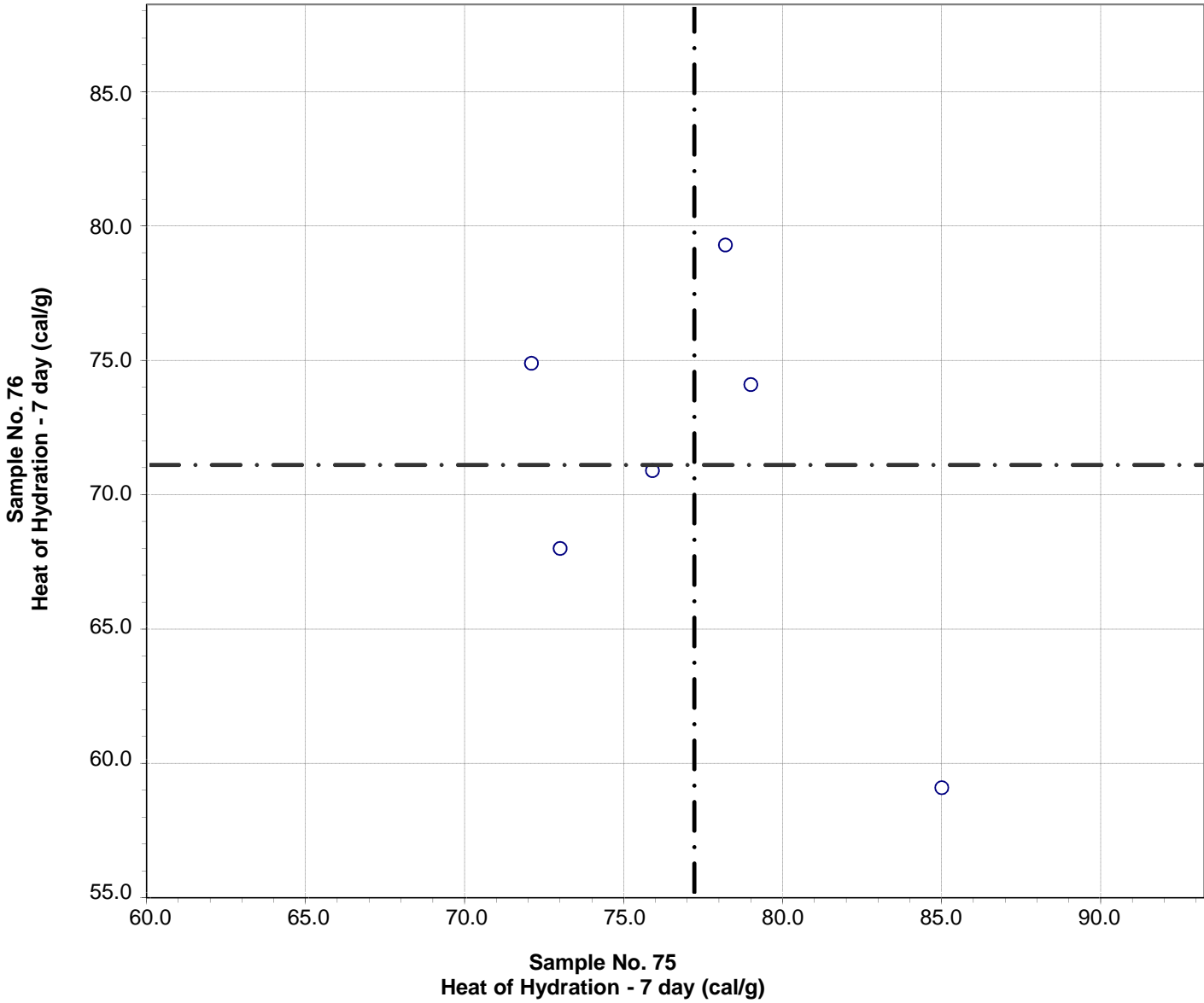
CCRL Proficiency Sample Program
Heat of Solution - 28 day
BLENDED CEMENT Samples No. 75 and No. 76



Test No. 301 Heat of Solution - 28 day 4 Points

Sample No. 75	Ave 504.0	S.D. 3.8	C.V. 0.76
Sample No. 76	Ave 500.1	S.D. 3.5	C.V. 0.70

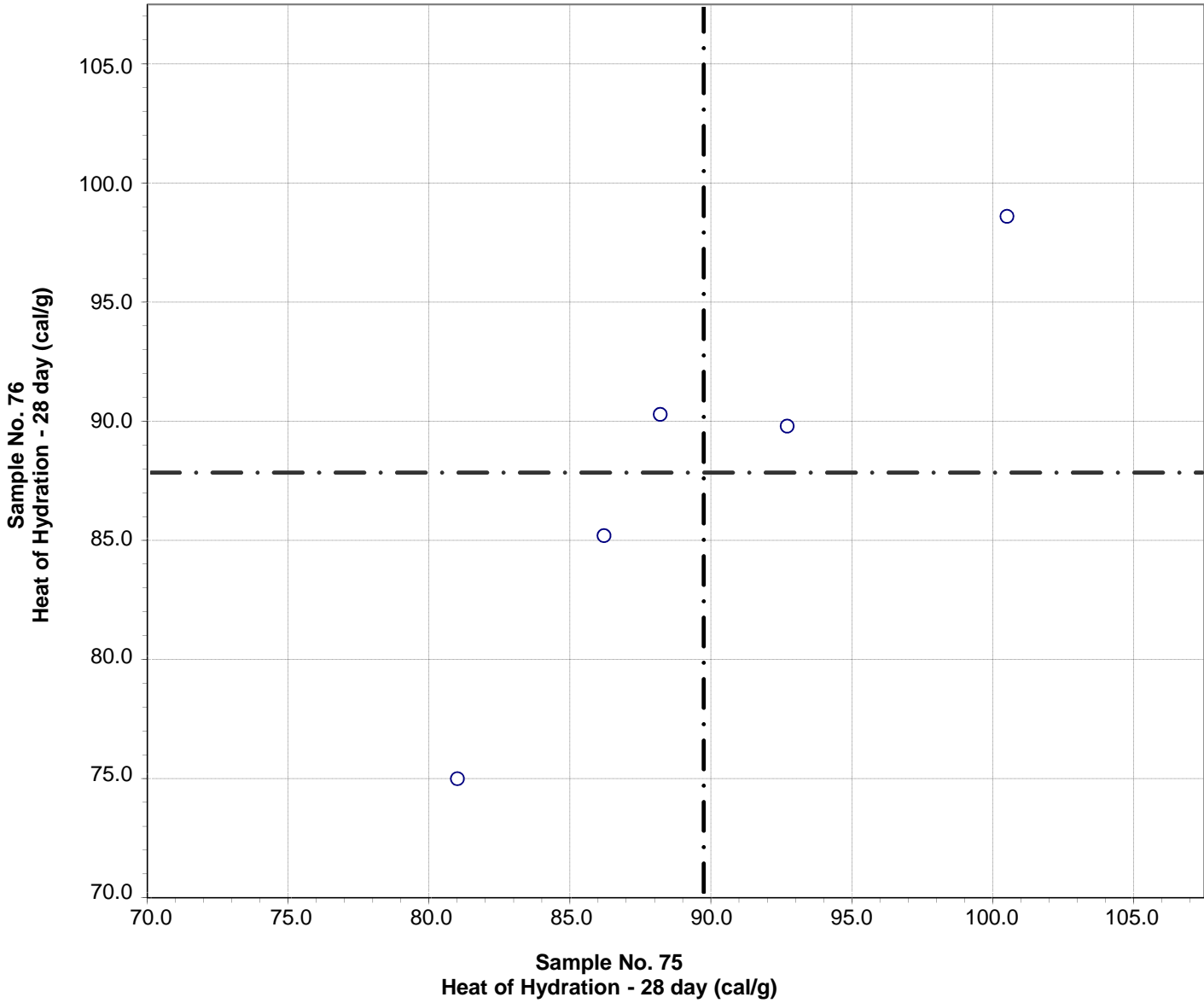
CCRL Proficiency Sample Program
Heat of Hydration - 7 day
BLENDED CEMENT Samples No. 75 and No. 76



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

Sample No. 75	Ave 77.2	S.D. 4.7	C.V. 6.1
Sample No. 76	Ave 71.0	S.D. 7.0	C.V. 9.8

CCRL Proficiency Sample Program
Heat of Hydration - 28 day
BLENDED CEMENT Samples No. 75 and No. 76



Test No. 300 Heat of Hydration - 28 day 5 Points

Sample No. 75	Ave 89.7	S.D. 7.3	C.V. 8.2
Sample No. 76	Ave 87.8	S.D. 8.6	C.V. 9.8