CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Masonry Units Proficiency Samples
Number 29 and Number 30

September 2010

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

September 15, 2010

TO: Participants in the CCRL Concrete Masonry Units Proficiency Sample Program

SUBJECT: Final Report for Concrete Masonry Units Proficiency Samples No. 29 and No. 30

Following is the report for the current pair of CCRL **Concrete Masonry Units** Proficiency Samples which were distributed in July 2010.

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 laboratory can be downloaded at our website located at: http://www.ccrl.us/.

The CCRL Proficiency Sample Programs are intended for internal use by the laboratory as a tool to identify potential problems in laboratory procedures or test equipment and to initiate remedial actions. These programs are designed to complement the CCRL Laboratory Inspection Program as part of a total quality system. Care should be taken when using this program for any other purpose.

Additional samples of these two concrete masonry units 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 Concrete Masonry Units Proficiency Samples will be distributed in July 2011.

Sincerely,

Robin K. Haupt

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

TO: Participants in the CCRL Concrete Masonry Units Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests on Concrete Masonry Units Proficiency Samples No. 29 and No. 30

This letter, and the material included with it, constitute the final report, and summary of results for the current pair of Concrete Masonry Units Proficiency Samples, which were distributed in July 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.

Laboratory Ratings

Each laboratory receives an individualized Laboratory Ratings. Each line of the ratings 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. Please note that individual laboratory ratings were not given for some test results. These results were gathered for information at the request of consulting ASTM Committee member.

The ratings for the individual laboratory were determined in the manner described by Crandall and Blaine using a rating scale of 1 to 5 instead of 0 to 4. The ratings have no valid standing beyond showing the difference between the individual laboratory result and the average for a particular test.

The following table details the relationship between the ratings and the averages.

Ratings	Range (Number of Standard Deviations)	Number (Per 100) of Laboratories achieving the rating [1]
5	Less than 1	69
4	1 to 1.5	18
3	1.5 to 2	9
2	2 to 2.5	3
1	Greater than 2.5	1

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

[1]Youden, W.J., "Statistical Aspects of the Cement Testing Program", *Proceedings of the American Society for testing and Materials Volume 59*, 1959.

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

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. Elimination of these outlying results may 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
Concrete Masonry Units Proficiency Samples No. 29 and No. 30
Final Report - September 24, 2010

SUMMARY OF RESULTS

Test		#Labs	Sample No. 29 Average	S.D.	C.V.	Sample No. 30 Average	S.D.	C.V.
COMPRESSION UNITS								
Received Weight	lb	154	9.6	0.08	0.80	11.7	0.07	0.59
Received Weight	lb	* 151	9.6	0.07	0.68	11.7	0.06	0.51
Max Comp Load	lbf	154	51914	7643	14.7	67899	11809	17.4
Max Comp Load	lbf	* 151	52045	5834	11.2	68097	9446	13.9
Comp Strength	psi	149	2641	404	15.3	3416	627	18.4
Comp Strength	psi	* 147	2635	344	13.1	3407	546	16.0
ABSORPTION UNITS								
Received Weight	lb	154	9.6	0.07	0.75	11.7	0.07	0.61
Width	inch	154	3.6	0.04	1.1	3.7	0.05	1.4
Height	inch	154	7.6	0.04	0.59	7.6	0.03	0.43
Length	inch	154	7.6	0.03	0.33	7.6	0.04	0.58
Face Thickness	inch	154	1.05	0.06	5.7	1.05	0.07	6.6
Face Thickness	inch	* 152	1.05	0.05	5.2	1.04	0.06	5.9
Web Thickness	inch	154	1.1	0.08	7.8	1.1	0.09	8.4
Immersed Weight	lb	154	5.0	0.10	2.0	7.0	0.15	2.2
Immersed Weight	lb	* 147	5.0	0.07	1.3	6.9	0.06	0.86

CONTINUED ON NEXT PAGE

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

COMPRESSION UNITS
Received Weight (CU) 946 1033 2109

Maximum Compressive Load 2241 2377 3245

Net Area Compressive Strength 2241 3245

ABSORPTION UNITS
Minimum Face Shell Thickness 1287 2438

Immersed Weight 196 2377 3069 825 923 1648 3091

CCRL PROFICIENCY SAMPLE PROGRAM
Concrete Masonry Units Proficiency Samples No. 29 and No. 30
Final Report - September 24, 2010

SUMMARY OF RESULTS

Test		#Labs	Sample No. 29 Average	S.D.	C.V.	Sample No. 30 Average	S.D.	C.V.
ABSORPTION UNITS - continued								
Saturated Weight	lb	154	10.4	0.09	0.90	12.4	0.10	0.77
Saturated Weight	lb	* 153	10.4	0.08	0.78	12.4	0.08	0.65
Oven-Dry Weight	lb	154	9.4	0.08	0.88	11.6	0.07	0.63
Oven-Dry Weight	lb	* 152	9.4	0.07	0.74	11.6	0.07	0.60
Net Area	in^2	154	19.8	1.5	7.4	20.0	1.5	7.6
Net Area	in^2	* 143	19.5	0.26	1.3	19.7	0.29	1.5
Absorption	lb/ft^3	154	12.1	1.0	8.4	9.3	1.1	12.3
Absorption	lb/ft^3	* 145	12.1	0.65	5.4	9.2	0.59	6.5
Density	lb/ft^3	154	109.1	2.8	2.6	133.2	3.9	2.9
Density	lb/ft^3	* 145	108.8	1.1	1.0	133.1	1.5	1.1
Equiv Thick	inch	153	2.7	0.51	19.2	2.7	0.53	19.8
Equiv Thick	inch	* 148	2.6	0.07	2.57	2.6	0.07	2.8

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

ABSORPTION UNITS

Saturated Weight 3091

Oven-Dry Weight 946 1098

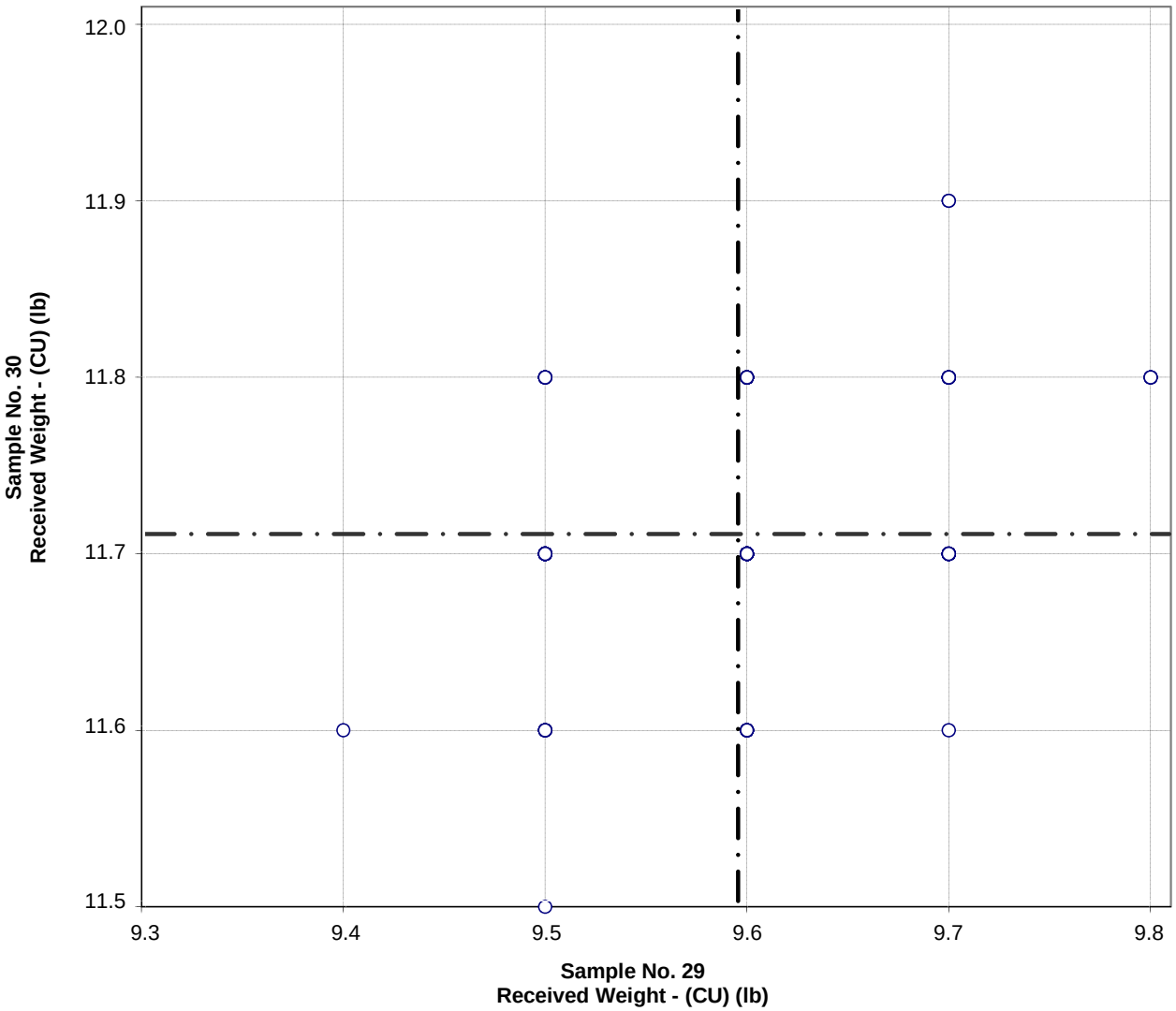
Net Area 1396 1522 2273 3069 196 825 1106 1207 2079 2438 3091

Absorption 946 1098 2241 28 196 920 923 951 3091

Density 196 2241 3069 825 1098 1120 1648 2377 3091

Equivalent Thickness 1310 1749 2069 2438 3069

CCRL Proficiency Sample Program
Received Weight - Compression Units
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

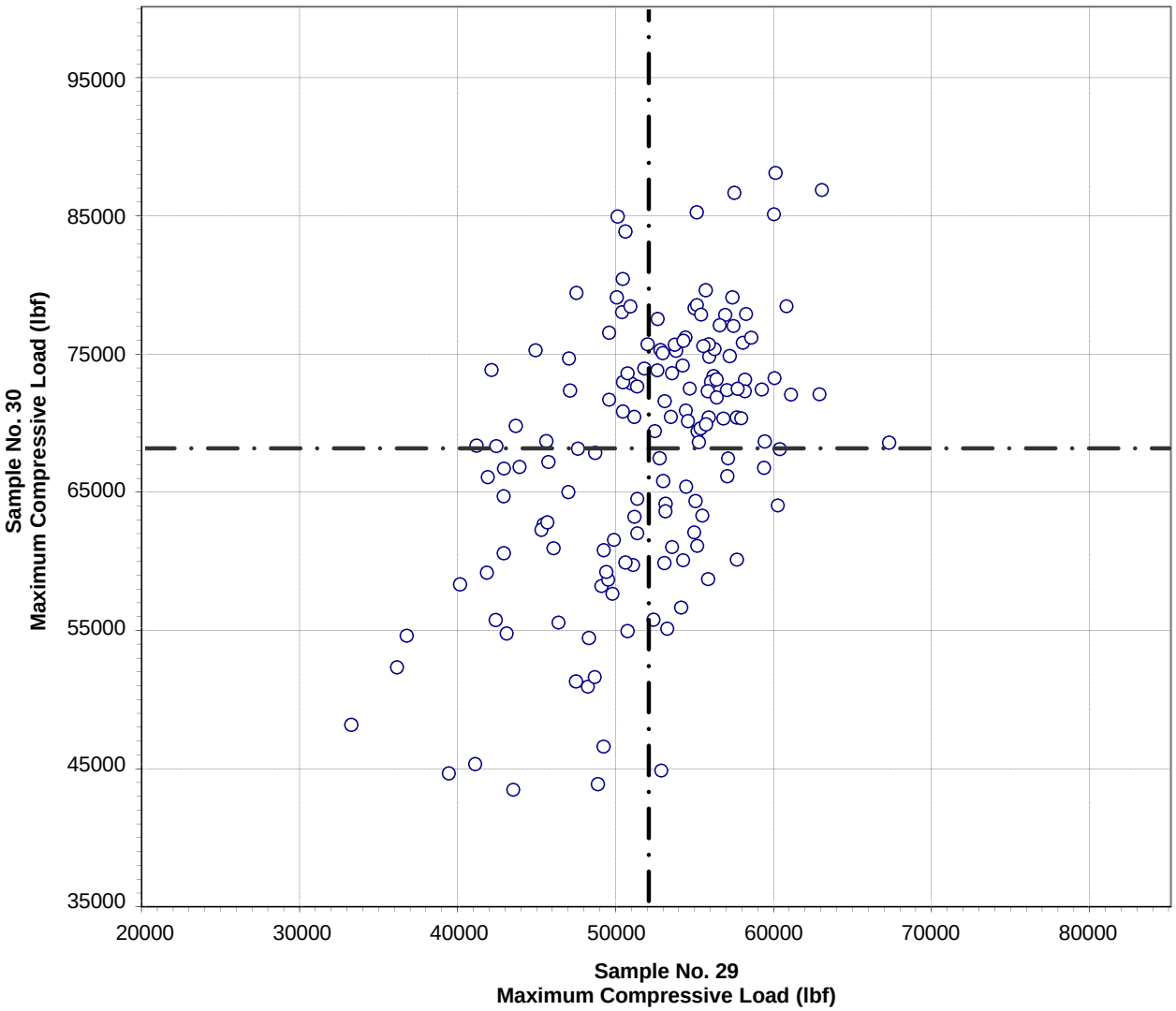


Test No. 500 Received Weight - Compression Units 151 Points

Sample No. 29 Ave 9.6 S.D. 0.07 C.V. 0.68
Sample No. 30 Ave 11.7 S.D. 0.06 C.V. 0.51

Labs eliminated: 946, 1033, 2109

CCRL Proficiency Sample Program
Maximum Compressive Load
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

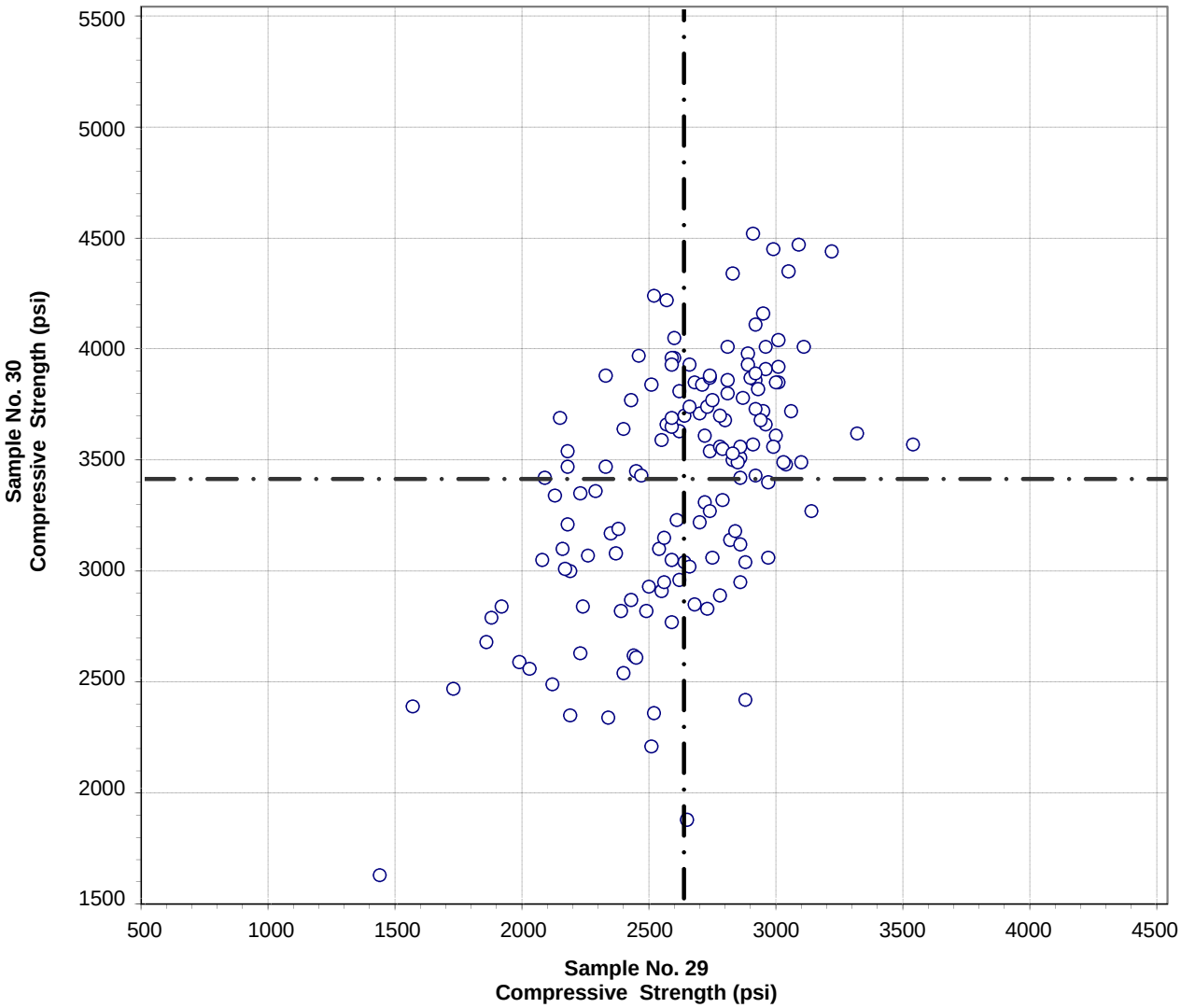


Test No. 550 Maximum Compressive Load 151 Points

Sample No. 29	Ave	52045	S.D.	5834	C.V. 11.2
Sample No. 30	Ave	68097	S.D.	9446	C.V. 13.9

Labs eliminated: 2241, 2377, 3245

CCRL Proficiency Sample Program
Net Area Compressive Strength
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

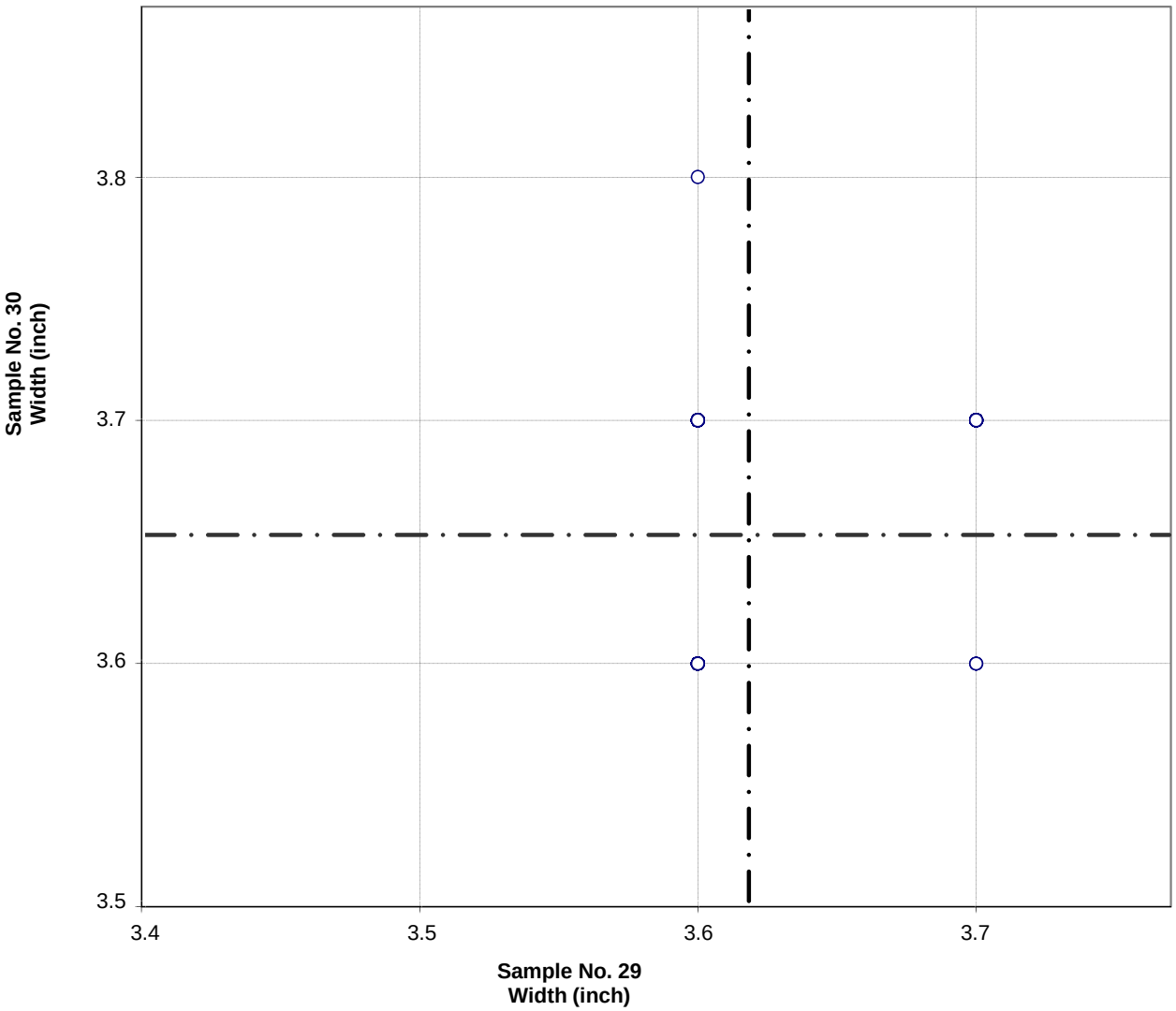


Test No. 560 Net Area Compressive Strength 147 Points

Sample No. 29	Ave	2635	S.D.	344	C.V.	13.1
Sample No. 30	Ave	3407	S.D.	546	C.V.	16.0

Labs eliminated: 2241, 3245

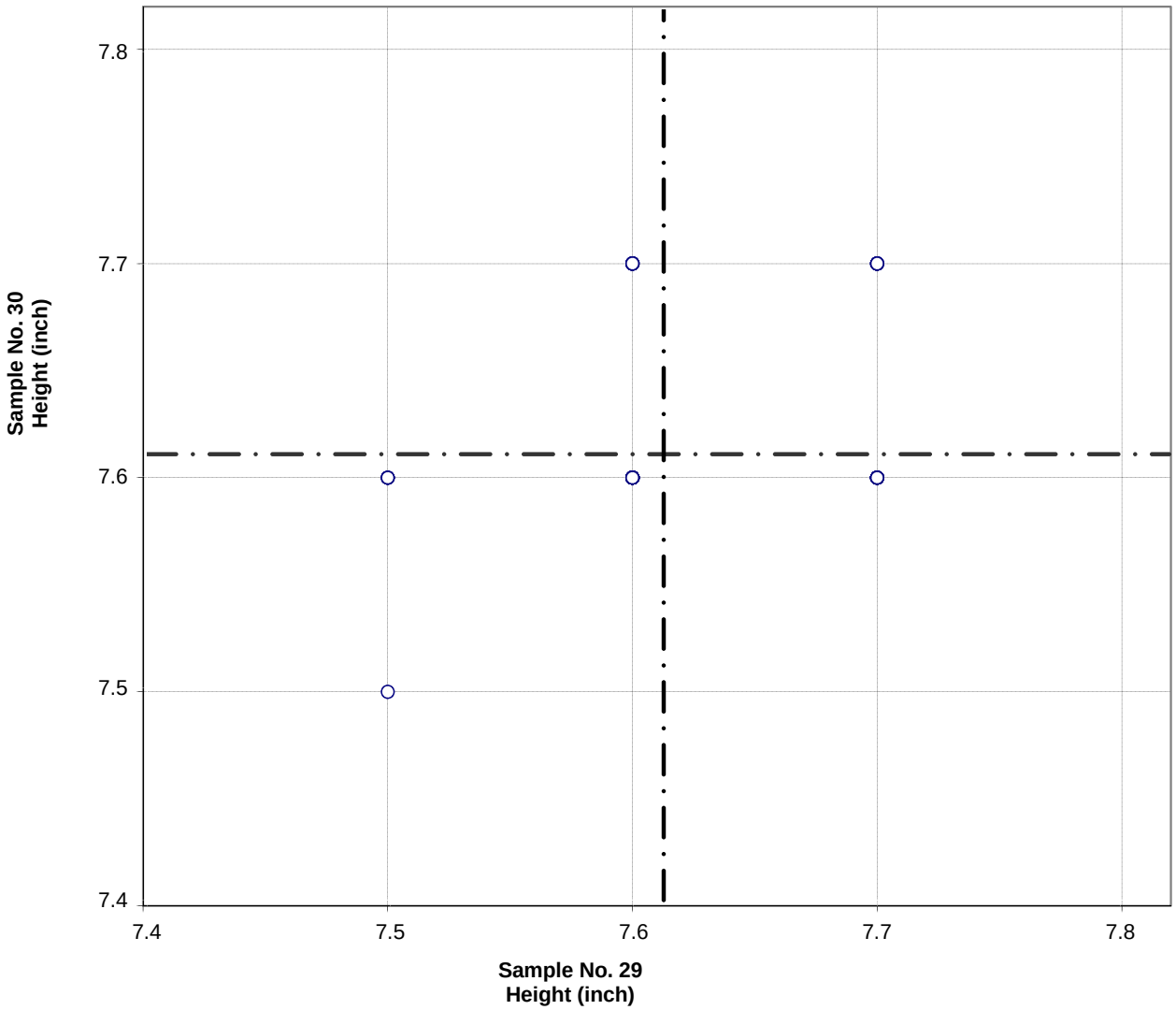
CCRL Proficiency Sample Program
Width
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 510 Width 154 Points

Sample No. 29	Ave	3.6	S.D.	0.04	C.V.	1.1
Sample No. 30	Ave	3.7	S.D.	0.05	C.V.	1.4

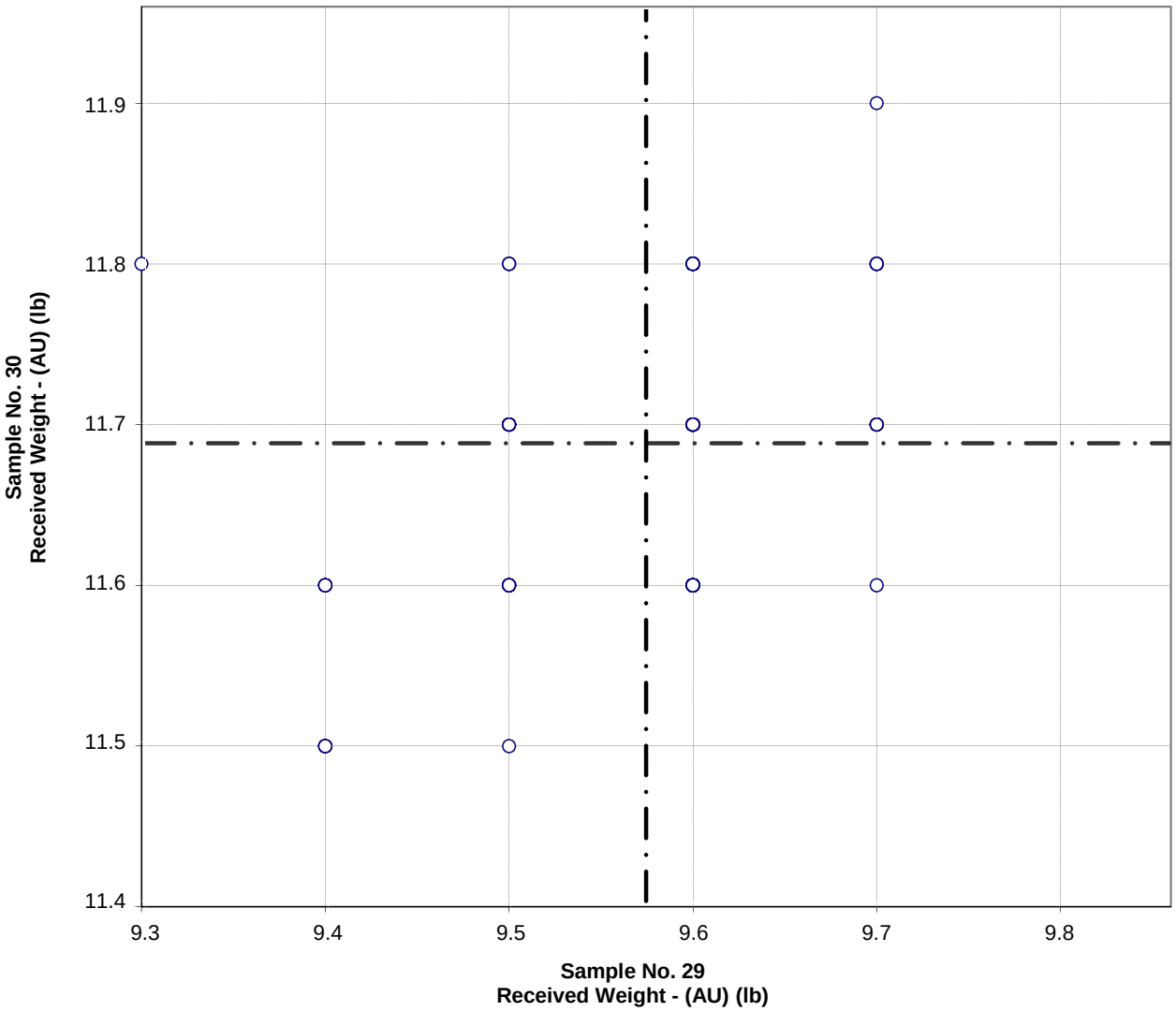
CCRL Proficiency Sample Program
Height
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 520 Height 154 Points

Sample No. 29	Ave	7.6	S.D.	0.04	C.V.	0.59
Sample No. 30	Ave	7.6	S.D.	0.03	C.V.	0.43

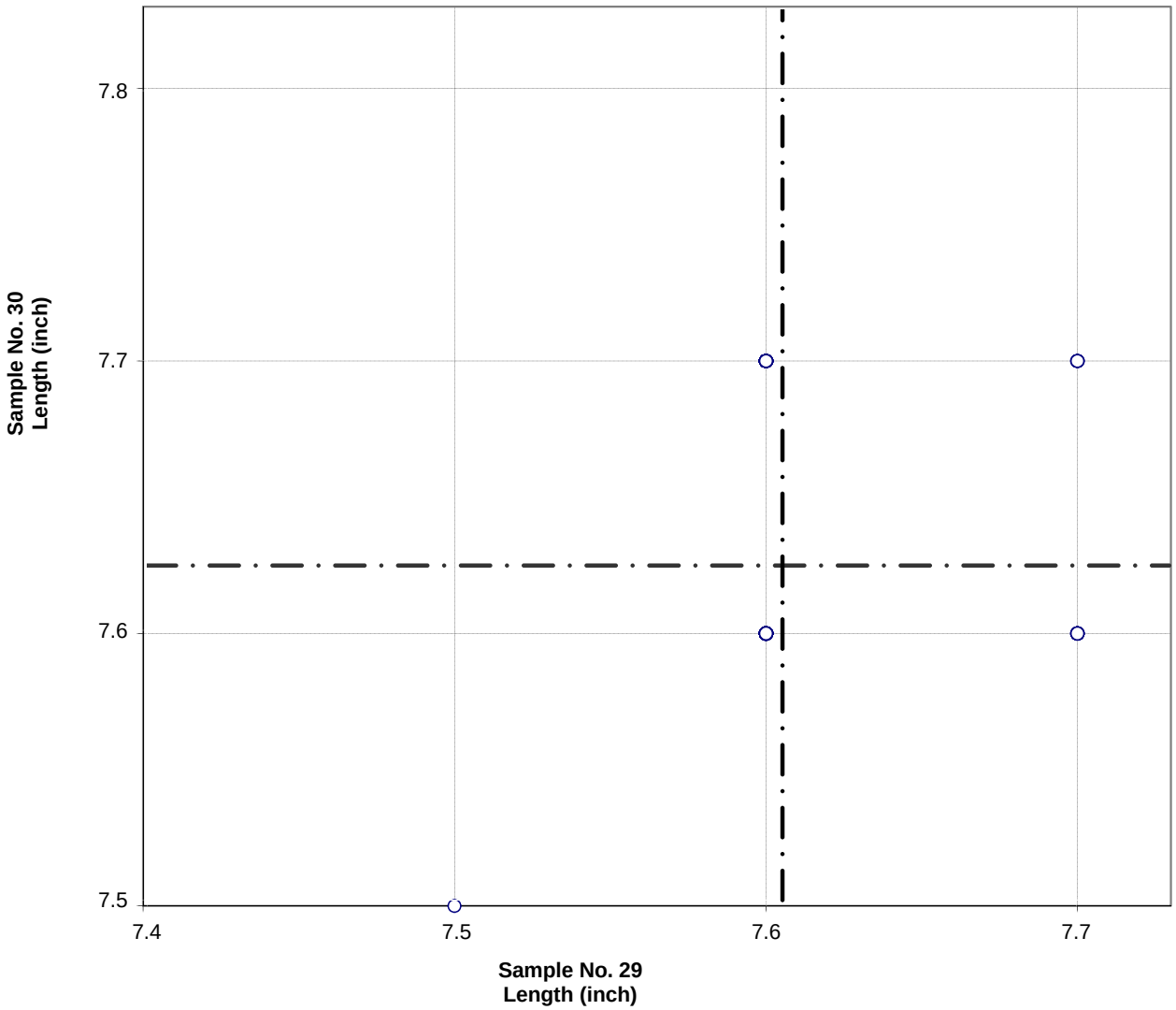
CCRL Proficiency Sample Program
Received Weight - Absorption Units
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 600 Received Weight - Absorption Units 154 Points

Sample No. 29 Ave 9.6 S.D. 0.07 C.V. 0.75
Sample No. 30 Ave 11.7 S.D. 0.07 C.V. 0.61

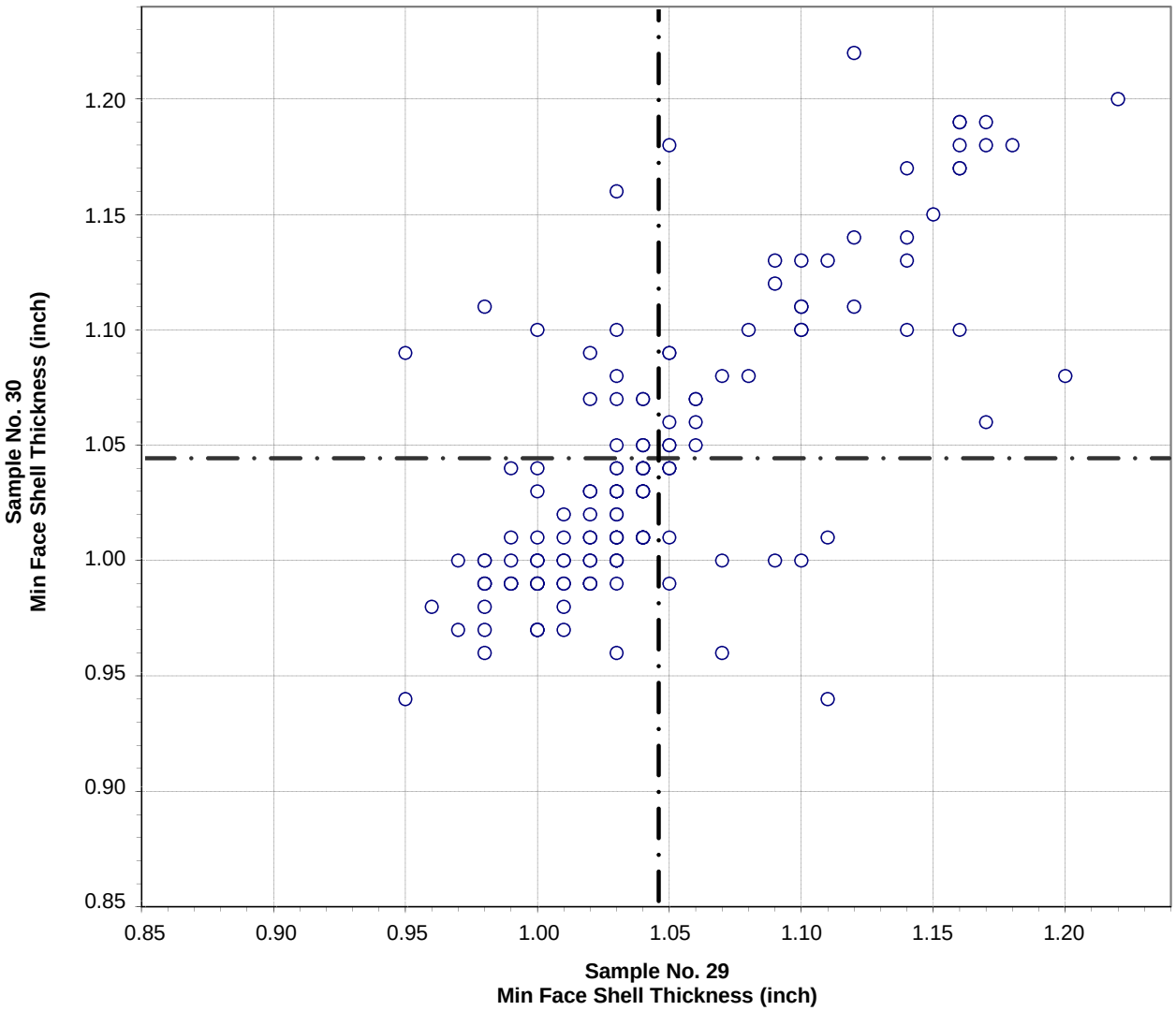
CCRL Proficiency Sample Program
Length
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 530 Length 154 Points

Sample No. 29	Ave	7.6	S.D.	0.03	C.V.	0.33
Sample No. 30	Ave	7.6	S.D.	0.04	C.V.	0.58

CCRL Proficiency Sample Program
Minimum Face Shell Thickness
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

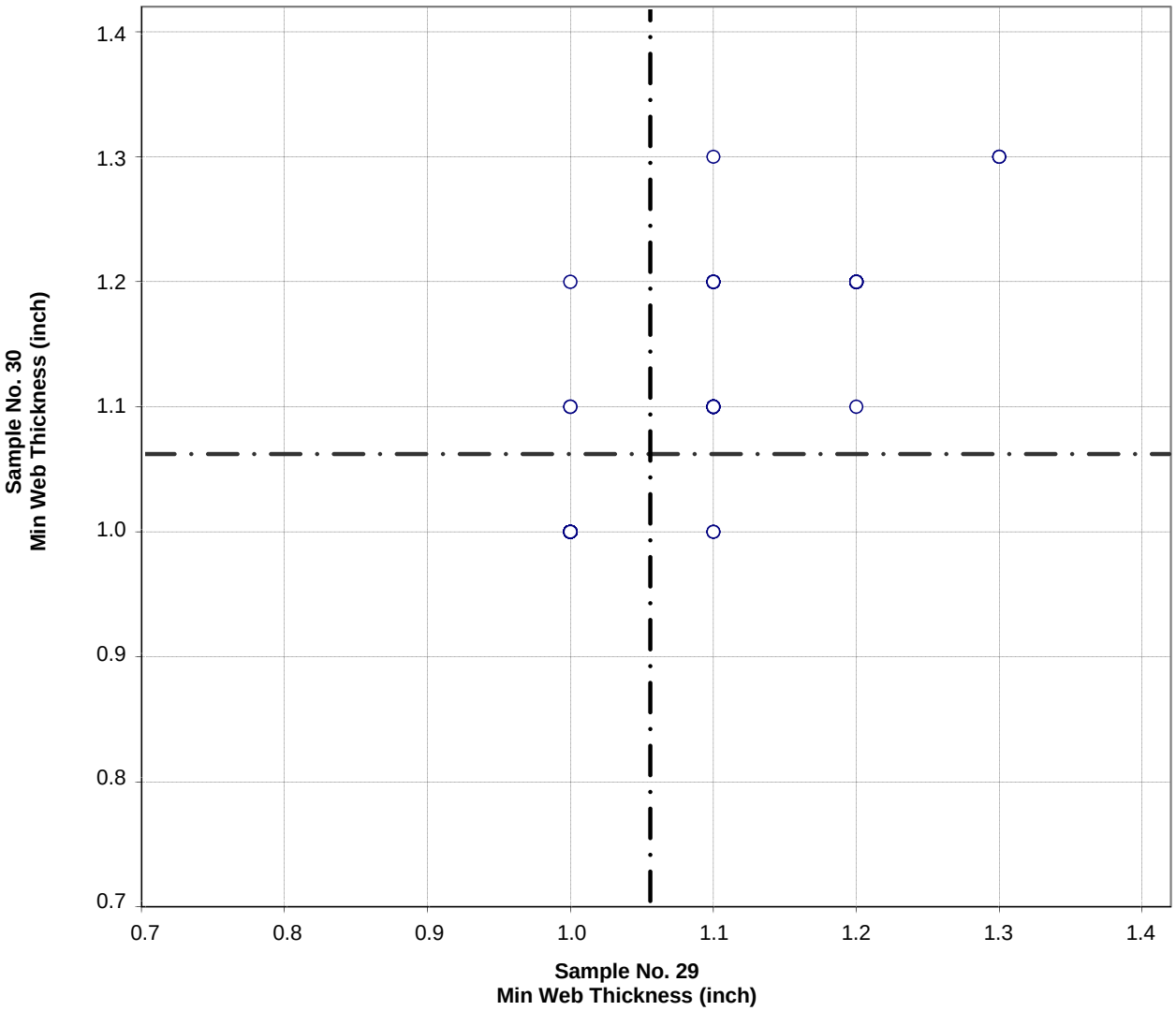


Test No. 532 Minimum Face Shell Thickness 152 Points

Sample No. 29	Ave	1.05	S.D.	0.05	C.V. 5.2
Sample No. 30	Ave	1.04	S.D.	0.06	C.V. 5.9

Labs eliminated: 1287, 2438

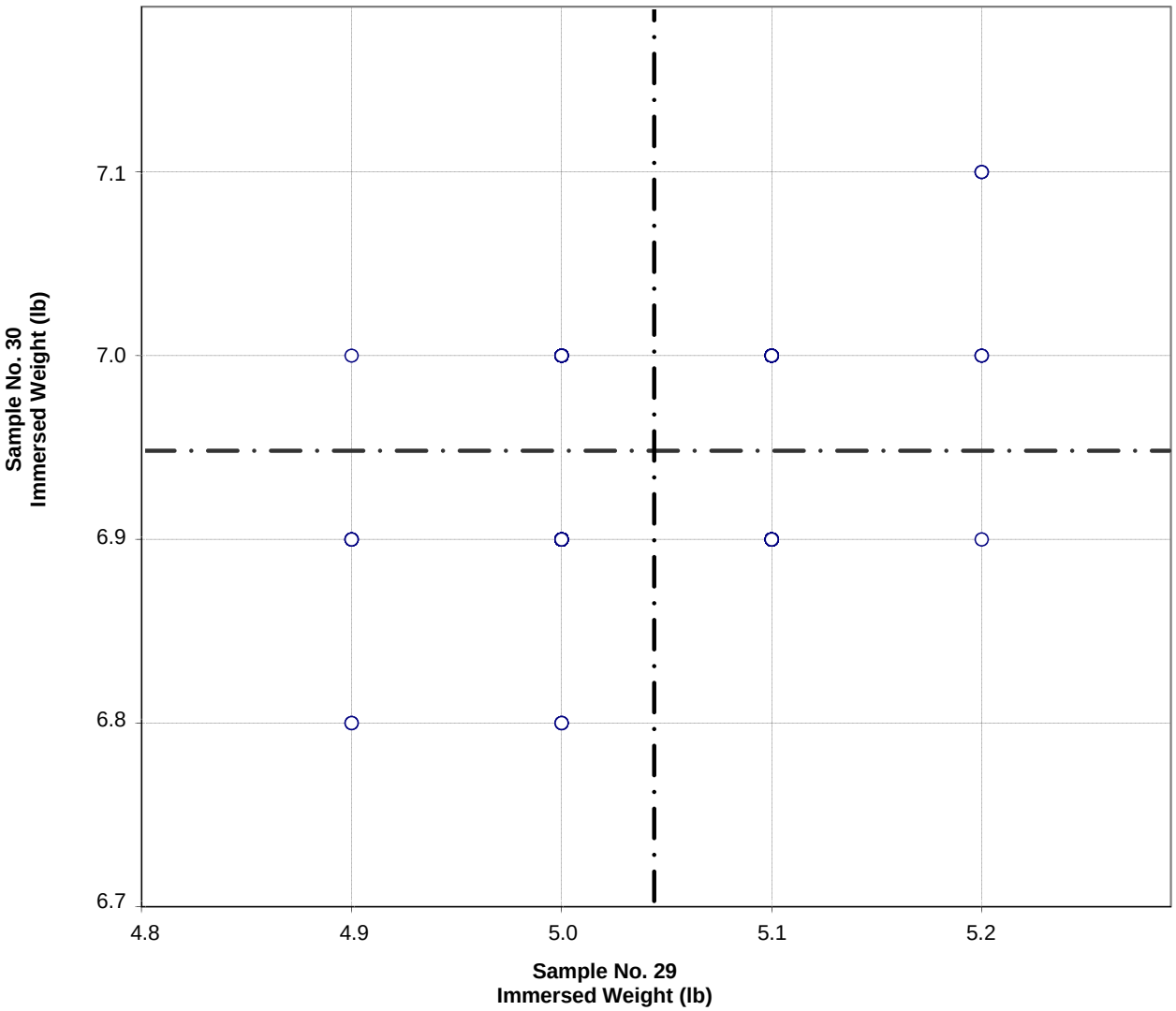
CCRL Proficiency Sample Program
Minimum Web Thickness
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 533 Minimum Web Thickness 154 Points

Sample No. 29	Ave	1.1	S.D.	0.08	C.V.	7.8
Sample No. 30	Ave	1.1	S.D.	0.09	C.V.	8.4

CCRL Proficiency Sample Program
Immersed Weight
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

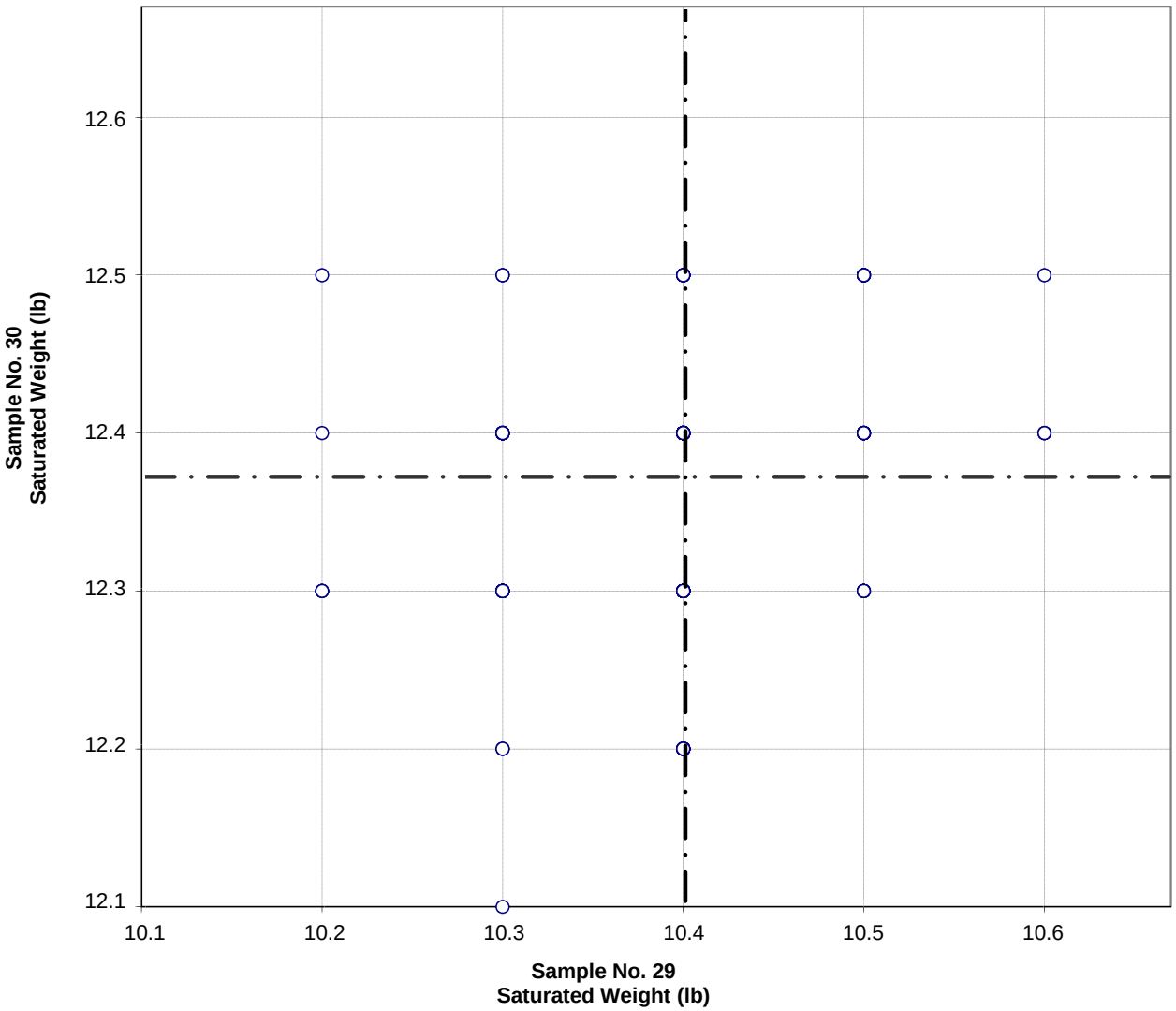


Test No. 610 Immersed Weight 147 Points

Sample No. 29	Ave	5.0	S.D.	0.07	C.V. 1.3
Sample No. 30	Ave	6.9	S.D.	0.06	C.V. 0.86

Labs eliminated: 196, 2377, 3069, 825, 923, 1648, 3091

CCRL Proficiency Sample Program
Saturated Weight
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

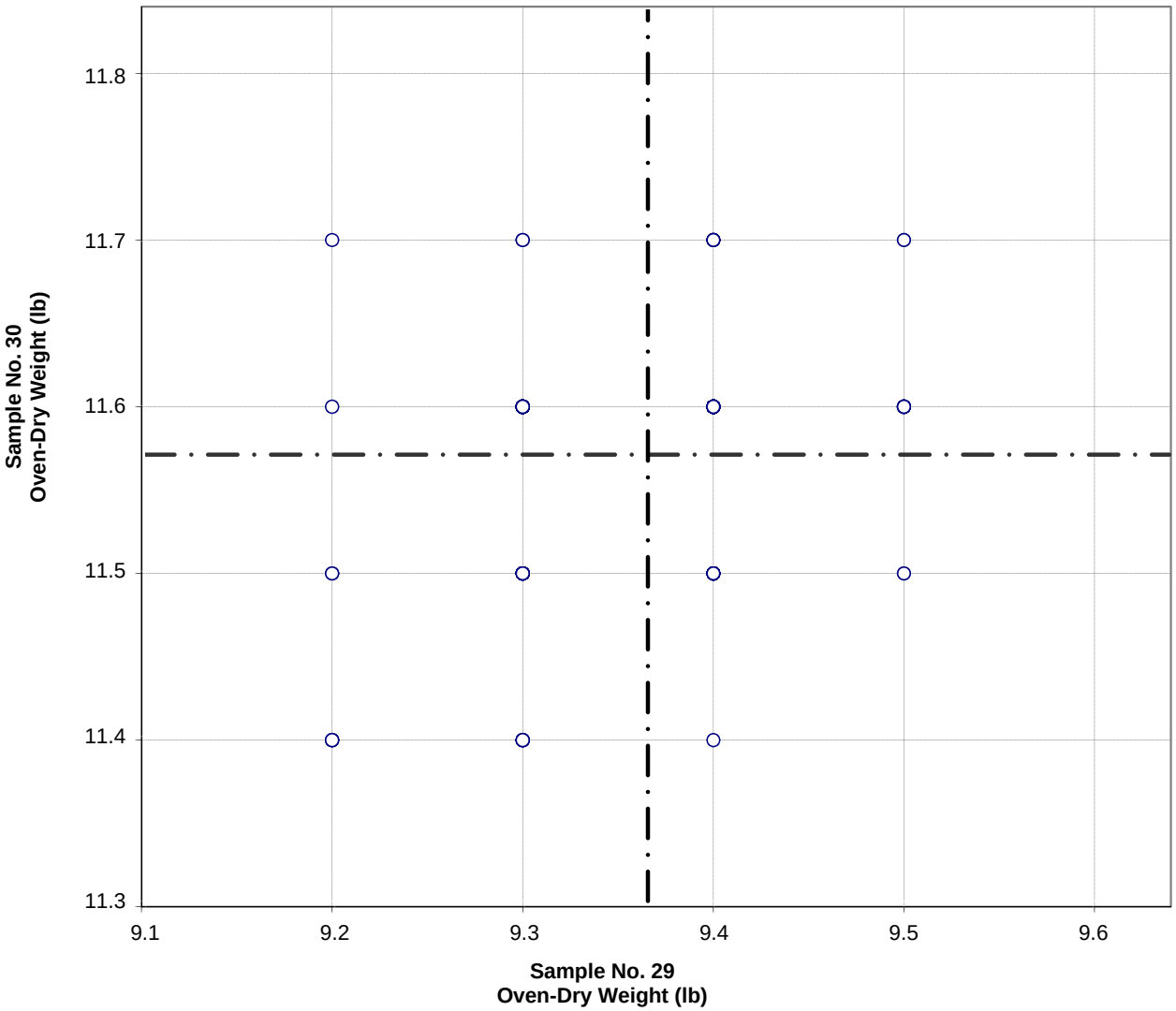


Test No. 620 Saturated Weight 153 Points

Sample No. 29	Ave	10.4	S.D.	0.08	C.V. 0.78
Sample No. 30	Ave	12.4	S.D.	0.08	C.V. 0.65

Labs eliminated: 3091

CCRL Proficiency Sample Program
Oven-Dry Weight
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

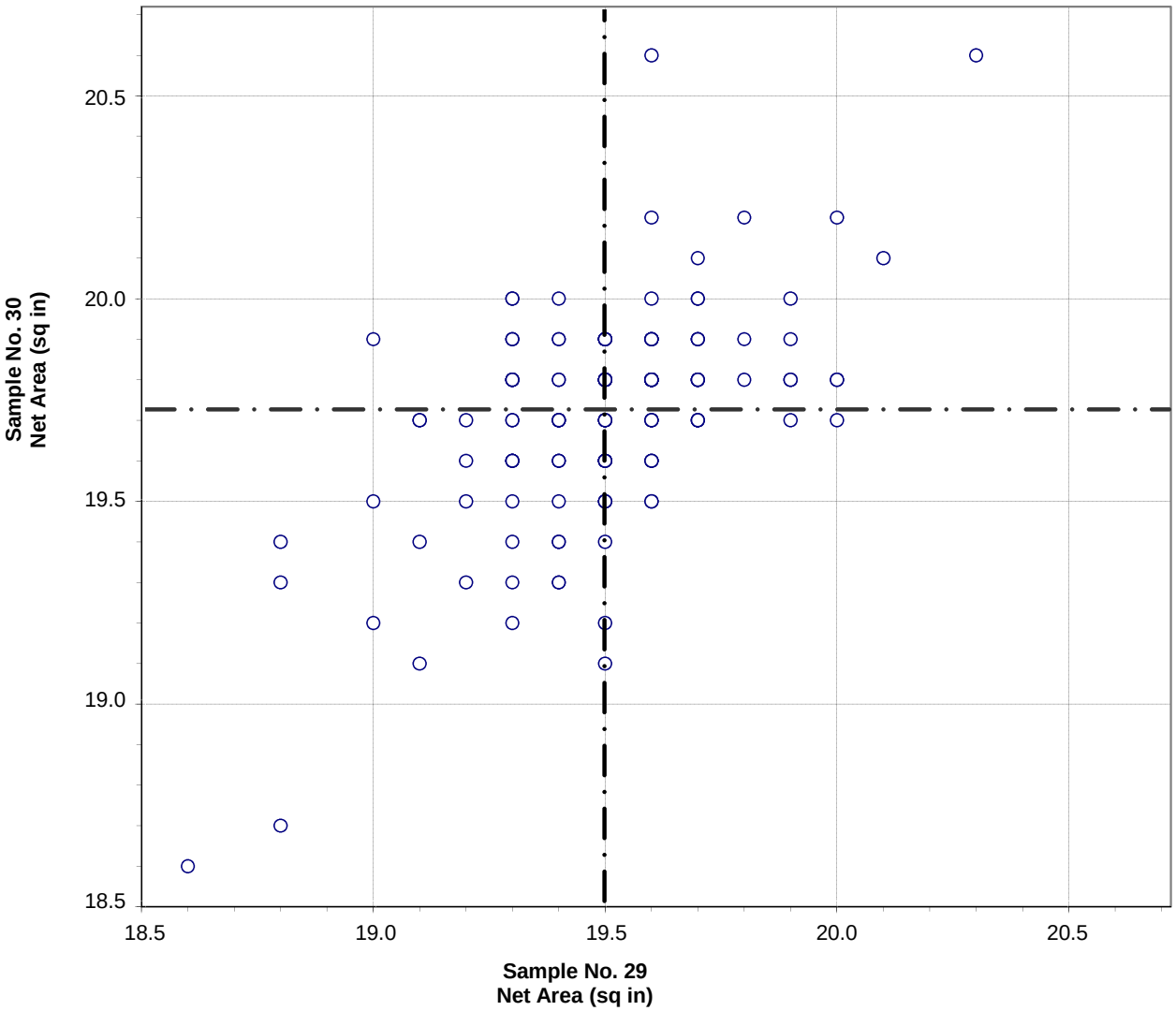


Test No. 630 Oven-Dry Weight 152 Points

Sample No. 29 Ave 9.4 S.D. 0.07 C.V. 0.74
Sample No. 30 Ave 11.6 S.D. 0.07 C.V. 0.60

Labs eliminated: 946, 1098

CCRL Proficiency Sample Program
Net Area
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



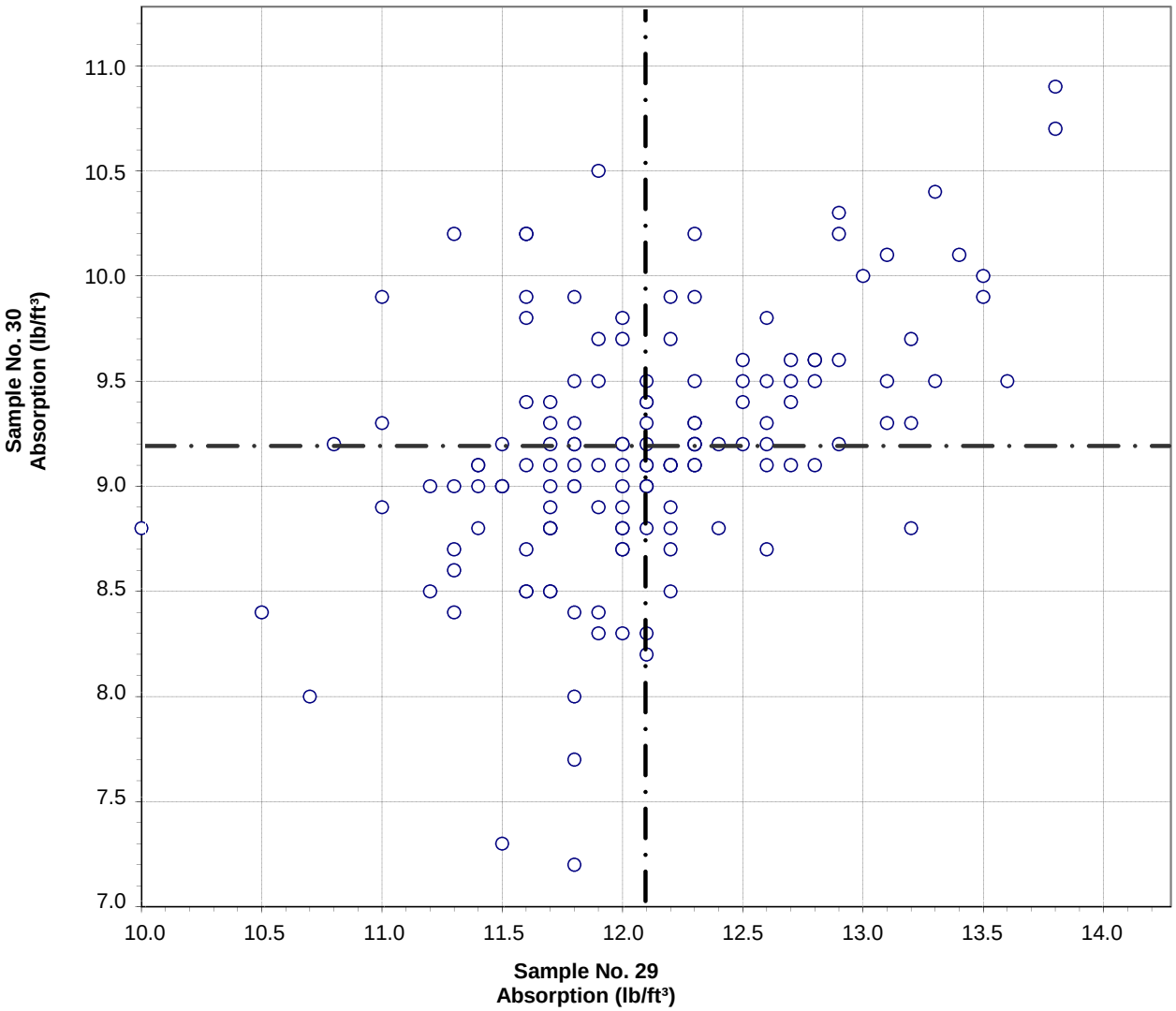
Test No. 635 Net Area 142 Points

Sample No. 29 Ave 19.5 S.D. 0.26 C.V. 1.3
Sample No. 30 Ave 19.7 S.D. 0.29 C.V. 1.5

Labs eliminated: 1396, 1522, 2273, 3069, 196, 825, 1106, 1207, 2079, 2438, 3091

Labs off Diagram: 2377

CCRL Proficiency Sample Program
Absorption
CONCRETE MASONRY UNITS Samples No. 29 and No. 30

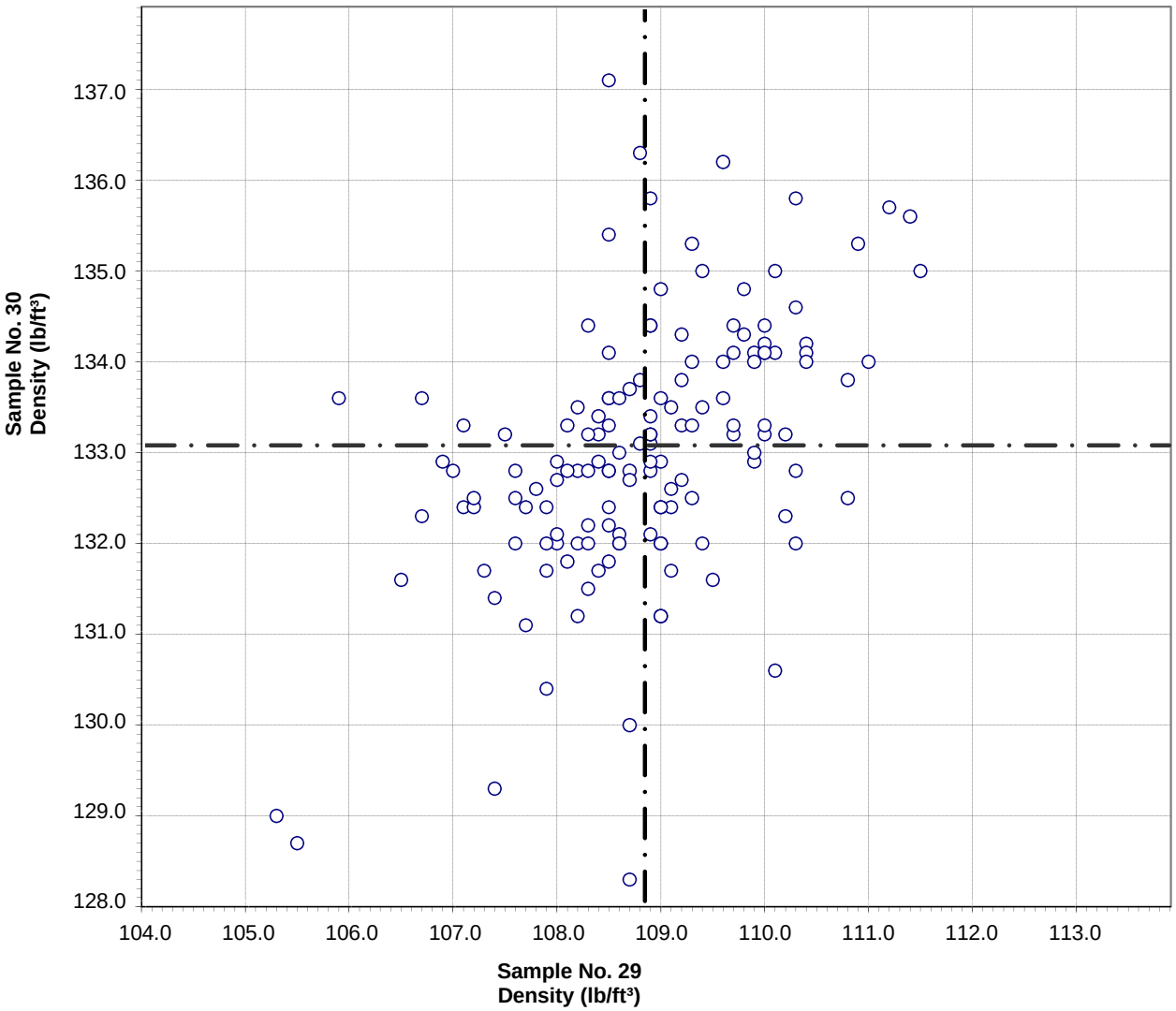


Test No. 640 Absorption 145 Points

Sample No. 29 Ave 12.1 S.D. 0.65 C.V. 5.4
Sample No. 30 Ave 9.2 S.D. 0.59 C.V. 6.5

Labs eliminated: 946, 1098, 2241, 28, 196, 920, 923, 951, 3091

CCRL Proficiency Sample Program
Density
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



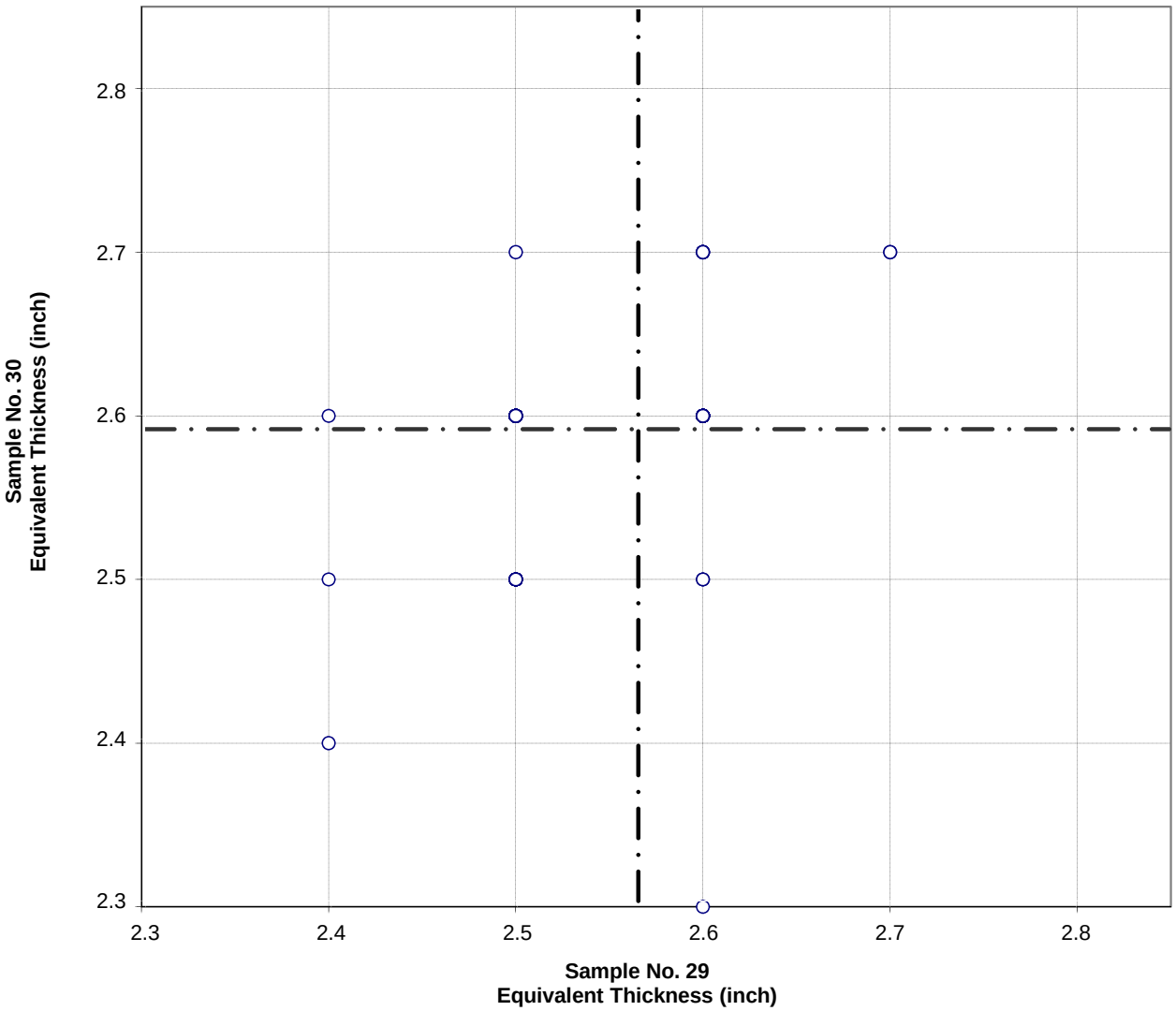
Test No. 650 Density 144 Points

Sample No. 29 Ave 108.8 S.D. 1.1 C.V. 1.0
Sample No. 30 Ave 133.1 S.D. 1.5 C.V. 1.1

Labs eliminated: 196, 2241, 3069, 825, 1098, 1120, 1648, 2377, 3091

Labs off Diagram: 823

CCRL Proficiency Sample Program
Equivalent Thickness
CONCRETE MASONRY UNITS Samples No. 29 and No. 30



Test No. 660 Equivalent Thickness 146 Points

Sample No. 29	Ave	2.6	S.D.	0.07	C.V.	2.6
Sample No. 30	Ave	2.6	S.D.	0.07	C.V.	2.8

Labs eliminated: 1310, 1749, 2069, 2438, 3069

Labs off Diagram: 196, 475