CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 163 and Number 164

June 2012

CCRL CEMENT AN D CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete
Reference Laboratory

www.ccrl.us

June 19, 2012

TO: Participants in the CCRL Portland Cement Concrete Proficiency Sample Program

SUBJECT: Concrete Proficiency Samples No. 163 and No. 164

Enclosed is your copy of the final report on the test results for the CCRL Concrete Proficiency Samples which were distributed in April 2012.

This report consists of a statistical Summary of Results, a set of general Scatter Diagrams and associated detailed information. The Table of Results with test results and ratings for your laboratory can be viewed and printed 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 materials 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 Proficiency Samples will be distributed in October 2012.

Sincerely,

Robin K. Haupt

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

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TO: Participants in the CCRL Concrete Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests on Portland Cement Concrete Proficiency Samples No. 163 and No. 164

This letter, and the material included with it, constitutes the final report and summary of results for the current pair of Concrete Proficiency Samples that were distributed in April 2012. This material includes a statistical Summary of Results, and a set of general Scatter Diagrams. If your laboratory was a participate in this program a Table of Laboratory Results (lab data and 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 Results

Each laboratory receives an individualized Table of Results that contains laboratory test results and ratings. Each line of the test information shows the test title and the reporting unit in the first two columns. After that it lists in order, the laboratory's test 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 temperature of concrete.

The ratings for each 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 indicates whether the result reported was greater or less than the average obtained.

[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.*

In cases where some laboratories' results are eliminated, averages, standard deviations, coefficients of variation, and the ratings of the remaining 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, that 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 provides 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 invalid and 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
Concrete Proficiency Samples No. 163 and No. 164

Final Report
June 19, 2012

SUMMARY OF RESULTS

		Sample No.163			Sample No. 164		
Test (unit)	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Air Content - Volumetric Method (percent)							
	1104	2.56	0.61	24	2.23	0.48	21
	*1083	2.54	0.52	20	2.22	0.43	19
* Labs Eliminated - 981, 1039, 1068, 1372, 1576, 1582, 1864, 2045, 2049, 2213, 2309, 2472, 2494, 2686, 2989, 3063, 3115, 3326, 3347, 3578, 3657							
Air Content - Pressure Method (percent)							
	1304	2.6	0.59	23	2.3	0.45	20
	*1276	2.6	0.49	19	2.2	0.40	18
* Labs Eliminated - 39, 143, 981, 1068, 1189, 1372, 1486, 1582, 1636, 1772, 1864, 1979, 2049, 2213, 2309, 2314, 2315, 2472, 2494, 2686, 2877, 3063, 3115, 3171, 3326, 3347, 3446, 3636							
Slump of Concrete (inch)							
	1315	3.42	1.16	34	2.83	1.06	37
	*1289	3.37	1.08	32	2.77	0.94	34
* Labs Eliminated - 266, 756, 805, 1103, 1383, 1403, 1612, 1952, 1979, 2030, 2387, 2471, 2515, 2877, 3048, 3061, 3109, 3171, 3243, 3252, 3520, 3567, 3610, 3657, 3675, 3703							
Unit Weight of Concrete (lb/ft³)							
	1309	148.9	3.0	2.0	149.9	2.6	1.7
	*1288	148.8	1.6	1.1	149.9	1.5	1.0
* Labs Eliminated - 33, 1179, 1210, 1357, 1428, 1447, 1700, 1796, 1864, 2030, 2289, 2300, 2393, 2444, 2515, 2941, 3039, 3314, 3474, 3610, 3660							
Compressive Strength 4 x 8 - 7 day (psi)							
	823	4667	435	9.3	4973	432	8.7
	*807	4700	365	7.8	4997	363	7.3
* Labs Eliminated - 636, 920, 981, 1210, 1552, 2471, 2515, 2936, 2999, 3053, 3061, 3115, 3344, 3468, 3585, 3636							
Compressive Strength 6 X 12 - 7 day (psi)							
	489	4325	373	8.6	4573	411	9.0
	*480	4344	326	7.5	4597	341	7.4
* Labs Eliminated - 756, 828, 1039, 1772, 2030, 2237, 2792, 3300, 3657							

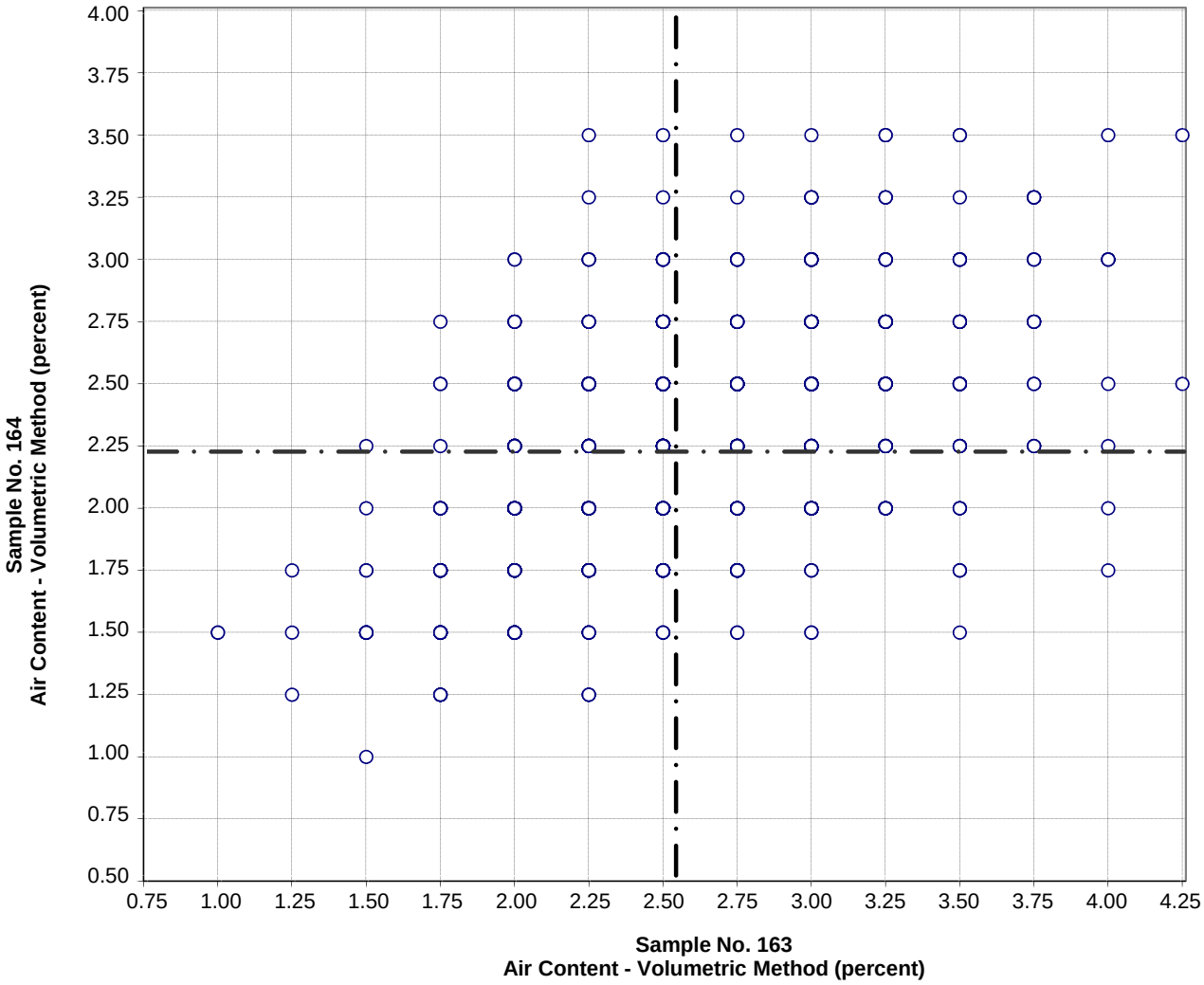
CCRL PROFICIENCY SAMPLE PROGRAM
Concrete Proficiency Samples No. 163 and No. 164

Final Report
June 19, 2012

SUMMARY OF RESULTS

		Sample No.163			Sample No. 164		
Test (unit)	#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Temperature of Concrete (**°F**)							
	1310	77	6	8.2	77	6	8.2
No Labs Eliminated for This Test							

CCRL Proficiency Sample Program
Air Content - Volumetric Method
CONCRETE Samples No. 163 and No. 164

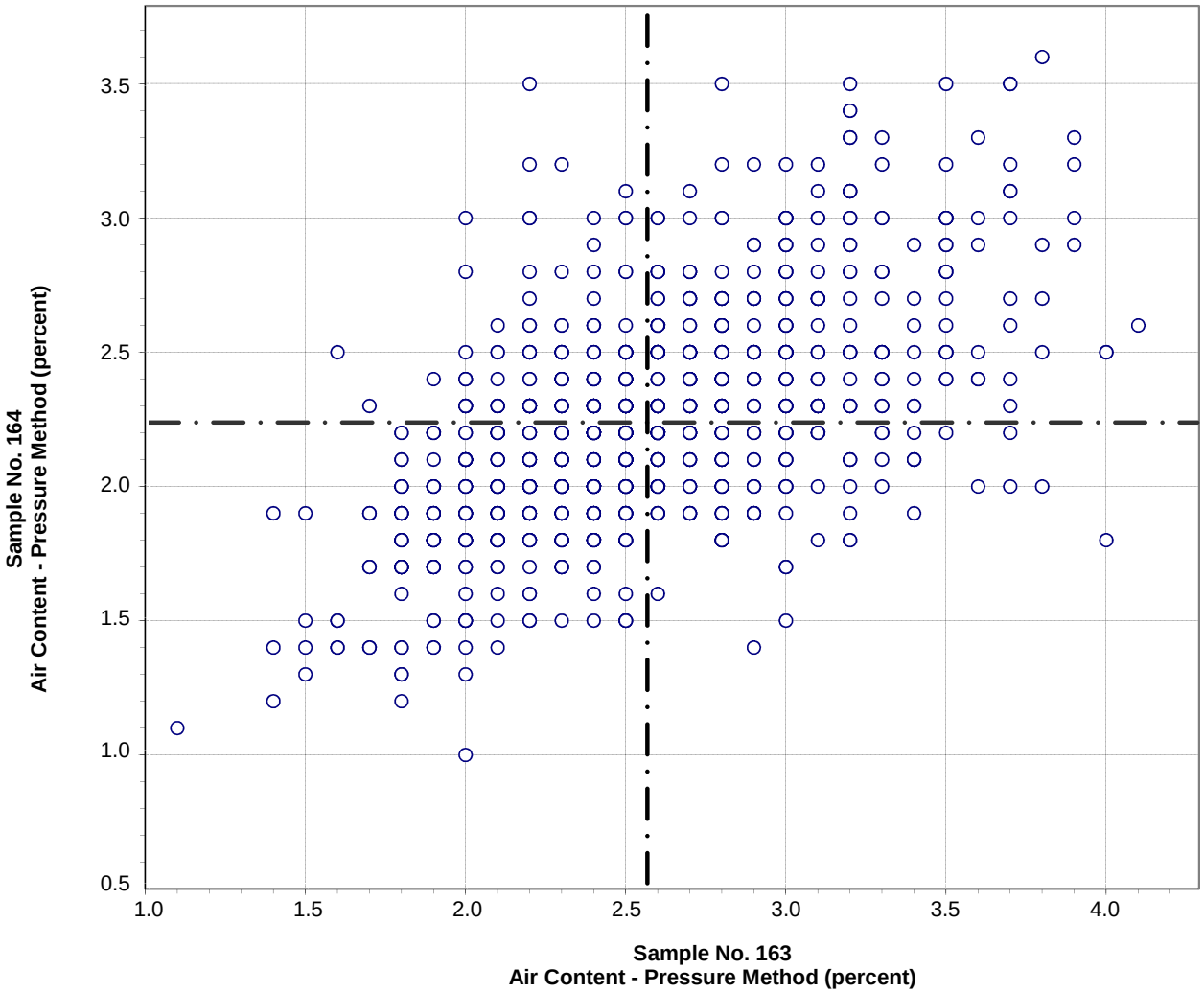


Test No. 1 Air Content - Volumetric Method 1083 Points

Sample No. 163 Ave 2.54 S.D. 0.52 C.V. 20
Sample No. 164 Ave 2.22 S.D. 0.43 C.V. 19

Labs Eliminated: 981, 1039, 1068, 1372, 1576, 1582, 1864, 2045, 2049, 2213, 2309, 2472, 2494, 2686, 2989, 3063, 3115, 3326, 3347, 3578, 3657

CCRL Proficiency Sample Program
Air Content - Pressure Method
CONCRETE Samples No. 163 and No. 164



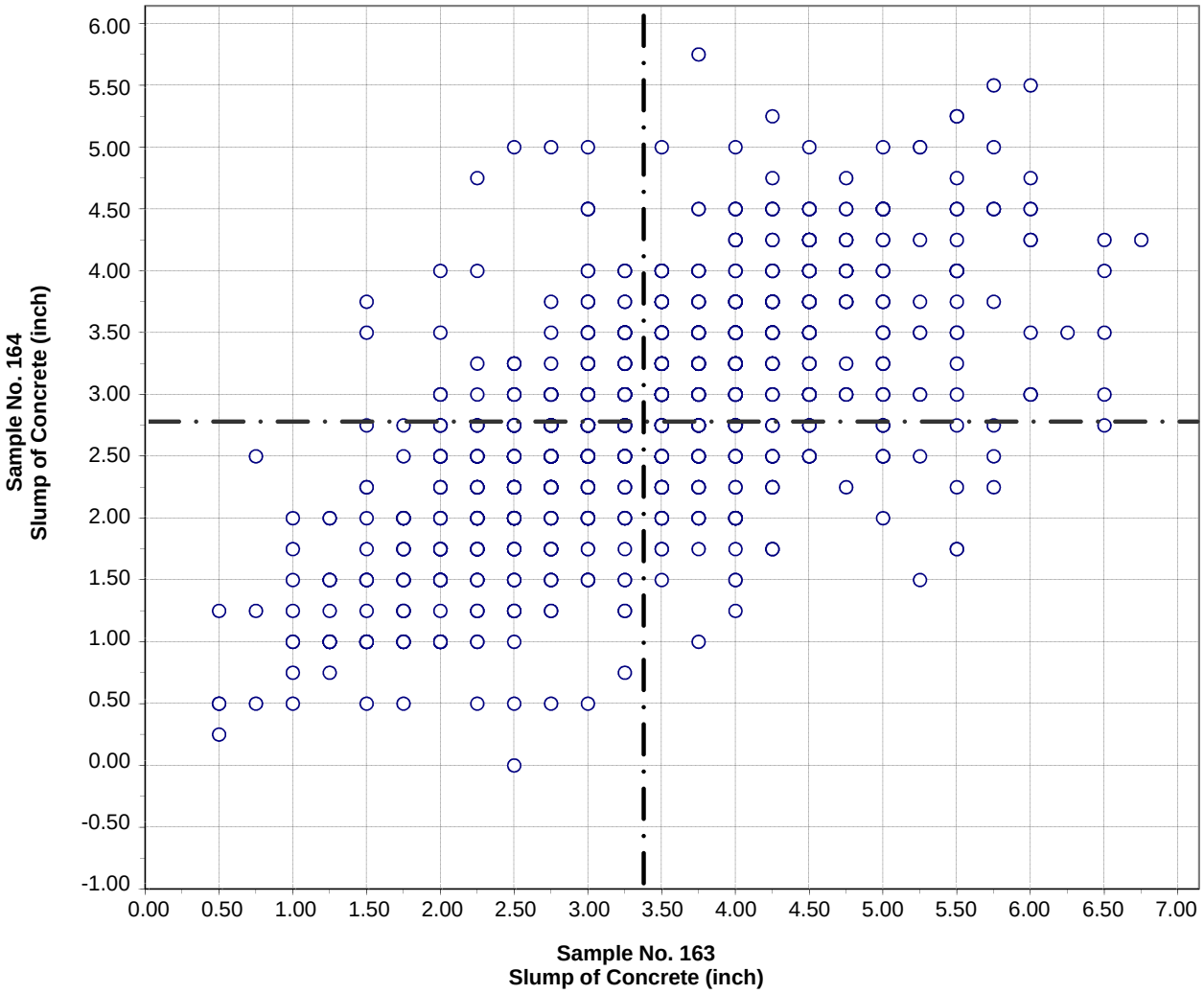
Test No. 6 Air Content - Pressure Method 1275 Points

Sample No. 163 Ave 2.6 S.D. 0.49 C.V. 19
Sample No. 164 Ave 2.2 S.D. 0.40 C.V. 18

Labs Eliminated: 39, 143, 981, 1068, 1189, 1372, 1486, 1582, 1636, 1772, 1864, 1979, 2049, 2213, 2309, 2314, 2315, 2472, 2494, 2686, 2877, 3063, 3115, 3171, 3326, 3347, 3446, 3636

Labs off Diagram: 1602

CCRL Proficiency Sample Program
Slump of Concrete
CONCRETE Samples No. 163 and No. 164

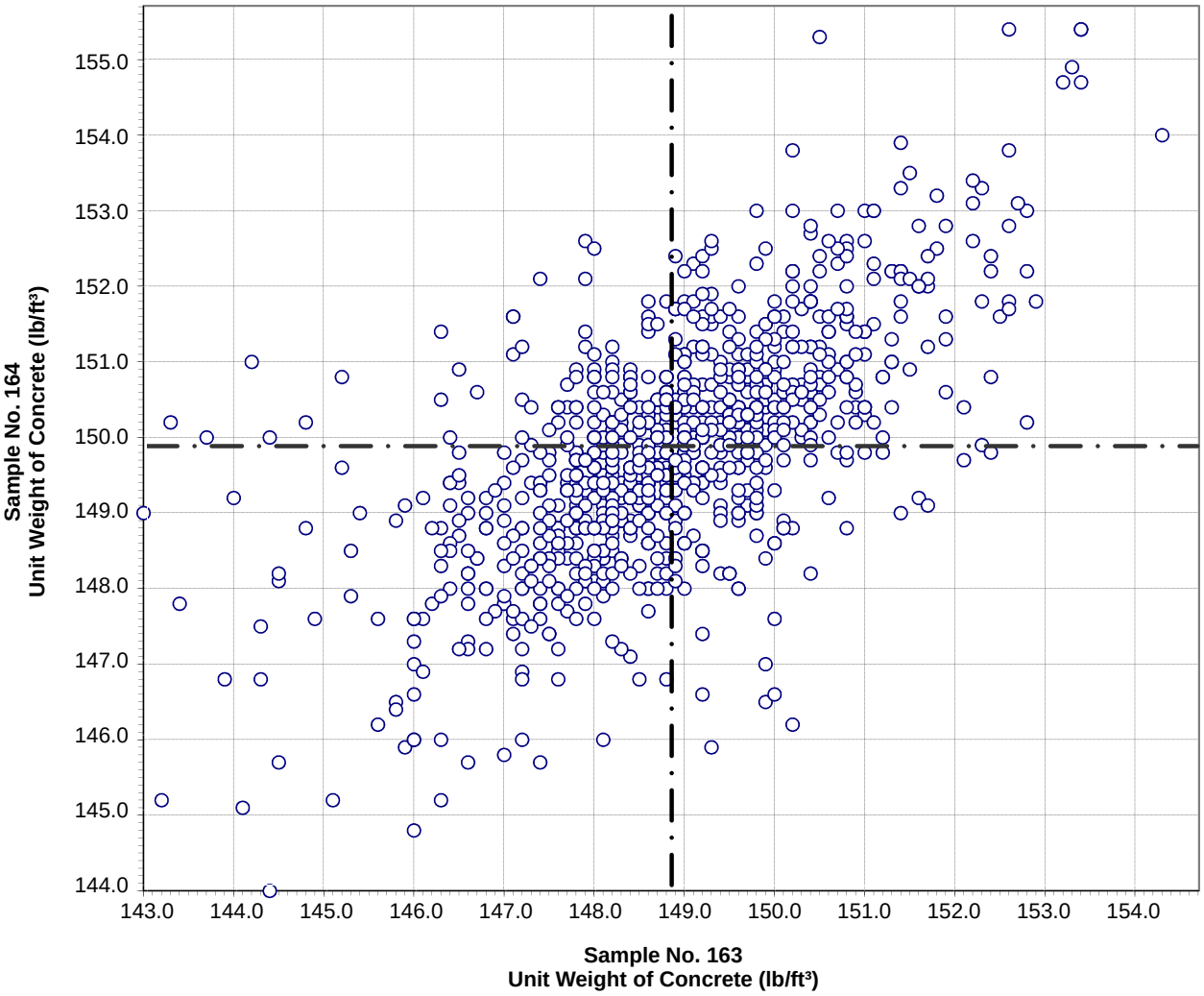


Test No. 2 Slump of Concrete 1289 Points

Sample No. 163	Ave	3.37	S.D.	1.08	C.V. 32
Sample No. 164	Ave	2.77	S.D.	0.94	C.V. 34

Labs Eliminated: 266, 756, 805, 1103, 1383, 1403, 1612, 1952, 1979, 2030, 2387, 2471, 2515, 2877, 3048, 3061, 3109, 3171, 3243, 3252, 3520, 3567, 3610, 3657, 3675, 3703

CCRL Proficiency Sample Program
Unit Weight of Concrete
CONCRETE Samples No. 163 and No. 164



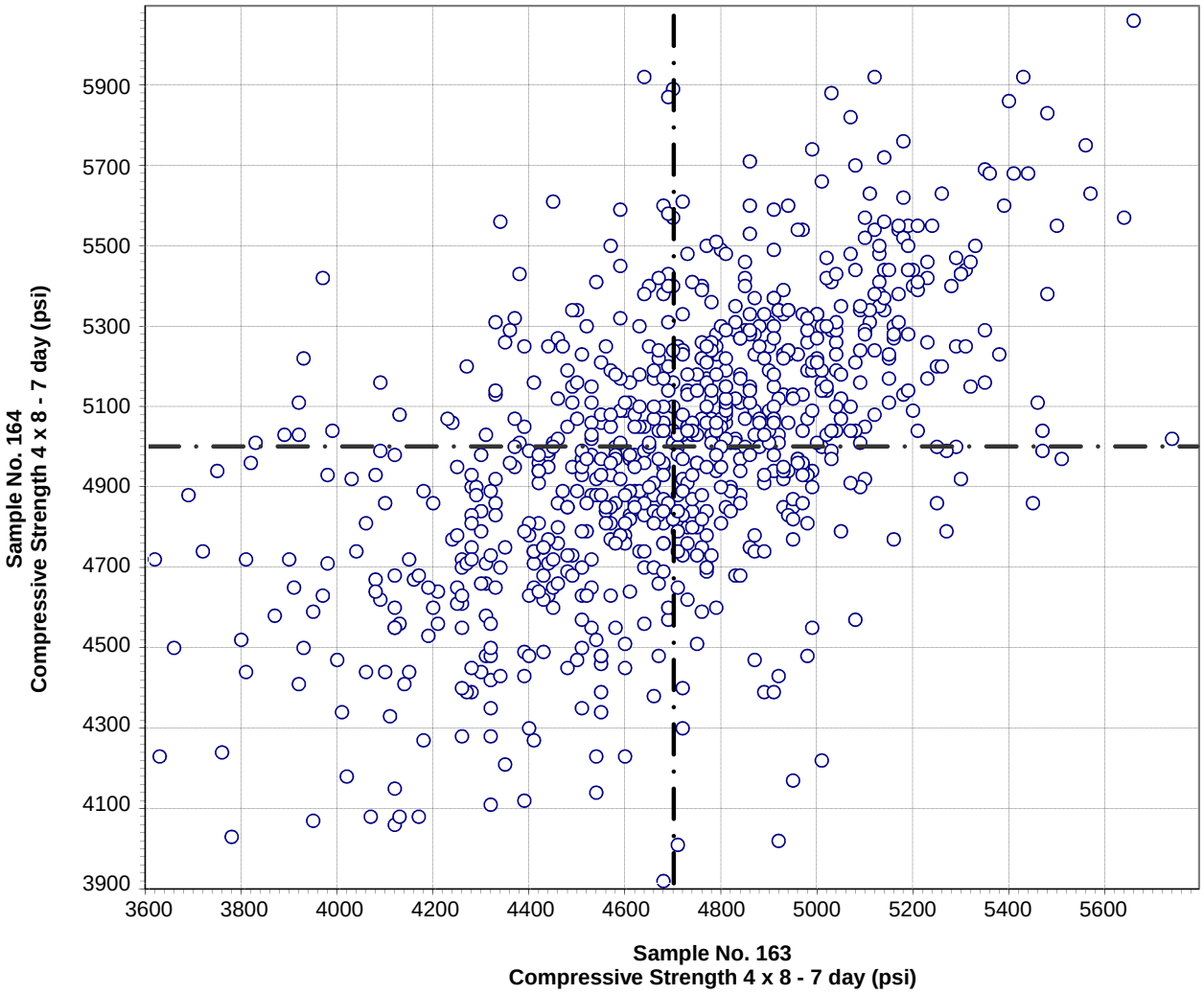
Test No. 3 Unit Weight of Concrete 1281 Points

Sample No. 163 Ave 148.8 S.D. 1.6 C.V. 1.1
Sample No. 164 Ave 149.9 S.D. 1.5 C.V. 1.0

Labs Eliminated: 33, 1179, 1210, 1357, 1428, 1447, 1700, 1796, 1864, 2030, 2289, 2300, 2393, 2444, 2515, 2941, 3039, 3314, 3474, 3610, 3660

Labs off Diagram: 390, 1068, 1125, 2448, 2933, 3326, 3347

CCRL Proficiency Sample Program
Compressive Strength 4 x 8 - 7 day
CONCRETE Samples No. 163 and No. 164



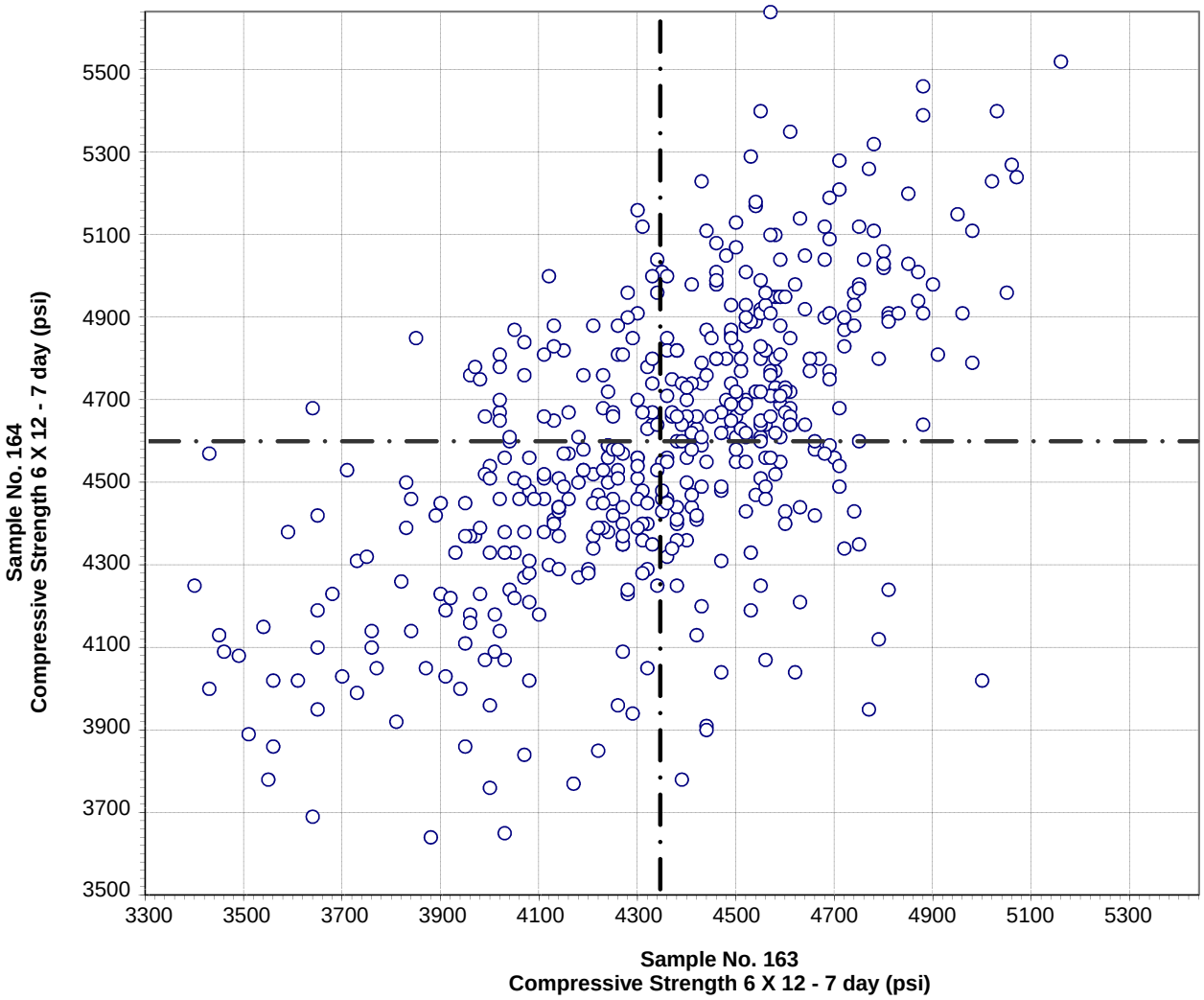
Test No. 4 Compressive Strength 4 x 8 - 7 day 798 Points

Sample No. 163	Ave 4700	S.D. 365	C.V. 7.8
Sample No. 164	Ave 4997	S.D. 363	C.V. 7.3

Labs Eliminated: 636, 920, 981, 1210, 1552, 2471, 2515, 2936, 2999, 3053, 3061, 3115, 3344, 3468, 3585, 3636

Labs off Diagram: 523, 1383, 1428, 1441, 1456, 3067, 3259, 3326, 3501

CCRL Proficiency Sample Program
Compressive Strength 6 X 12 - 7 day
CONCRETE Samples No. 163 and No. 164



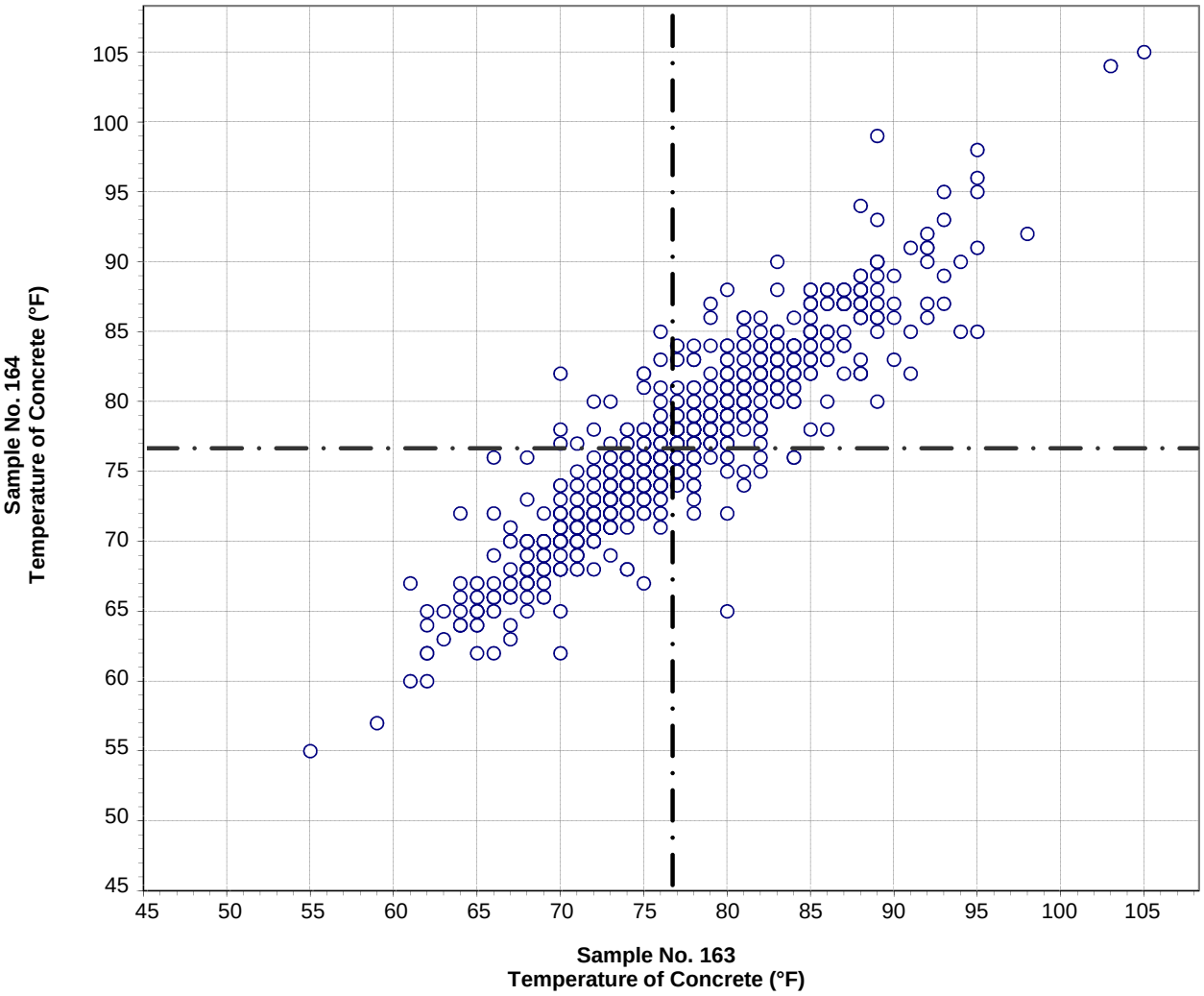
Test No. 4 Compressive Strength 6 X 12 - 7 day 477 Points

Sample No. 163	Ave	4344	S.D.	326	C.V. 7.5
Sample No. 164	Ave	4597	S.D.	341	C.V. 7.4

Labs Eliminated: 756, 828, 1039, 1772, 2030, 2237, 2792, 3300, 3657

Labs off Diagram: 2285, 3347, 3446

CCRL Proficiency Sample Program
Temperature of Concrete
CONCRETE Samples No. 163 and No. 164



Test No. 5 Temperature of Concrete 1310 Points

Sample No. 163	Ave	77	S.D.	6	C.V. 8.2
Sample No. 164	Ave	77	S.D.	6	C.V. 8.2