CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 157 and Number 158

January 2011

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

January 7, 2011

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

SUBJECT: Concrete Proficiency Samples No. 157 and No. 158

Enclosed is your copy of the final report on the test results for the CCRL Concrete Proficiency Samples which were distributed in October 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 test results and ratings for your laboratory 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 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 April 2011.

Sincerely,

Robin K. Haupt

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

Attachment

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. 157 and No. 158

This letter, and the material included with it, constitute the final report, and summary of results for the current pair of Concrete Proficiency Samples, which were distributed in October 2010. 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 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 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. 157 and No. 158
Final Report - January 7, 2011

SUMMARY OF RESULTS

Test		#Labs	Sample No. 157 Average	S.D.	C.V.	Sample No. 158 Average	S.D.	C.V.
Air Cont, Volume	%	1068	1.93	0.43	22	1.89	0.41	22
Air Cont, Volume	%	*1046	1.90	0.38	20	1.86	0.35	19
Air Cont, Pressure	%	1256	1.9	0.37	19	1.9	0.34	18
Air Cont, Pressure	%	*1230	1.9	0.33	17	1.9	0.30	16
Slump	inches	1263	3.37	1.10	34	2.82	1.00	36
Slump	inches	*1244	3.32	1.05	32	2.78	0.90	32
Unit Weight	lbs/ft^3	1261	155.3	4.7	3.1	155.8	4.6	3.0
Unit Weight	lbs/ft^3	*1216	155.6	1.7	1.1	156.1	1.6	1.0
Compressive Strength, 7 day, 6 x 12 inch specimens								
Comp Strength	psi	554	4760	499	10	4272	463	11
Comp Strength	psi	* 547	4785	426	8.9	4298	385	9.0
Compressive Strengthength, 7 day, 4 x 8 inch specimens								
Comp Strength	psi	704	5128	568	11	4627	493	11
Comp Strength	psi	* 686	5167	482	9.3	4656	415	8.9
Temperature of Conc	°F	1261	71	6	9.1	70	6	8.9

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

Air Content - Volumetric 426 446 537 715 827 1139 1294 1520 1543 1570 1979 2243 2285 2392 2549 2989 3131 3147 3171 3172 3439 3481

Air Content - Pressure 537 818 827 1140 1352 1446 1543 1570 1622 1625 2285 2346 2392 2574 2761 3108 3117 3171 3319 3481 3491 3514 3545 3567 3572 3583

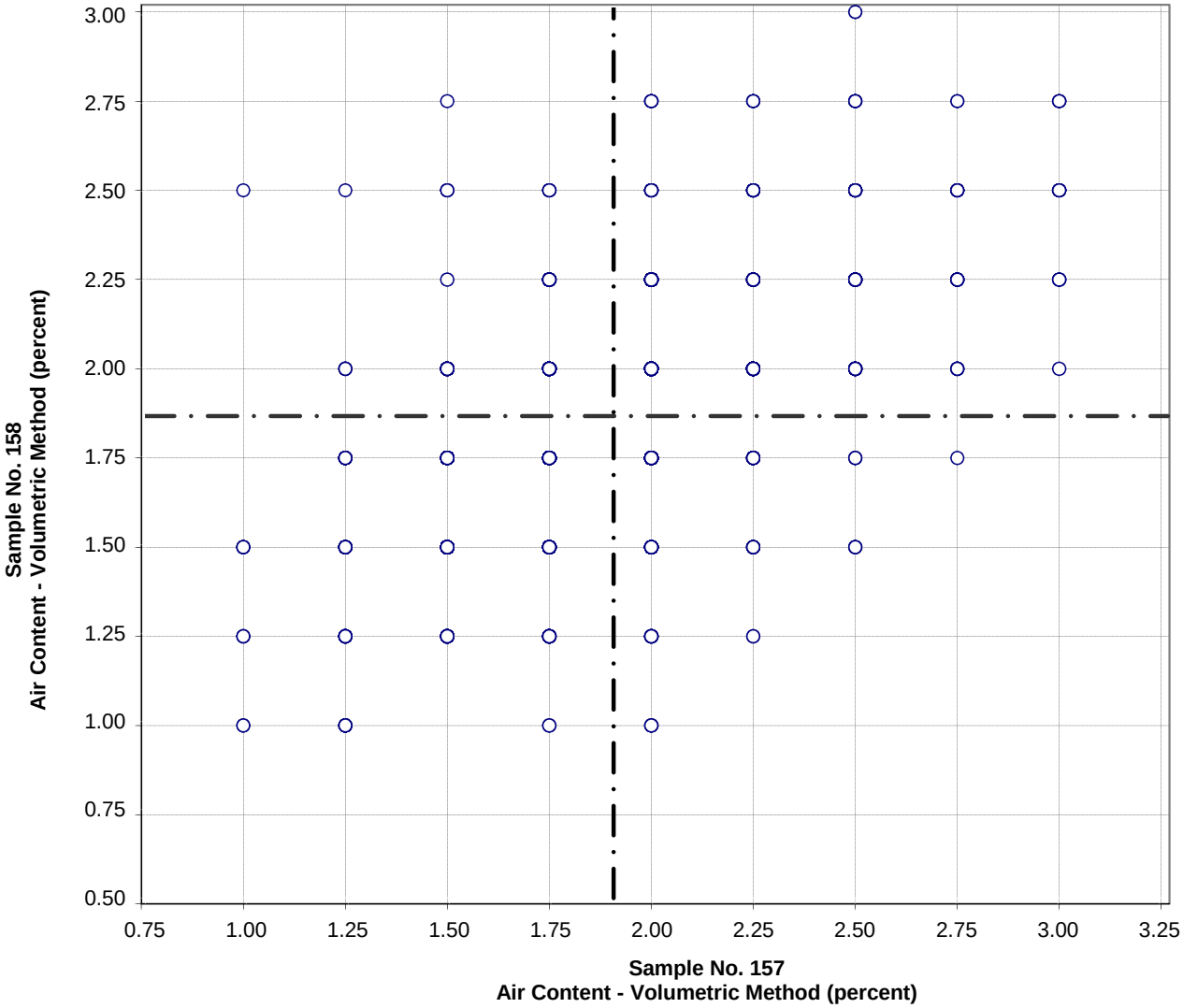
Slump of Concrete 158 525 1580 1903 2237 2300 2574 3145 3313 3314 3344 3418 3444 3452 3492 3495 3514 3545 3582

Unit Weight of Concrete 40 546 1006 1086 1098 1250 1458 2346 2365 2989 3145 3296 3452 49 210 552 951 1226 1278 1447 1481 1520 1549 1700 1794 1800 1979 2088 2093 2221 2243 2394 2476 2621 3054 3165 3171 3203 3313 3370 3460 3479 3493 3548 3583

Compressive Strength, 6 x 12 inch 1596 2237 2300 3203 3439 3444 3514

Compressive Strength, 4 x 8 inch 896 1441 1706 2346 2443 2991 3065 3069 3077 3091 3115 3171 3206 3286 3313 3452 3492 3533

CCRL Proficiency Sample Program
Air Content - Volumetric Method
CONCRETE Samples No. 157 and No. 158

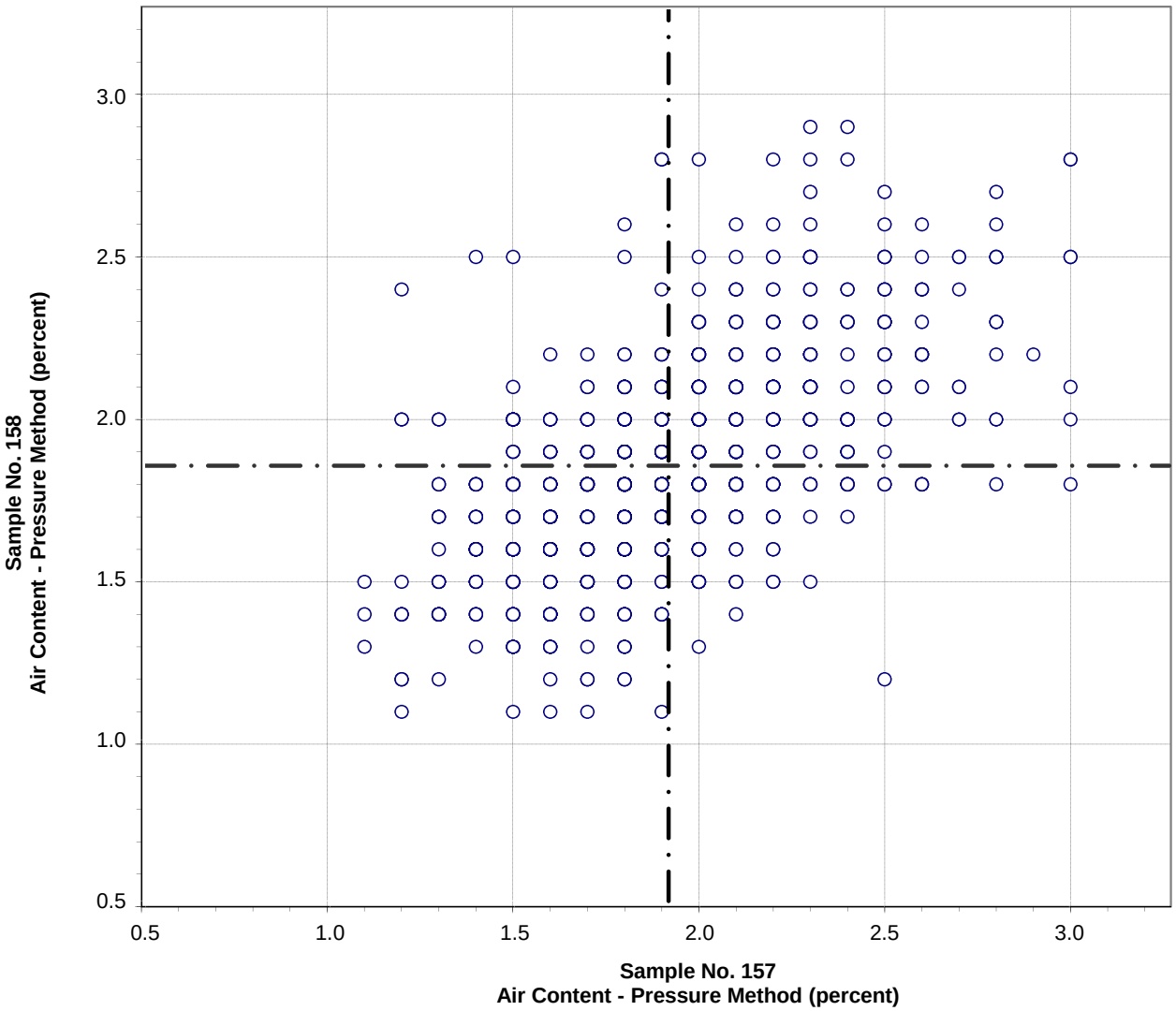


Test No. 1 Air Content - Volumetric Method 1046 Points

Sample No. 157	Ave	1.90	S.D.	0.38	C.V.	19.7
Sample No. 158	Ave	1.86	S.D.	0.35	C.V.	18.9

Labs eliminated: 426, 446, 537, 715, 827, 1139, 1294, 1520, 1543, 1570, 1979, 2243, 2285, 2392, 2549, 2989, 3131, 3147, 3171, 3172, 3439, 3481

CCRL Proficiency Sample Program
Air Content - Pressure Method
CONCRETE Samples No. 157 and No. 158

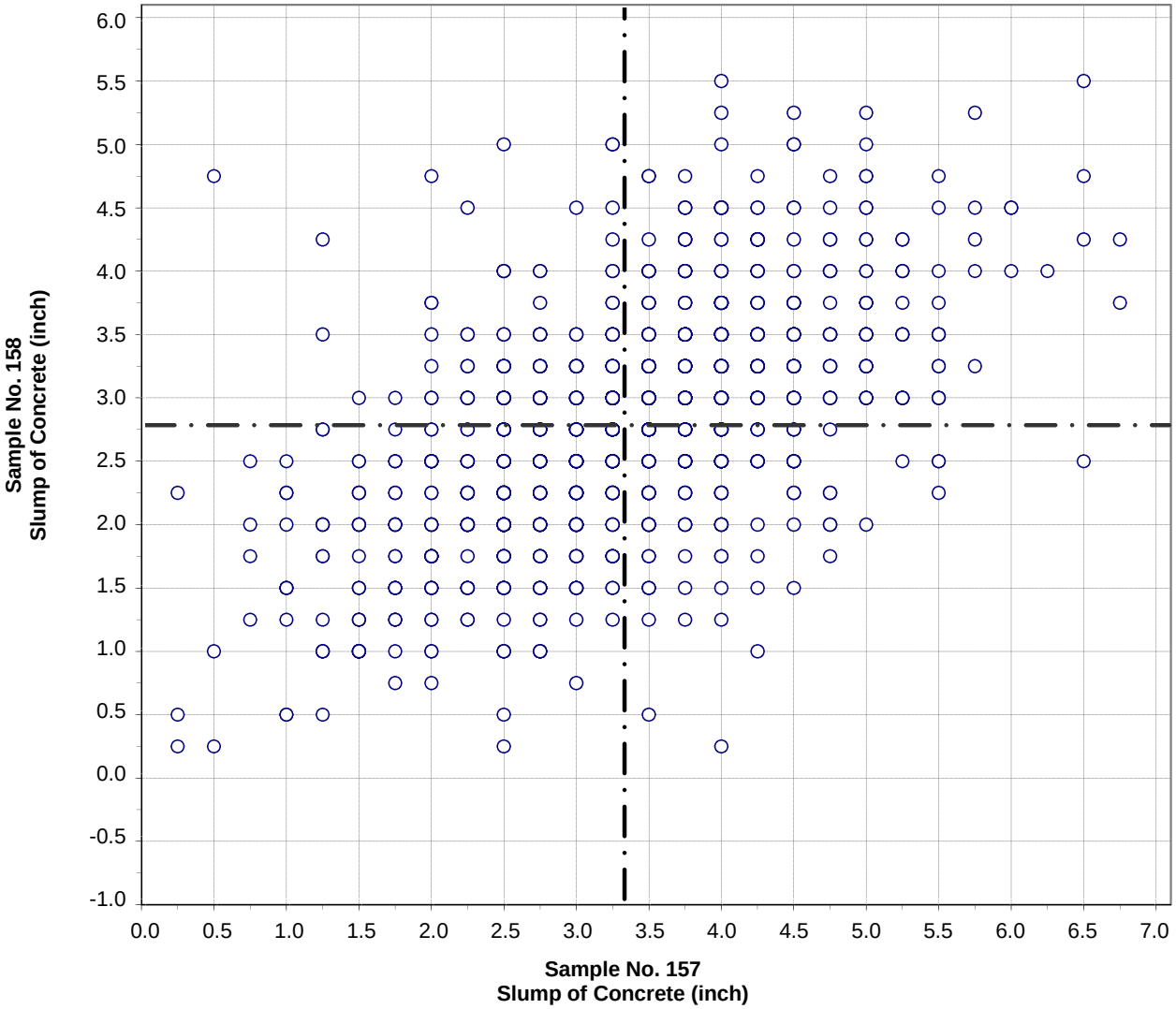


Test No. 6 Air Content - Pressure Method 1230 Points

Sample No. 157	Ave	1.9	S.D.	0.3	C.V. 17.1
Sample No. 158	Ave	1.9	S.D.	0.3	C.V. 16.0

Labs eliminated: 537, 818, 827, 1140, 1352, 1446, 1543, 1570, 1622, 1625, 2285, 2346, 2392, 2574, 2761, 3108, 3117, 3171, 3319, 3481, 3491, 3514, 3545, 3567, 3572, 3583

CCRL Proficiency Sample Program
Slump of Concrete
CONCRETE Samples No. 157 and No. 158

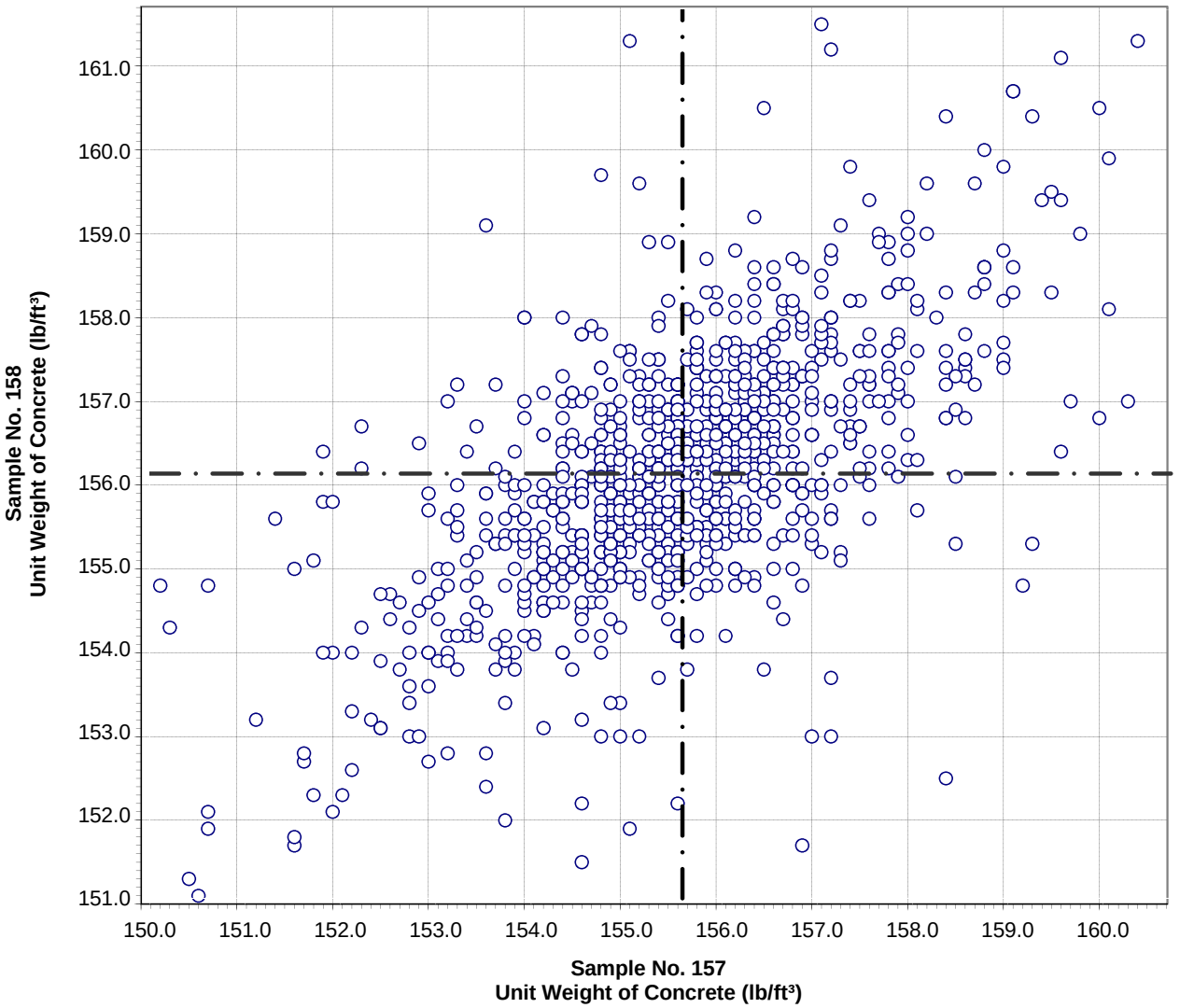


Test No. 2 Slump of Concrete 1244 Points

Sample No. 157 Ave 3.32 S.D. 1.05 C.V. 32
Sample No. 158 Ave 2.78 S.D. 0.90 C.V. 32

Labs eliminated: 158, 525, 1580, 1903, 2237, 2300, 2574, 3145, 3313, 3314, 3344, 3418, 3444, 3452, 3492, 3495, 3514, 3545, 3582

CCRL Proficiency Sample Program
Unit Weight of Concrete
CONCRETE Samples No. 157 and No. 158



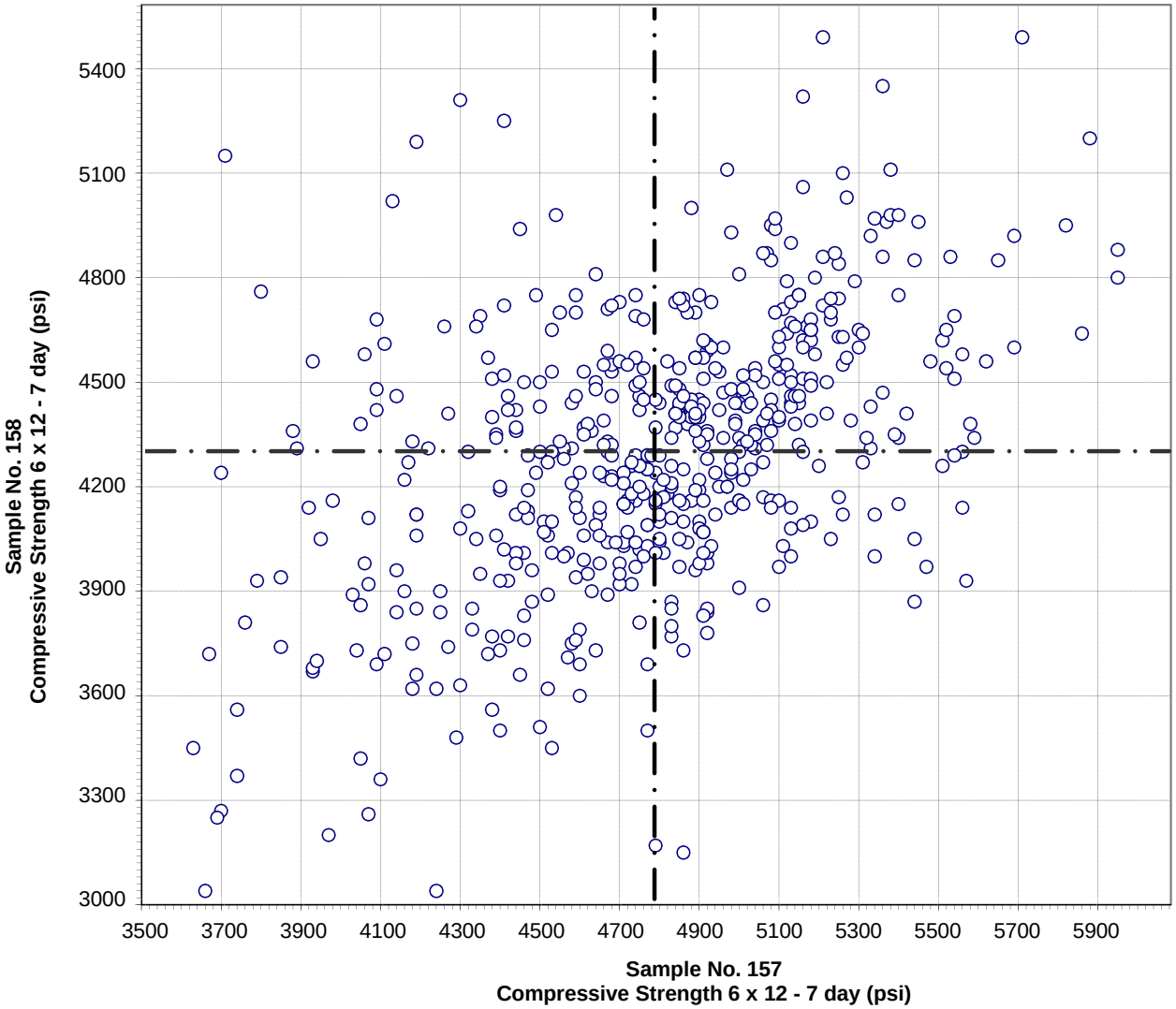
Test No. 3 Unit Weight of Concrete 1195 Points

Sample No. 157	Ave	155.6	S.D.	1.7	C.V.	1.1
Sample No. 158	Ave	156.1	S.D.	1.6	C.V.	1.0

See SUMMARY OF RESULTS page for list of labs.

Labs off Diagram: 293, 537, 802, 825, 834, 946, 1359, 1465, 1614, 1821, 1885, 2033, 2052, 2057, 2058, 2230, 2445, 2550, 3107, 3245, 3539

CCRL Proficiency Sample Program
Compressive Strength 6 X 12 - 7 day
CONCRETE Samples No. 157 and No. 158



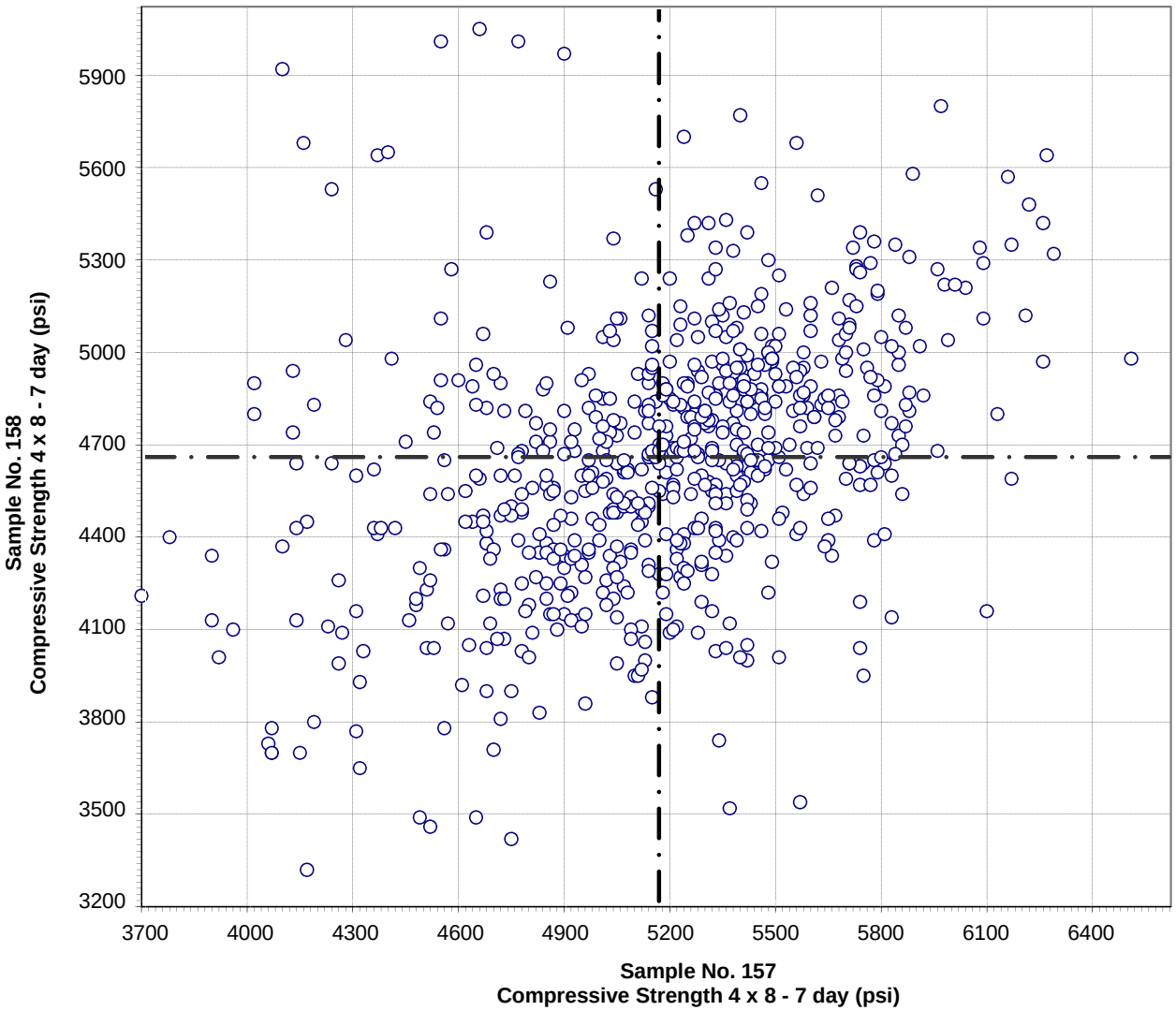
Test No. 4 Compressive Strength 6 X 12 - 7 day 545 Points

Sample No. 157 Ave 4785 S.D. 426 C.V. 8.9
Sample No. 158 Ave 4298 S.D. 385 C.V. 9.0

Labs eliminated: 1596, 2237, 2300, 3203, 3439, 3444, 3514

Labs off Diagram: 1442, 1612

CCRL Proficiency Sample Program
Compressive Strength 4 x 8 - 7 day
CONCRETE Samples No. 157 and No. 158



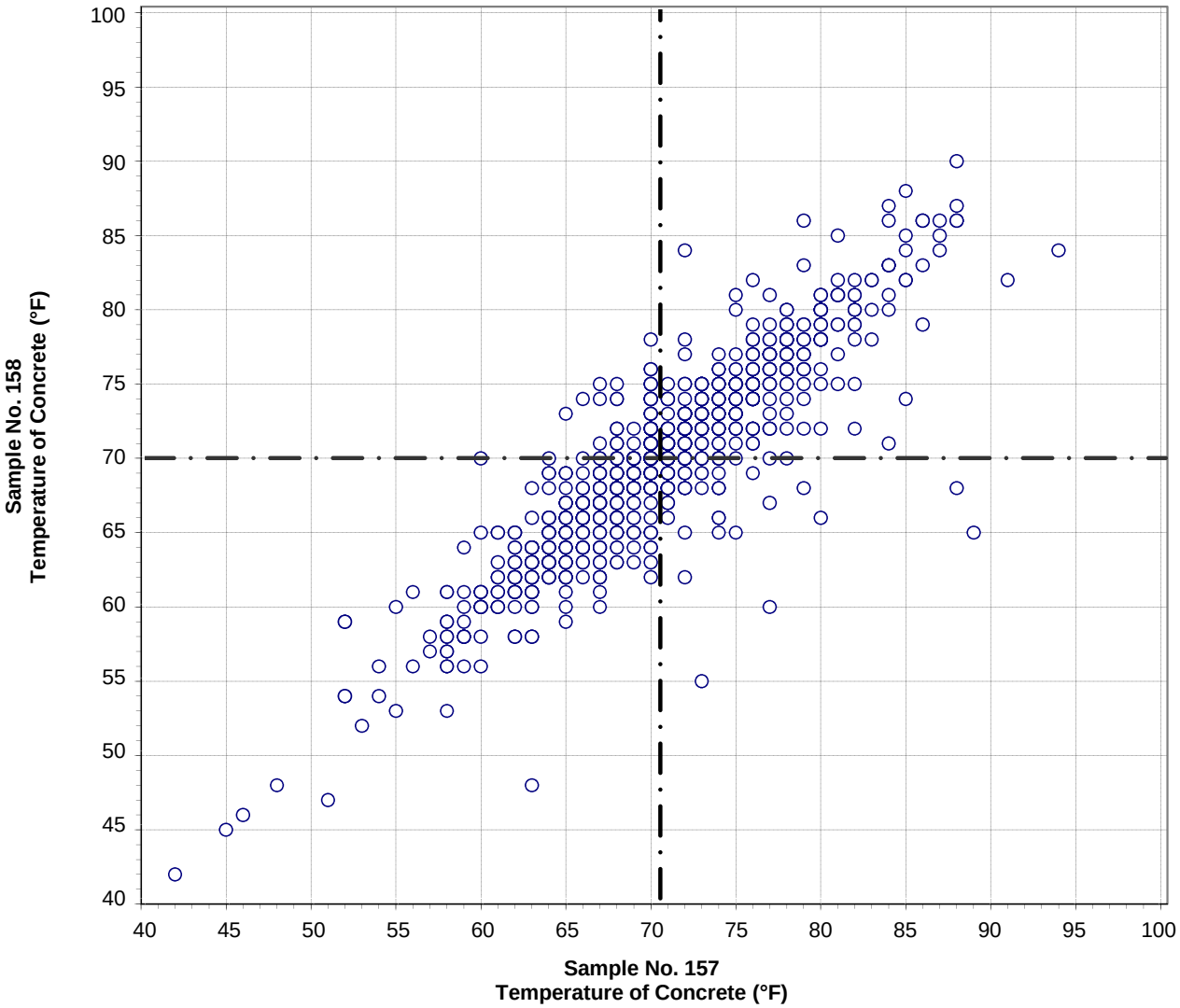
Test No. 4 Compressive Strength 4 x 8 - 7 day 679 Points

Sample No. 157 Ave 5167 S.D. 482 C.V. 9.3
Sample No. 158 Ave 4656 S.D. 415 C.V. 8.9

Labs eliminated: 896, 1441, 1706, 2346, 2443, 2991, 3065, 3069, 3077, 3091, 3115, 3171, 3206, 3286, 3313, 3452, 3492, 3533

Labs off Diagram: 2082, 2099, 2471, 2475, 3192, 3199, 3544

CCRL Proficiency Sample Program
Temperature of Concrete
CONCRETE Samples No. 157 and No. 158



Test No. 5 Temperature of Concrete 1261 Points

Sample No. 157	Ave	71	S.D.	6	C.V.	9.1
Sample No. 158	Ave	70	S.D.	6	C.V.	8.9