CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 153 and Number 154

January 2010

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

January 5, 2010

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

SUBJECT: Concrete Proficiency Samples No. 153 and No. 154

Enclosed is your copy of the final report on the test results for the CCRL Concrete Proficiency Samples which were distributed in October 2009.

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 2010.

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. 153 and No. 154

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 2009. 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. 153 and No. 154
Final Report - January 8, 2010

SUMMARY OF RESULTS

Test		#Labs	Sample No. 153 Average	S.D.	C.V.	Sample No. 154 Average	S.D.	C.V.
Air Cont, Volume	%	1032	3.28	0.90	27.4	2.30	0.68	29.5
Air Cont, Volume	%	*1003	3.25	0.82	25.2	2.27	0.59	25.9
Air Cont, Pressure	%	1215	3.3	0.8	25.4	2.3	0.6	27.5
Air Cont, Pressure	%	*1194	3.3	0.8	24.4	2.3	0.6	24.7
Slump	inches	1229	3.54	1.11	31.4	3.90	1.26	32.4
Slump	inches	*1214	3.51	1.06	30.3	3.86	1.19	30.9
Unit Weight	lbs/ft^3	1228	147.9	3.6	2.4	148.2	3.4	2.3
Unit Weight	lbs/ft^3	*1175	147.8	1.6	1.1	148.1	1.4	0.9
Compressive Strength, 7 day, 6 x 12 inch specimens								
Comp Strength	psi	604	3824	429	11.22	4736	422	8.9
Comp Strength	psi	* 575	3793	335	8.83	4783	341	7.1
Compressive Strength, 7 day, 4 x 8 inch specimens								
Comp Strength	psi	627	4340	2764	63.7	5339	3359	62.9
Comp Strength	psi	* 608	4180	407	9.7	5180	450	8.7
Temperature of Conc	°F	1225	69	6.8	9.8	70	6.7	9.5

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

Air Content - Volumetric 44 46 470 936 945 1044 1140 1260 1276 1779 1790 1979 2112 2224 2255 2393 2409 2489 2652 2723 2935 2989 3087 3179 3187 3263 3314 3317 3467

Air Content - Pressure 44 46 180 470 945 1033 1140 1276 1552 2112 2131 2224 2267 2276 2319 2393 2423 2438 2489 3314 3317

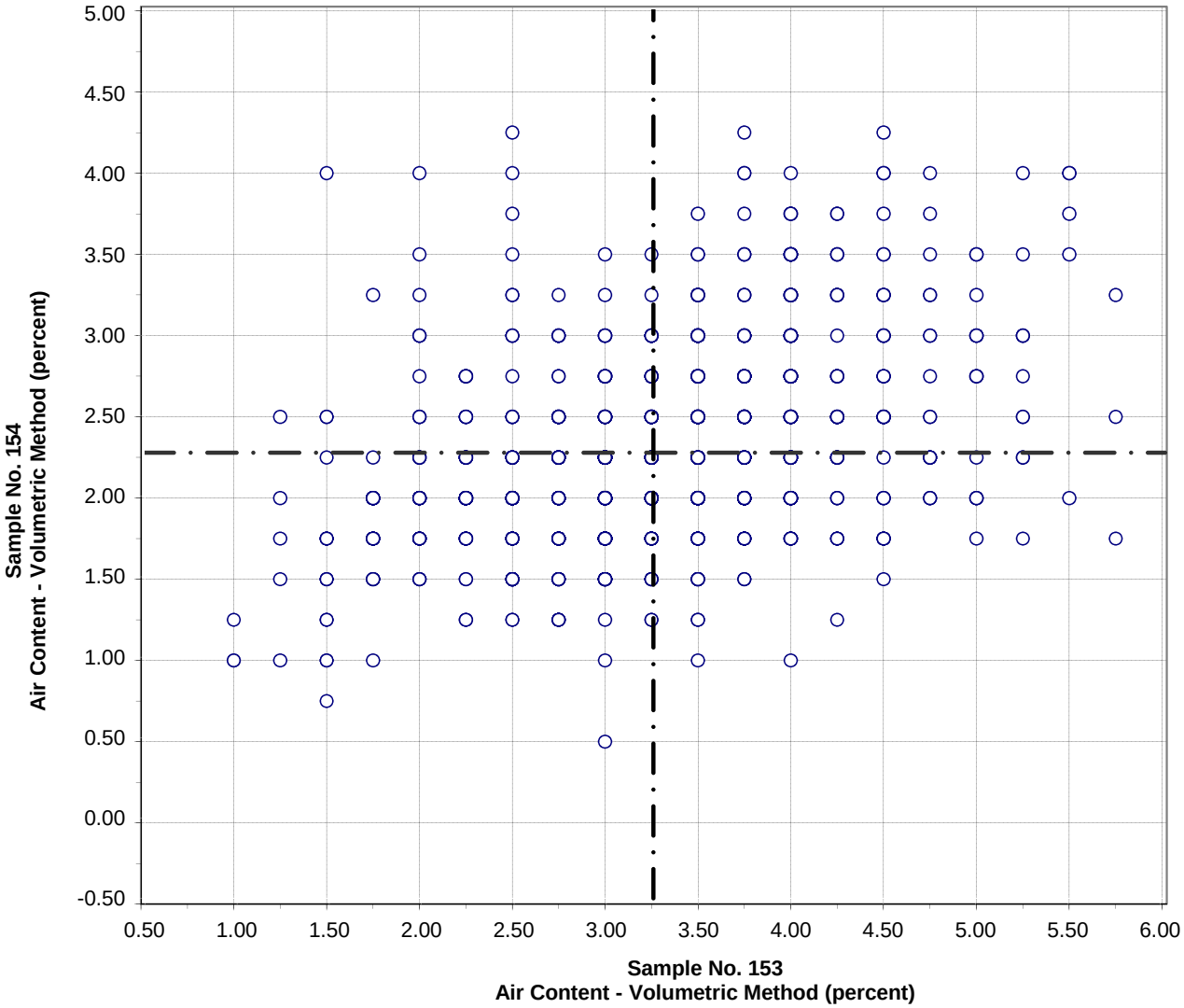
Slump of Concrete 604 1265 1307 1442 1772 1779 2052 2276 2725 2961 3091 3192 3273 3403 3467

Unit Weight of Concrete 49 421 424 788 1191 1449 1817 2399 2410 2423 2509 2511 3065 3145 3203 3348 44 116 470 753 802 1044 1103 1158 1276 1372 1417 1585 1602 1706 1772 1888 1903 1979 1987 2058 2069 2131 2279 2282 2302 2346 2680 3034 3128 3138 3158 3286 3347 3356 3446 3451 3499

Compressive Strength 49 63 116 396 1104 1207 1422 1442 1564 1640 1772 1823 1854 1863 2038 2045 2285 2511 3192 3206 945 1223 1677 1885 2399 2438 3117 3300 3475

Compressive Strength 2128 539 757 1027 1270 1313 1534 1979 1995 2224 2276 2423 2621 2652 3007 3259 3273 3323 3499

CCRL Proficiency Sample Program
Air Content - Volumetric Method
CONCRETE Samples No. 153 and No. 154

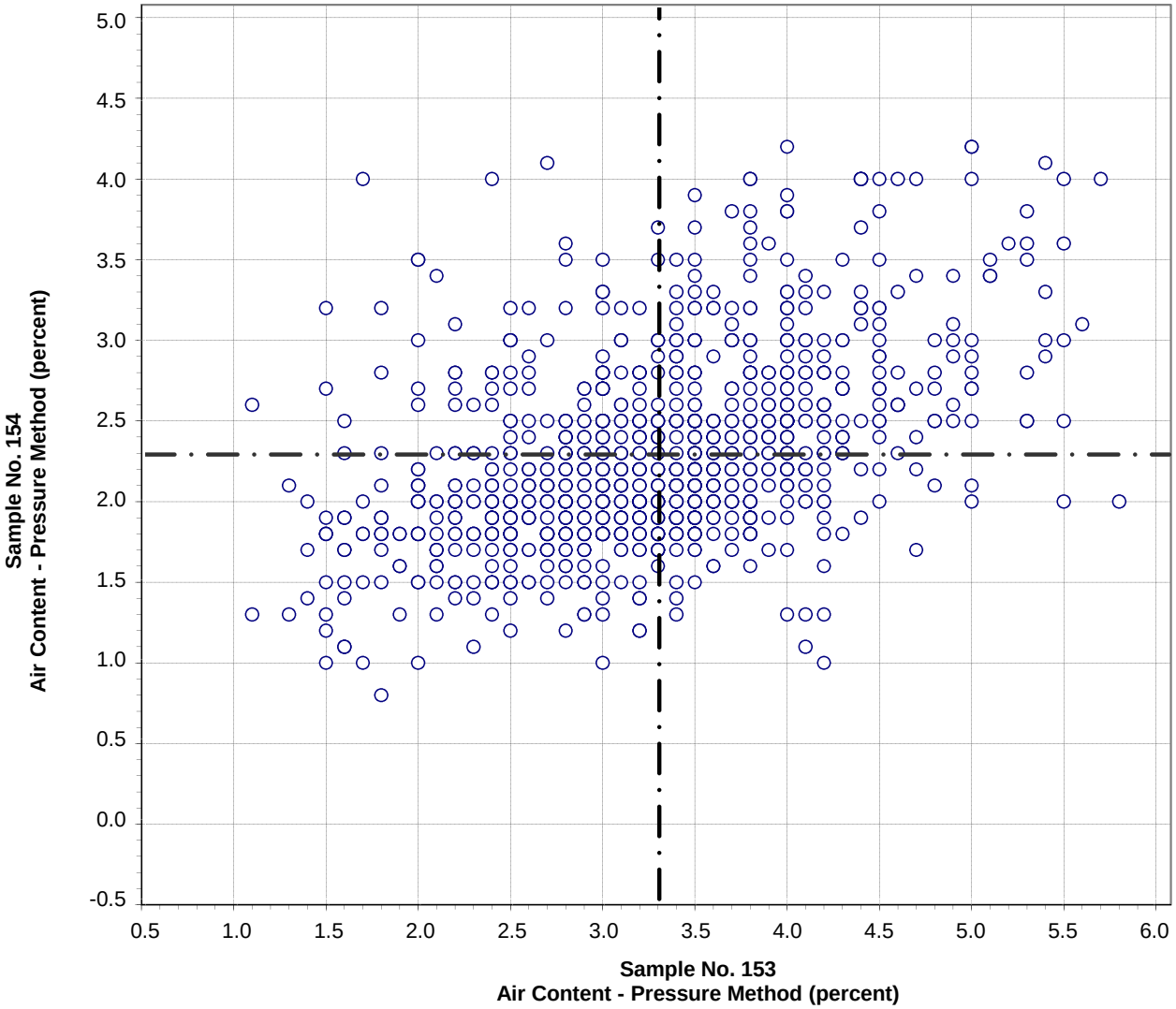


Test No. 1 Air Content - Volumetric Method 1003 Points

Sample No. 153	Ave	3.25	S.D.	0.82	C.V.	25.2
Sample No. 154	Ave	2.27	S.D.	0.59	C.V.	25.9

Labs eliminated: 44, 46, 470, 936, 945, 1044, 1140, 1260, 1276, 1779, 1790, 1979, 2112, 2224, 2255, 2393, 2409, 2489, 2652, 2723, 2935, 2989, 3087, 3179, 3187, 3263, 3314, 3317, 3467

CCRL Proficiency Sample Program
Air Content - Pressure Method
CONCRETE Samples No. 153 and No. 154

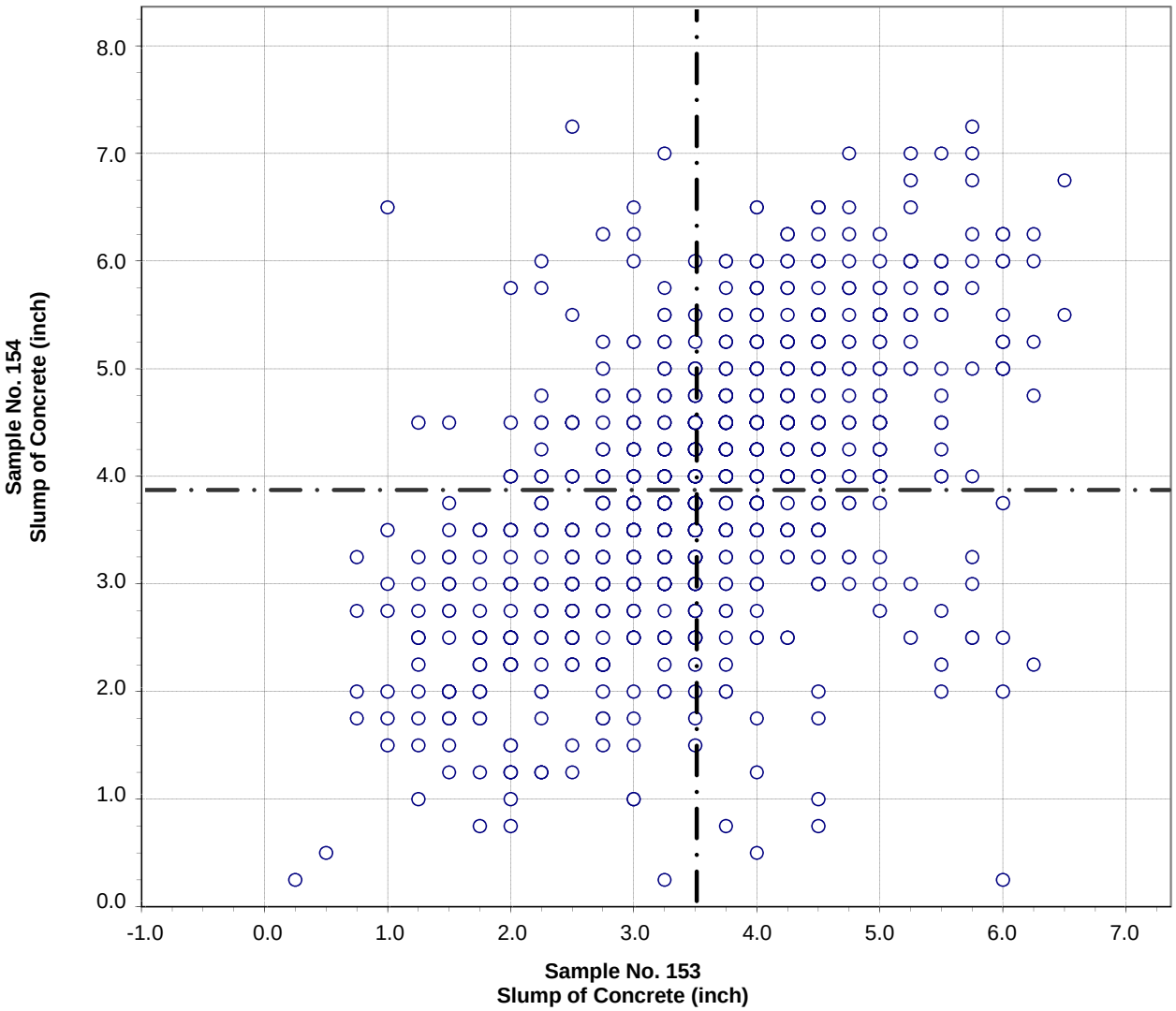


Test No. 6 Air Content - Pressure Method 1194 Points

Sample No. 153	Ave	3.3	S.D.	0.8	C.V. 24.4
Sample No. 154	Ave	2.3	S.D.	0.6	C.V. 24.7

Labs eliminated: 44, 46, 180, 470, 945, 1033, 1140, 1276, 1552, 2112, 2131, 2224, 2267, 2276, 2319, 2393, 2423, 2438, 2489, 3314, 3317

CCRL Proficiency Sample Program
Slump of Concrete
CONCRETE Samples No. 153 and No. 154

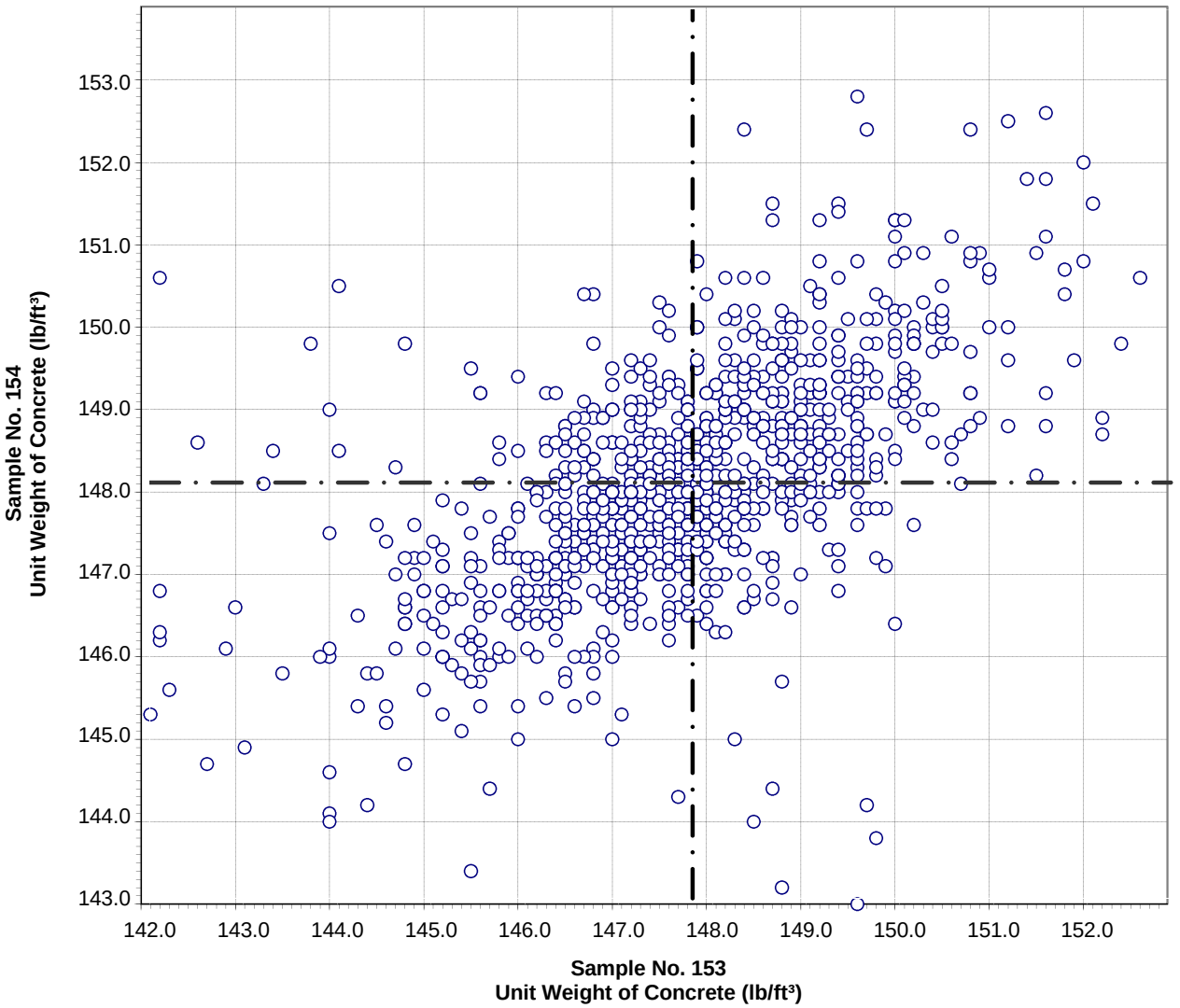


Test No. 2 Slump of Concrete 1214 Points

Sample No. 153	Ave	3.51	S.D.	1.06	C.V.	30.3
Sample No. 154	Ave	3.86	S.D.	1.19	C.V.	30.9

Labs eliminated: 604, 1265, 1307, 1442, 1772, 1779, 2052, 2276, 2725, 2961, 3091, 3192, 3273, 3403, 3467

CCRL Proficiency Sample Program
Unit Weight of Concrete
CONCRETE Samples No. 153 and No. 154



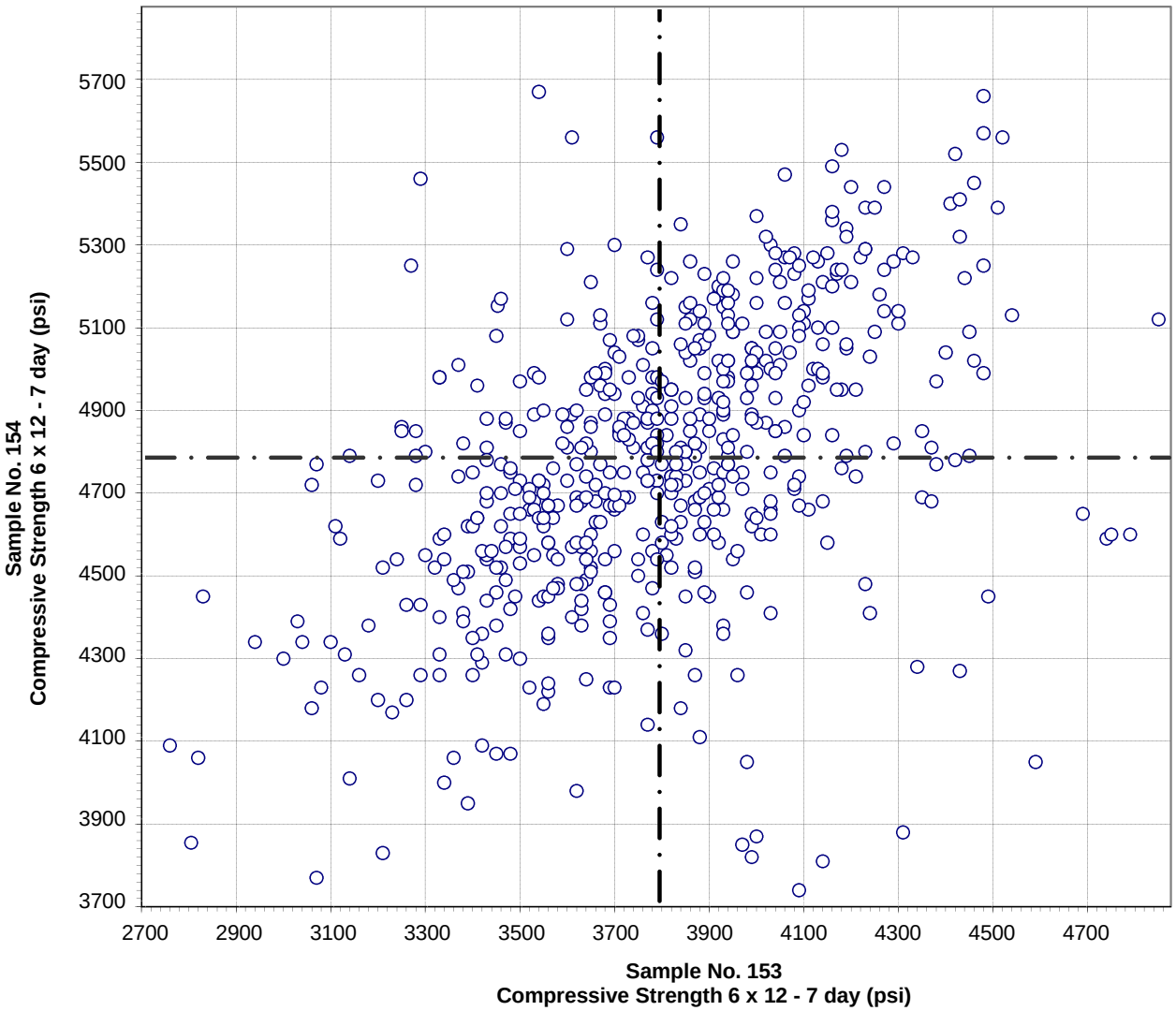
Test No. 3 Unit Weight of Concrete 1172 Points

Sample No. 153 Ave 147.8 S.D. 1.7 C.V. 1.1
Sample No. 154 Ave 148.1 S.D. 1.4 C.V. 0.9

Labs eliminated: See SUMMARY OF RESULTS page for list of labs.

Labs off Diagram: 801, 1863, 3089

CCRL Proficiency Sample Program
Compressive Strength 6 X 12 - 7 day
CONCRETE Samples No. 153 and No. 154

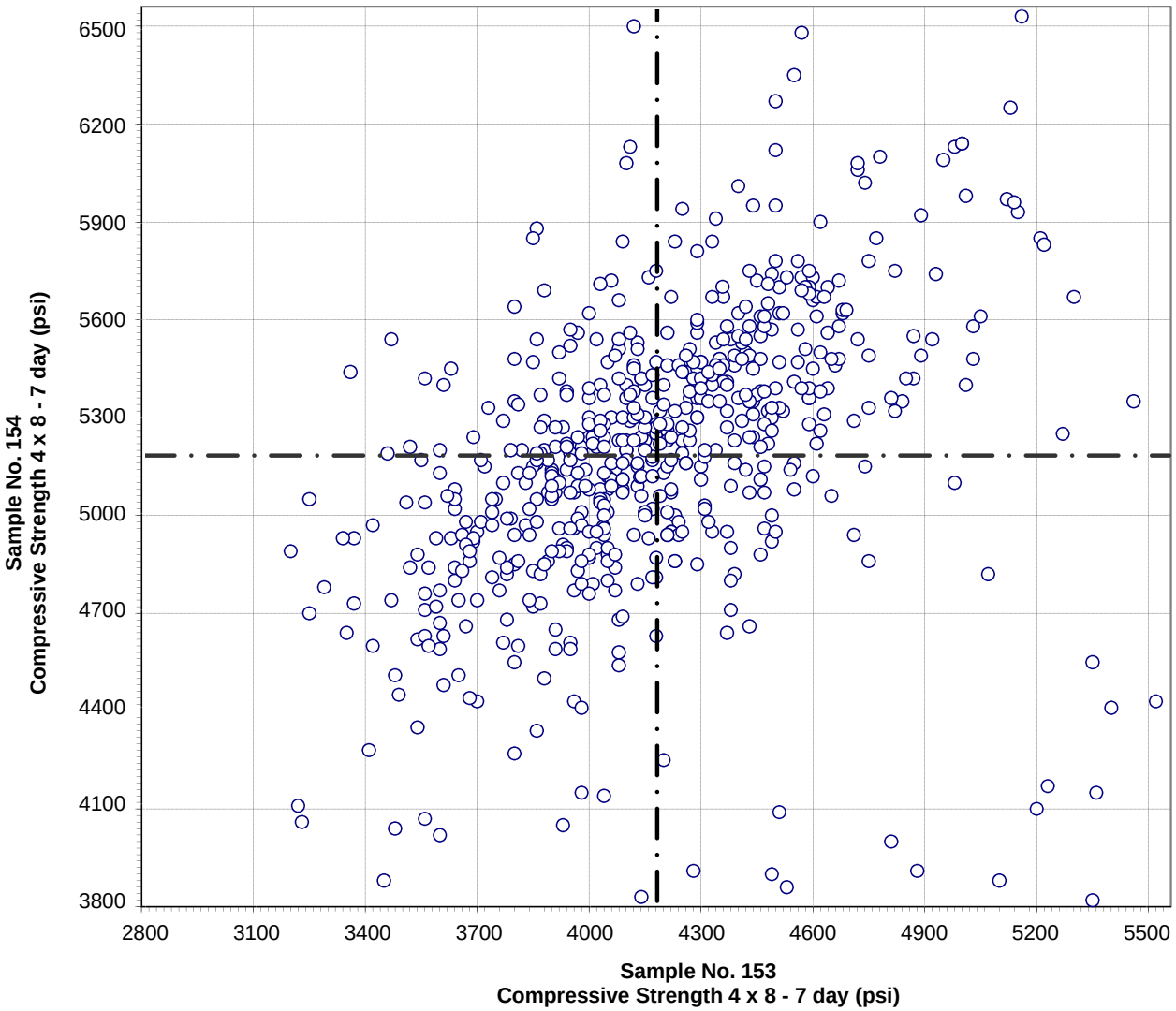


Test No. 6 Compressive Strength 6 X 12 - 7 day 575 Points

Sample No. 153 Ave 3793 S.D. 335 C.V. 8.8
Sample No. 154 Ave 4783 S.D. 341 C.V. 7.1

Labs eliminated: 49, 63, 116, 396, 1104, 1207, 1422, 1442, 1564, 1640, 1772, 1823, 1854, 1863, 2038, 2045, 2285, 2511, 3192, 3206, 945, 1223, 1677, 1885, 2399, 2438, 3117, 3300, 3475

CCRL Proficiency Sample Program
Compressive Strength 4 x 8 - 7 day
CONCRETE Samples No. 153 and No. 154



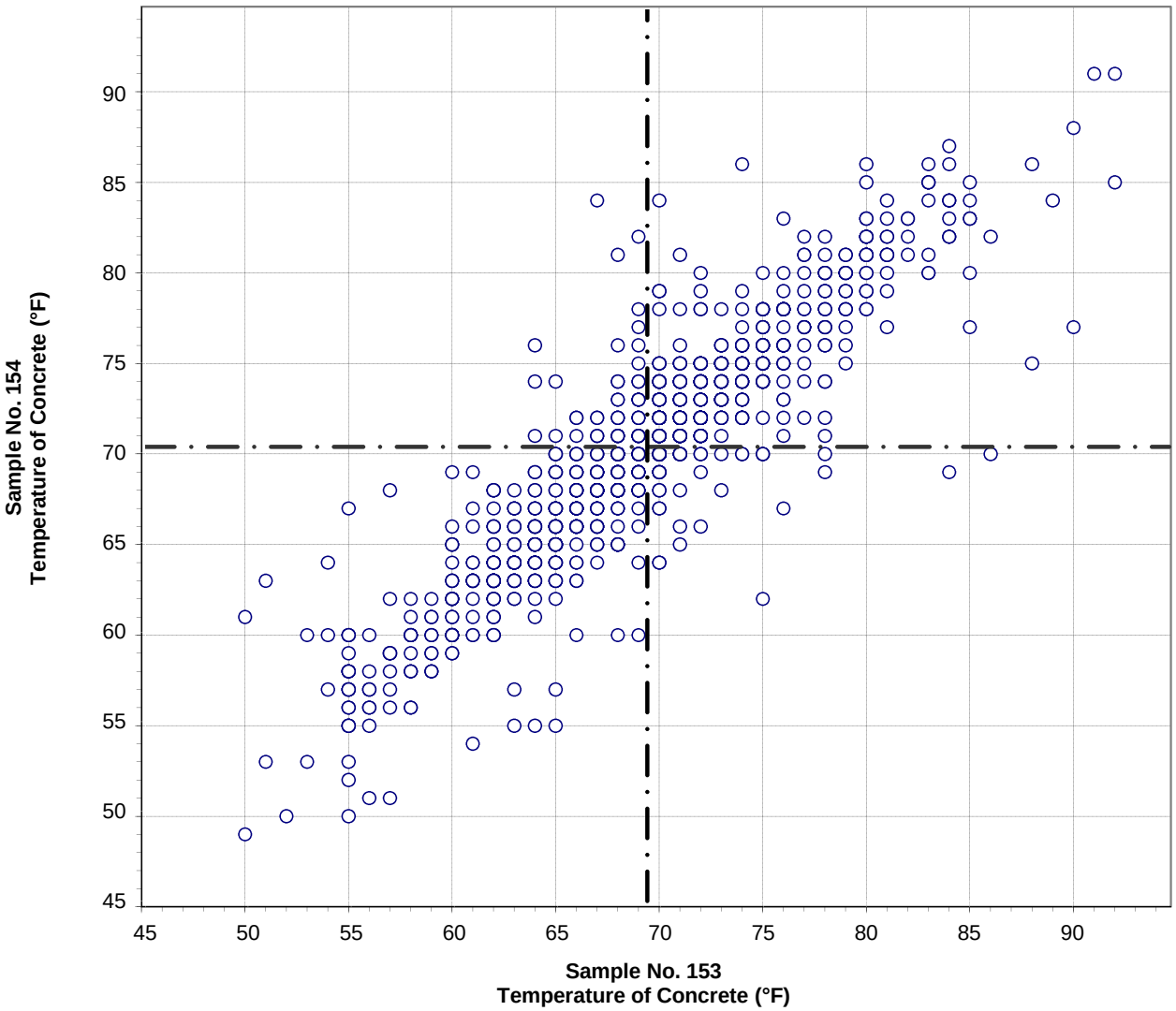
Test No. 4 Compressive Strength 4 x 8 - 7 day 603 Points

Sample No. 153	Ave	4180	S.D.	407	C.V. 9.7
Sample No. 154	Ave	5180	S.D.	450	C.V. 8.7

Labs eliminated: 2128, 539, 757, 1027, 1270, 1313, 1534, 1979, 1995, 2224, 2276, 2423, 2621, 2652, 3007, 3259, 3273, 3323, 3499

Labs off Diagram: 823, 2680, 3058, 3091, 3168

CCRL Proficiency Sample Program
Temperature of Concrete
CONCRETE Samples No. 153 and No. 154



Test No. 5 Temperature of Concrete 1222 Points

Sample No. 153	Ave 69	S.D. 7	C.V. 9.8
Sample No. 154	Ave 70	S.D. 7	C.V. 9.5

Labs off Diagram: 1410, 2398, 2933