CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 151 and Number 152

June 2009

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

June 26, 2009

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

SUBJECT: Concrete Proficiency Samples No. 151 and No. 152

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

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. 151 and No. 152

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 April 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. 151 and No. 152
Final Report - June 26, 2009

SUMMARY OF RESULTS

Test		#Labs	Sample No. 151 Average	S.D.	C.V.	Sample No. 152 Average	S.D.	C.V.
Air Cont, Volume	%	985	1.74	0.44	25.2	1.97	0.43	21.8
Air Cont, Volume	%	* 969	1.73	0.36	20.6	1.96	0.37	19.0
Air Cont, Pressure	%	1181	1.7	0.44	25.6	1.9	0.39	20.0
Air Cont, Pressure	%	*1135	1.7	0.28	17.0	1.9	0.29	15.1
Slump	inches	1192	3.12	1.0	32.6	3.03	1.0	33.1
Slump	inches	*1179	3.09	0.97	31.5	3.00	0.95	31.6
Unit Weight	lbs/ft^3	1186	149.7	4.4	2.97	149.7	4.3	2.86
Unit Weight	lbs/ft^3	*1146	149.9	1.3	0.849	149.8	1.3	0.875
Compressive Strength, 7 day, 6 x 12 inch specimens								
Comp Strength	psi	600	3759	350.2	9.32	4135	387.8	9.38
Comp Strength	psi	* 589	3775	320.6	8.49	4159	323.4	7.77
Compressive Strength, 7 day, 4 x 8 inch specimens								
Comp Strength	psi	591	3983	356.2	8.94	4497	368.8	8.20
Comp Strength	psi	* 581	3997	326.5	8.17	4514	339.8	7.53
Temperature of Conc	°F	1176	75	6.4	8.56	75	6.4	8.50

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

Air Content - Volumetric 490 795 1191 1222 1223 1294 1318 1419 1447 1979 2033 2131 2989 3095 3187 3206

Air Content - Pressure 31 490 672 1222 1318 1419 1447 1552 2089 2131 2132 2414 2445 2680 3055 3095 3181 46 360 849 945 1093 1154 1191 1268 1352 1441 1605 1697 1876 1976 2088 2093 2166 2299 2323 2324 2422 2761 2935 3077 3087 3206 3282 3326 3346

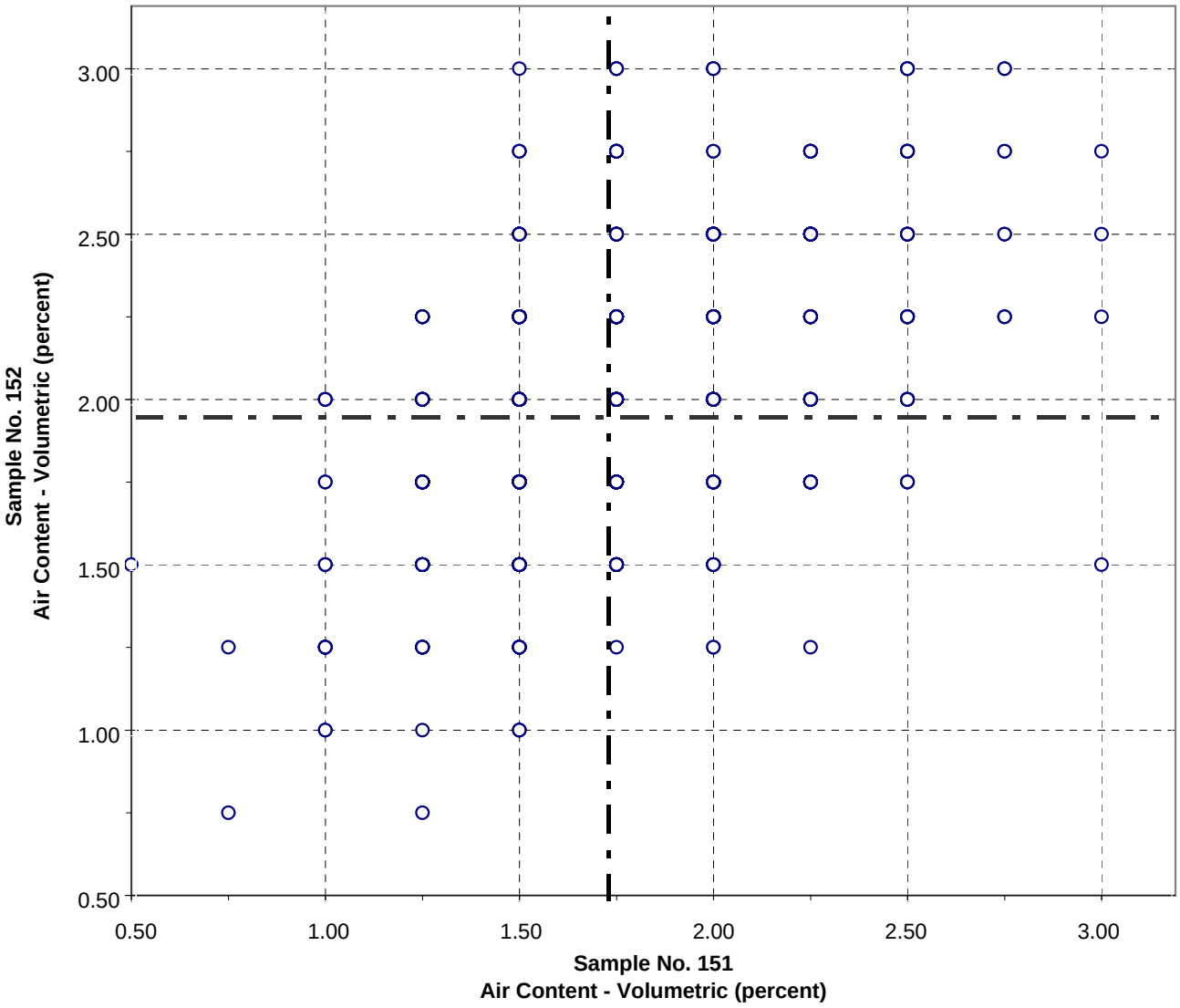
Slump of Concrete 360 1098 1191 1519 1520 1605 2393 2803 3072 3197 3206 3369 3410

Unit Weight of Concrete 986 1154 1444 1856 2404 2410 2502 2923 3044 3048 650 804 840 897 1085 1098 1103 1166 1243 1572 1772 2043 2045 2259 2262 2336 2414 2438 2509 3089 3095 3100 3109 3181 3216 3260 3295 3313 3339 3427

Compressive Strength (6x12) 1186 1560 1585 1772 2030 2033 2088 2093 2452 3181 3410

Compressive Strength (4x8) 471 795 1270 1418 1465 1519 2986 3206 3329 3358

CCRL Proficiency Sample Program
Air Content - Volumetric Method
CONCRETE Samples No. 151 and No. 152



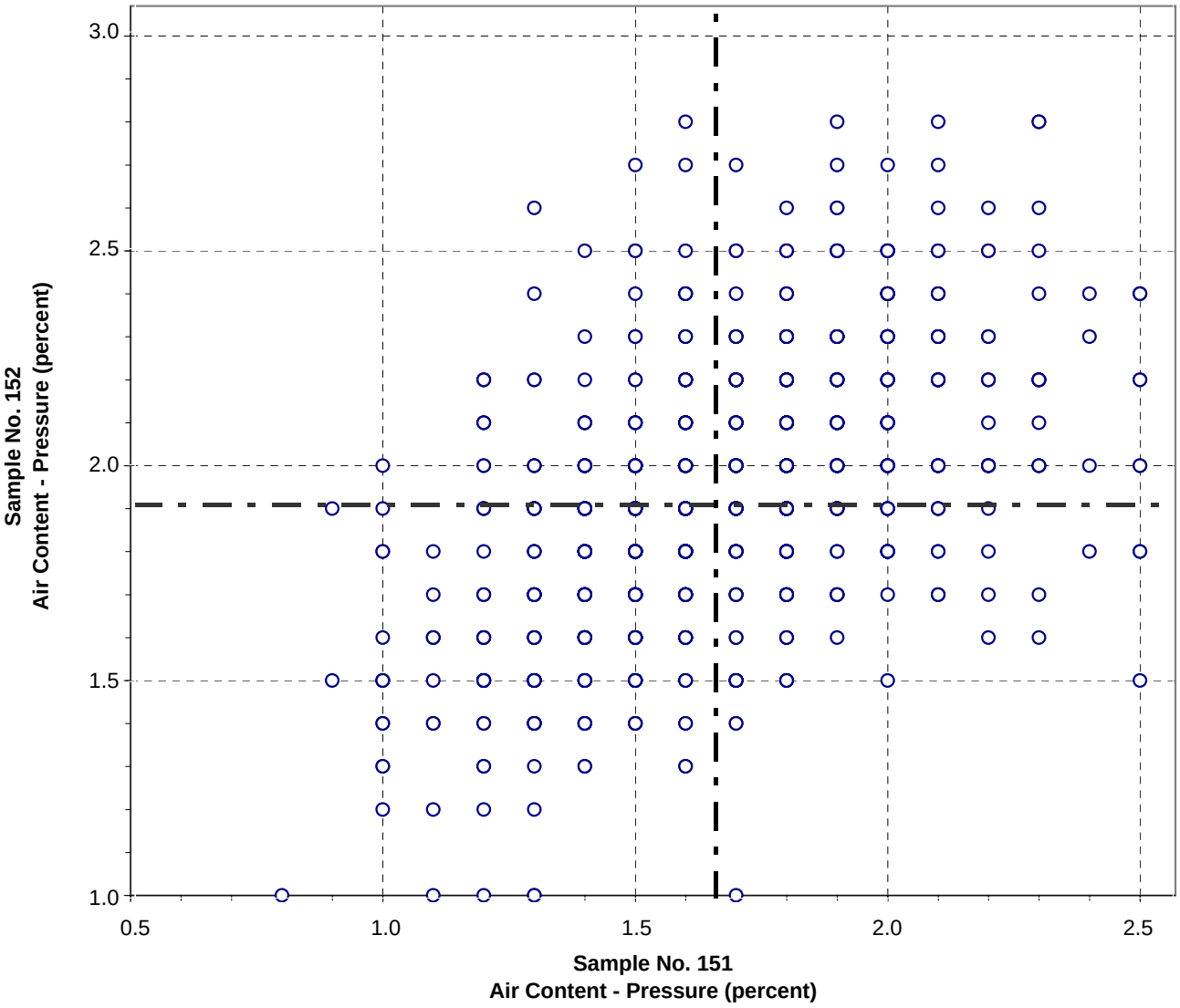
Test No. 1 Air Content - Volumetric Method 966 Points

Sample No. 151	Ave	1.73	S.D.	0.36	C.V. 20.6
Sample No. 152	Ave	1.96	S.D.	0.37	C.V. 19.0

Labs eliminated: 490, 795, 1191, 1222, 1223, 1294, 1318, 1419, 1447, 1979, 2033, 2131, 2989, 3095, 3187, 3206

Labs off Diagram: 397, 1289, 3077

CCRL Proficiency Sample Program
Air Content - Pressure Method
CONCRETE Samples No. 151 and No. 152



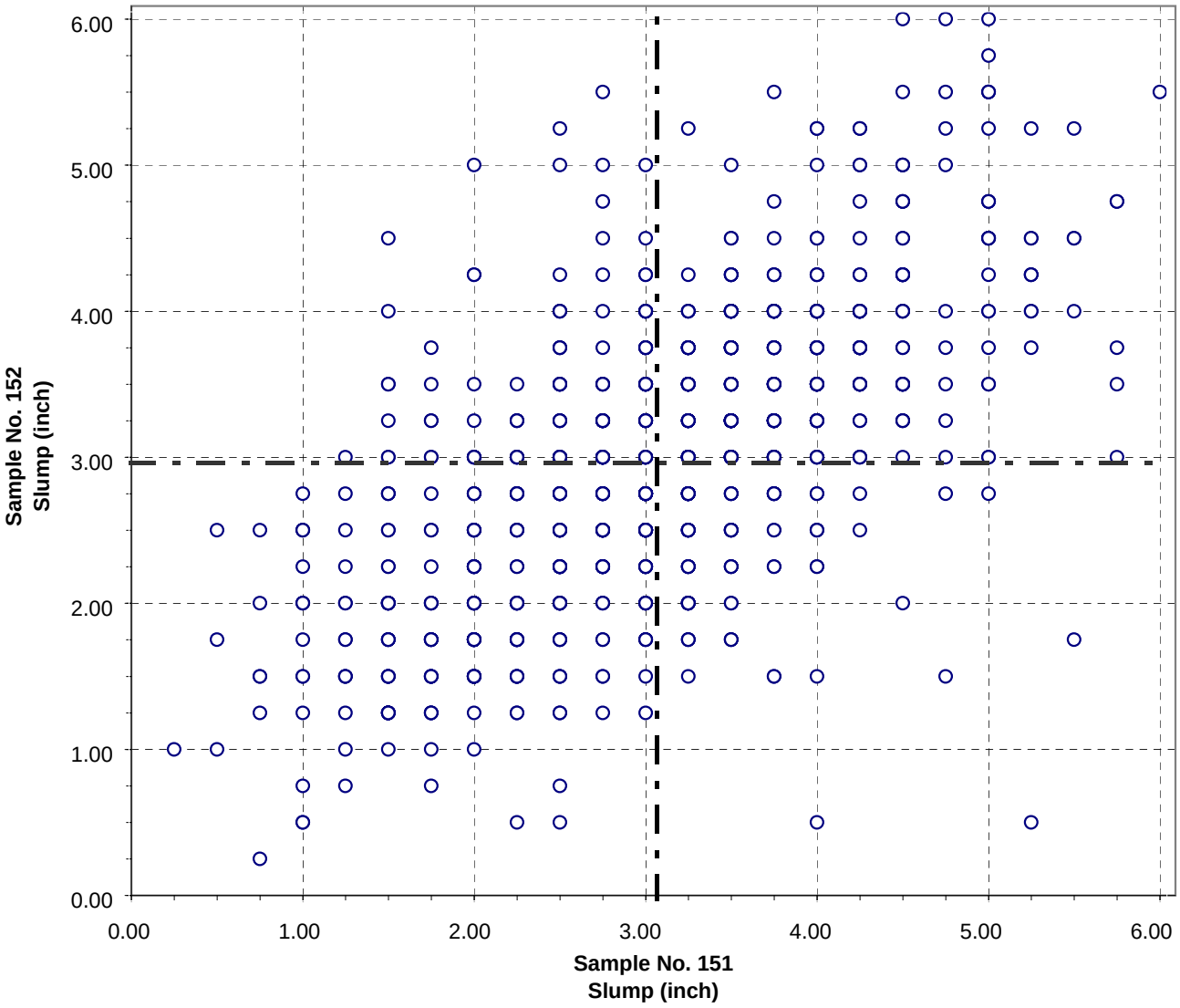
Test No. 6 Air Content - Pressure Method 1132 Points

Sample No. 151	Ave	1.7	S.D.	0.28	C.V. 17.0
Sample No. 152	Ave	1.9	S.D.	0.29	C.V. 15.1

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

Labs off Diagram: 1044, 1465, 2420

CCRL Proficiency Sample Program
Slump of Concrete
CONCRETE Samples No. 151 and No. 152

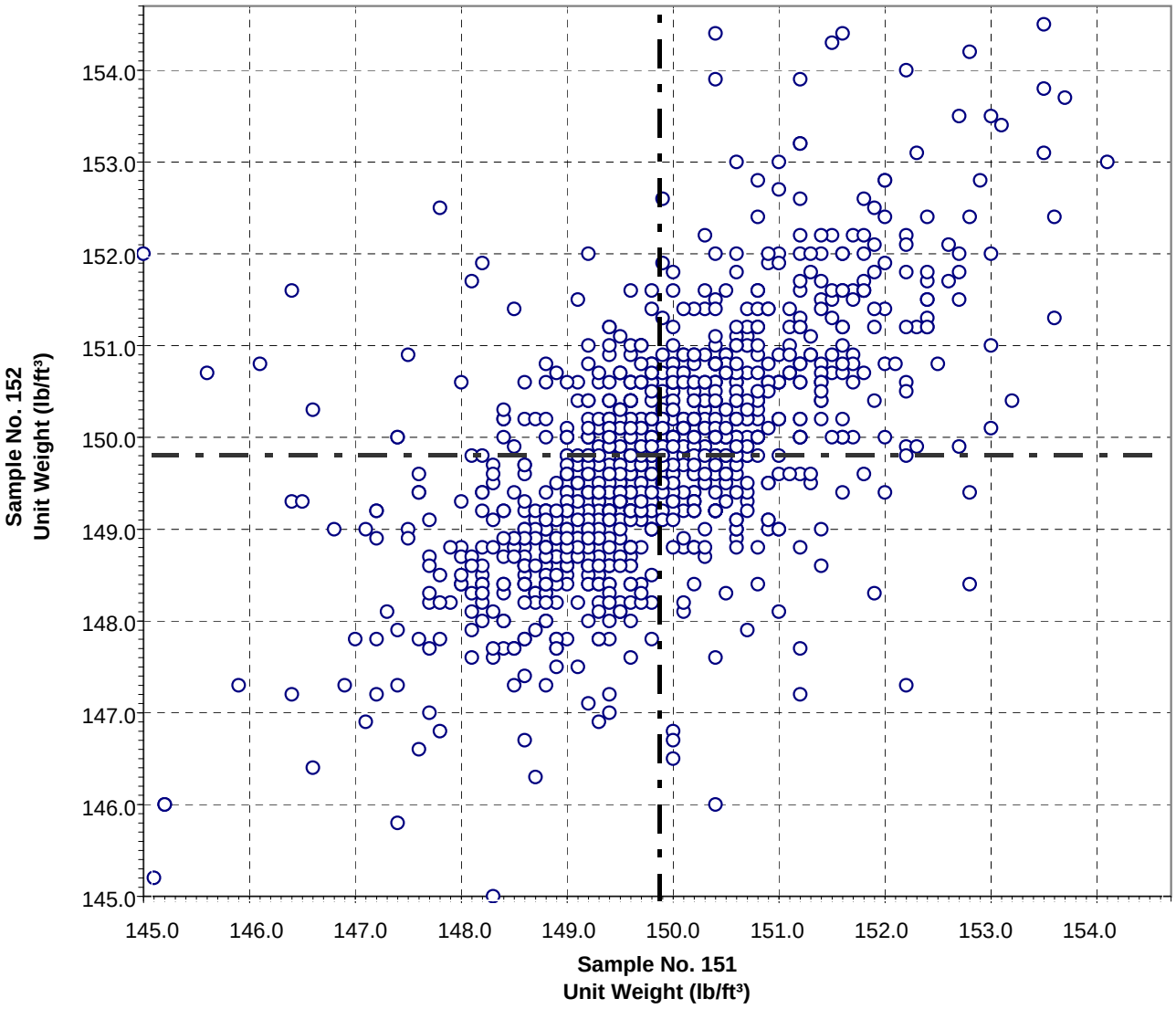


Test No. 2 Slump of Concrete 1179 Points

Sample No. 151	Ave	3.09	S.D.	0.97	C.V.	31.5
Sample No. 152	Ave	3.00	S.D.	0.95	C.V.	31.6

Labs eliminated: 360, 1098, 1191, 1519, 1520, 1605, 2393, 2803, 3072, 3197, 3206, 3369, 3410

CCRL Proficiency Sample Program
Unit Weight of Concrete
CONCRETE Samples No. 151 and No. 152



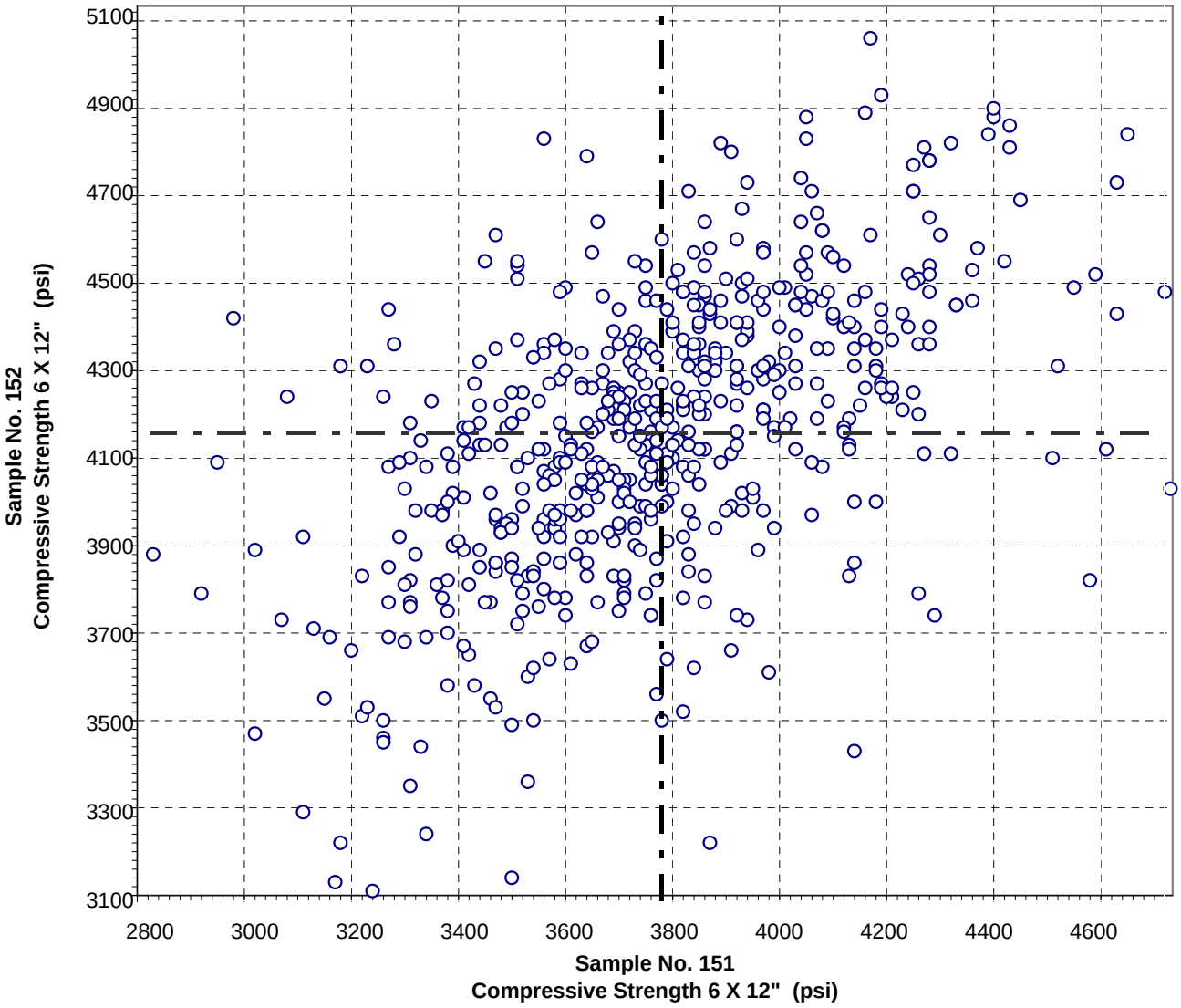
Test No. 3 Unit Weight of Concrete 1141 Points

Sample No. 151	Ave	149.9	S.D.	1.3	C.V.	0.849
Sample No. 152	Ave	149.8	S.D.	1.3	C.V.	0.875

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

Labs off Diagram: 1359, 2214, 2619, 2743, 3037

CCRL Proficiency Sample Program
Compressive Strength 6 X 12 - 7 day
CONCRETE Samples No. 151 and No. 152



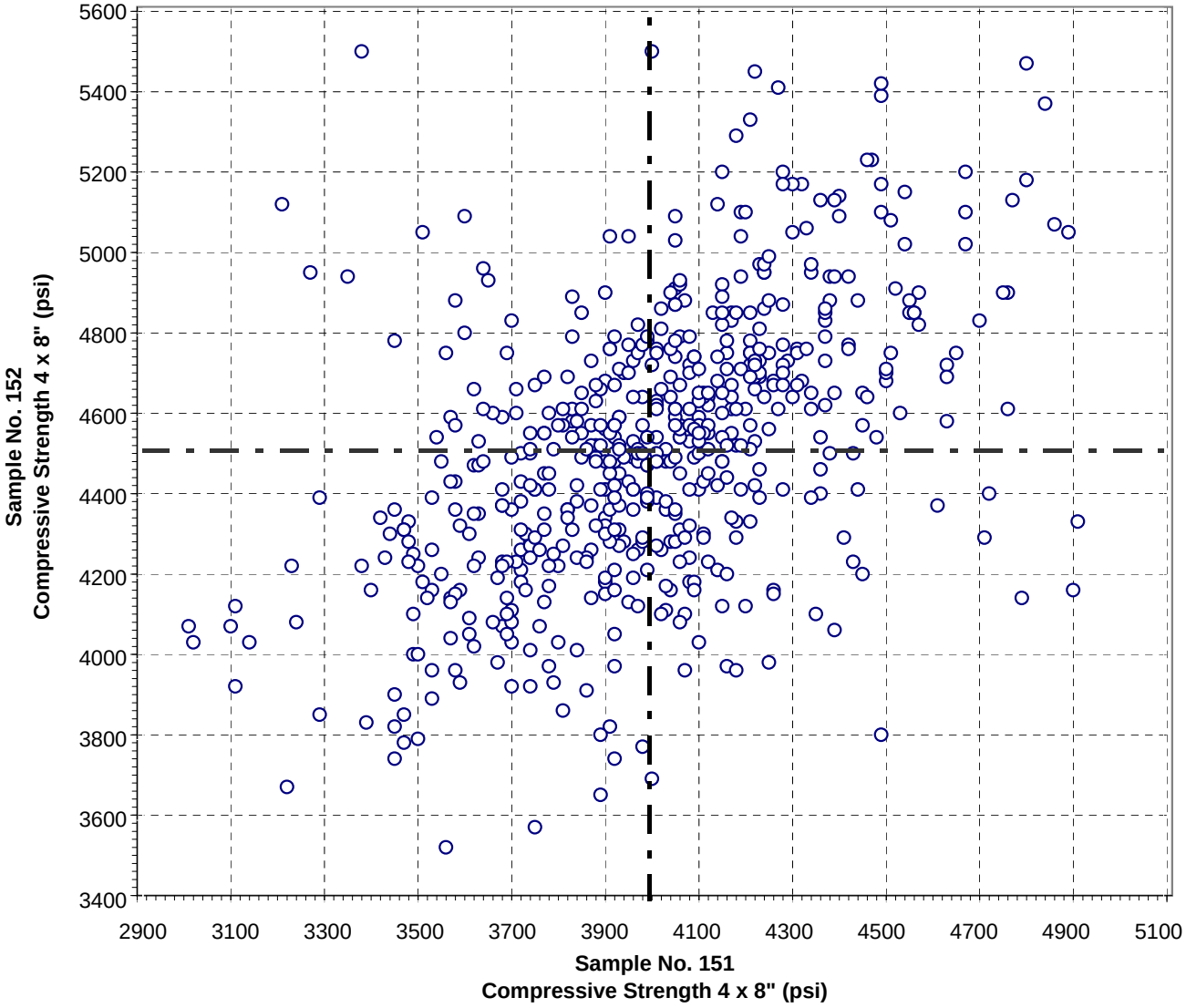
Test No. 4 Compressive Strength 6 X 12 - 7 day 585 Points

Sample No. 151	Ave	3775	S.D.	320.6	C.V. 8.49
Sample No. 152	Ave	4159	S.D.	323.4	C.V. 7.77

Labs eliminated: 1186, 1560, 1585, 1772, 2030, 2033, 2088, 2093, 2452, 3181, 3410

Labs off Diagram: 678, 2136, 2168, 3391

CCRL Proficiency Sample Program
Compressive Strength 4 x 8 - 7 day
CONCRETE Samples No. 151 and No. 152

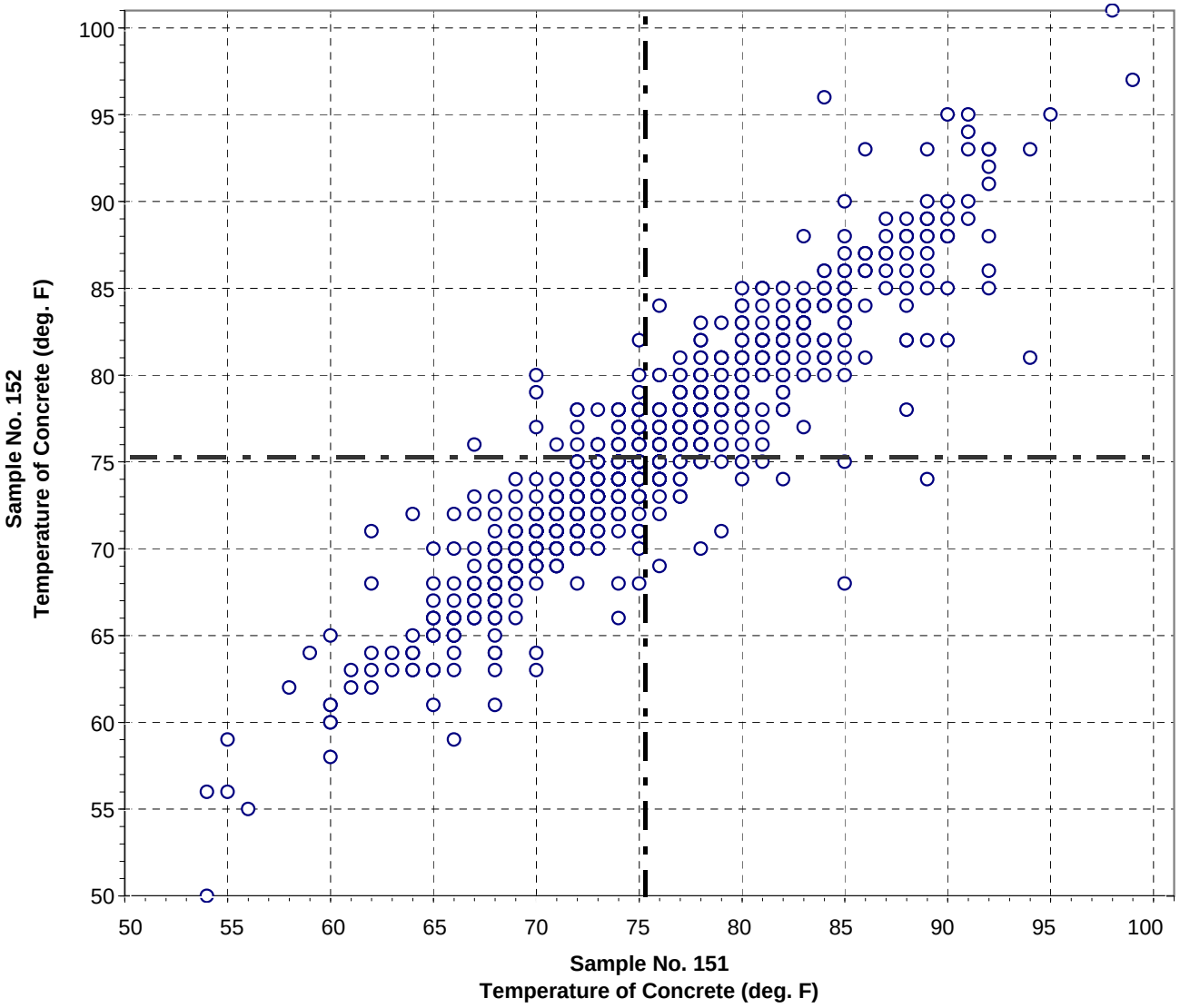


Test No. 4 Compressive Strength 4 x 8 - 7 day 581 Points

Sample No. 151	Ave	3997	S.D.	326.5	C.V. 8.17
Sample No. 152	Ave	4514	S.D.	339.8	C.V. 7.53

Labs eliminated: 471, 795, 1270, 1418, 1465, 1519, 2986, 3206, 3329, 3358

CCRL Proficiency Sample Program
Temperature of Concrete
CONCRETE Samples No. 151 and No. 152



Test No. 5 Temperature of Concrete 1175 Points

Sample No. 151 Ave 75 S.D. 6.4 C.V. 8.56
Sample No. 152 Ave 75 S.D. 6.4 C.V. 8.50

Labs off Diagram: 1484