CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 141 and Number 142

January 2007

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CEMENT AND CONCRETE REFERENCE LABORATORY
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SPONSORED BY
COMMITTEE C-1 ON CEMENT
COMMITTEE C-9 ON CONCRETE AND
CONCRETE AGGREGATES
AMERICAN SOCIETY FOR TESTING AND MATERIALS

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January 17, 2007

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

SUBJECT: Concrete Proficiency Samples No. 141 and No. 142

Enclosed is your copy of the final report on the test results for the CCRL Concrete Proficiency Samples which were distributed in November 2006.

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 2007.

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. 141 and No. 142

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 November 2006. 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. 141 and No. 142
Final Report - January 17, 2007

SUMMARY OF RESULTS

			Sample No. 141			Sample No. 142		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Air Cont, Volume	prcnt	885	1.73	0.47	27.3	1.88	0.52	27.7
Air Cont, Volume	prcnt	* 861	1.73	0.38	21.8	1.88	0.42	22.1
Air Cont, Pressure	prcnt	1058	1.7	0.45	26.3	1.8	0.46	24.8
Air Cont, Pressure	prcnt	*1035	1.7	0.34	20.3	1.8	0.36	20.0
Slump	inches	1067	3.00	0.98	32.5	3.31	1.00	30.1
Slump	inches	*1038	2.94	0.84	28.8	3.25	0.84	25.9
Unit Weight	lb/ft^2	1064	150.1	3.6	2.43	149.3	3.7	2.47
Unit Weight	lb/ft^2	*1017	150.3	1.3	0.864	149.5	1.3	0.871
Comp Str 7 day	psi	1065	4155	401.8	9.67	4314	432.3	10.02
Comp Str 7 day	psi	*1049	4170	363.9	8.73	4323	411.8	9.53
Temperature of Conc	°F	1067	70	6.3	9.03	71	6.5	9.27

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

Air Content - Volume 175 188 202 454 751 849 897 1200 1278 1519 1522 1790 2062 2066 2081 2087 2099 2269 2364 2457 2844 2989 3004 3054

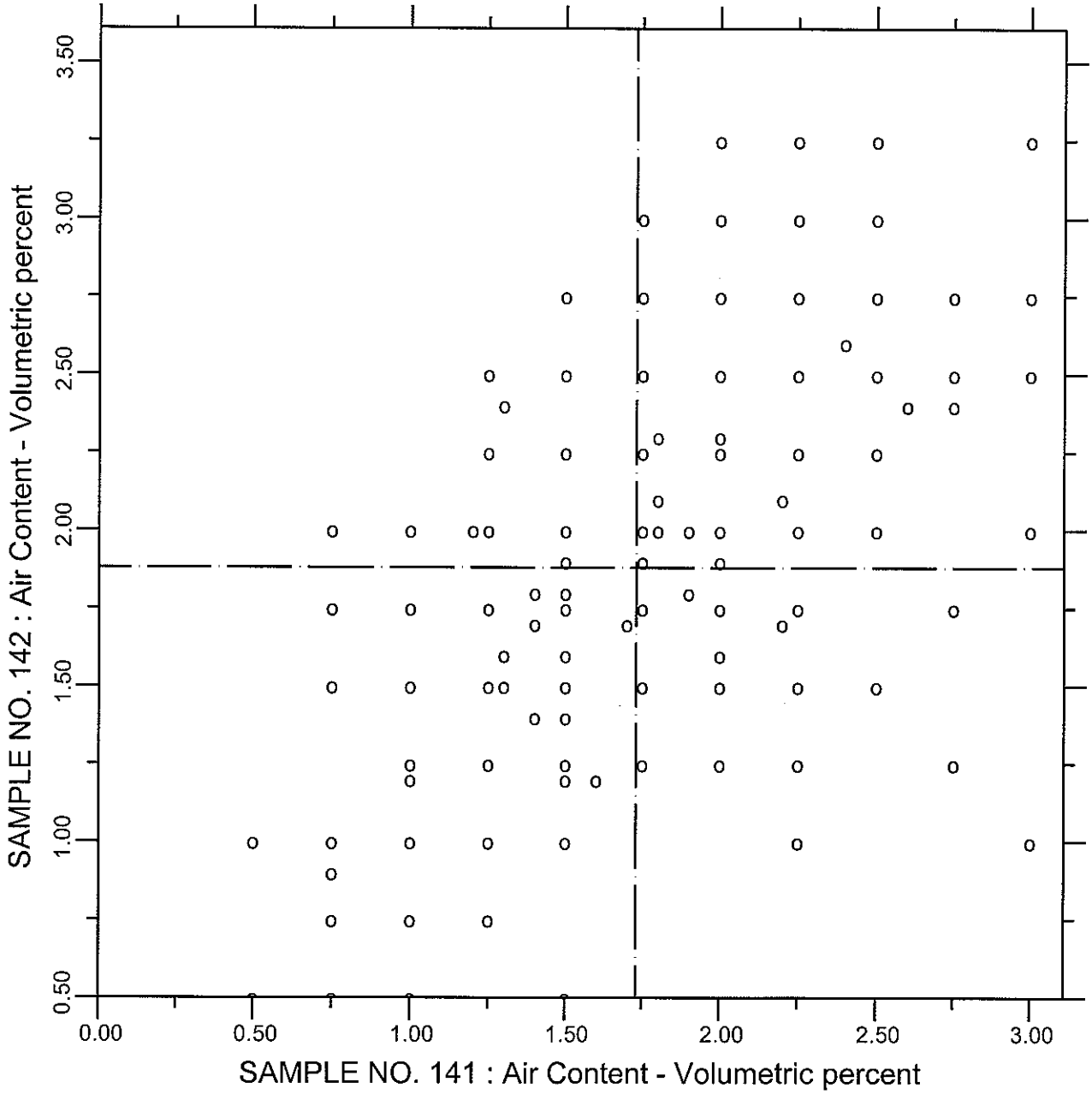
Air Content - Pressure 636 751 795 849 897 928 1200 1247 1268 1330 1390 1487 1660 1790 2011 2062 2219 2269 2270 2411 2844 3027 3163

Slump 180 196 565 795 1028 1154 1359 1372 1391 1392 1515 1767 1784 1901 2047 2062 2106 2146 2206 2217 2248 2276 2300 2314 2315 2376 2584 2961 3147

Unit Weight 640 726 728 1378 1390 1440 1582 1773 1779 2152 2179 2407 2493 188 918 1158 1200 1242 1268 1372 1408 1421 1435 1505 1506 1522 1600 1772 1857 1863 2056 2058 2073 2217 2230 2300 2347 2376 2386 2401 2422 2497 2621 2673 2844 3071 3163

Compressive Strength 51 648 923 1268 1372 1391 1552 1900 1958 2022 2106 2372 2966 3069 3121 3163

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Volumetric Method
CONCRETE SAMPLES NO. 141 & NO. 142



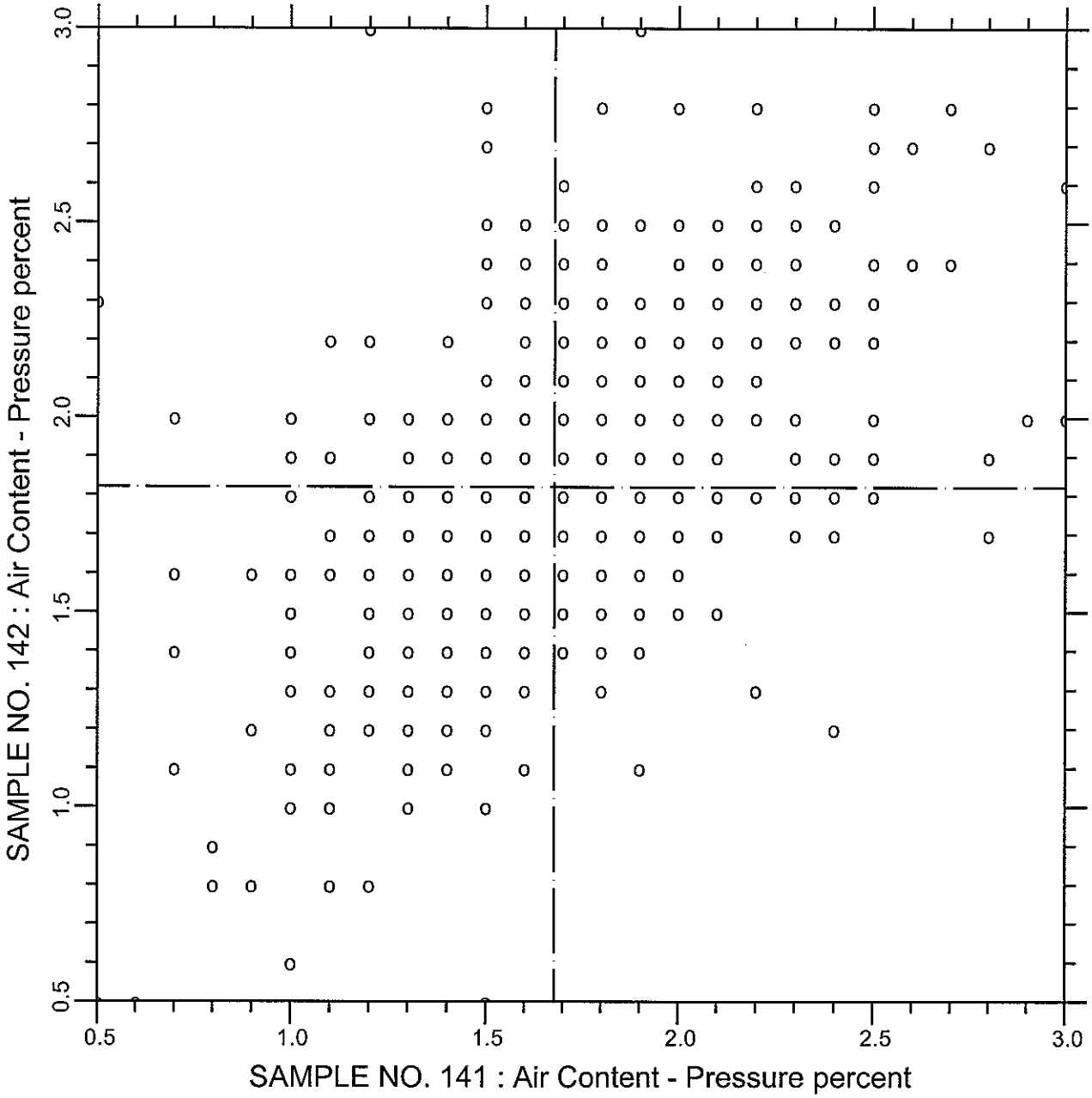
TEST NO.1 Air Content - Volumetric 861 POINTS

SAMPLE NO. 141 AVE 1.730 S.D. 0.38 C.V. 21.8

SAMPLE NO. 142 AVE 1.880 S.D. 0.42 C.V. 22.1

LABS ELIMINATED 175 188 202 454 751 849 897 1200 1278 1519 1522 1790 2062 2066 2081 2087 2099 2269 2364 2457 2844 2989 3004 3054

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Pressure Method
CONCRETE SAMPLES NO. 141 & NO. 142



TEST NO.6 Air Content - Pressure 1031 POINTS

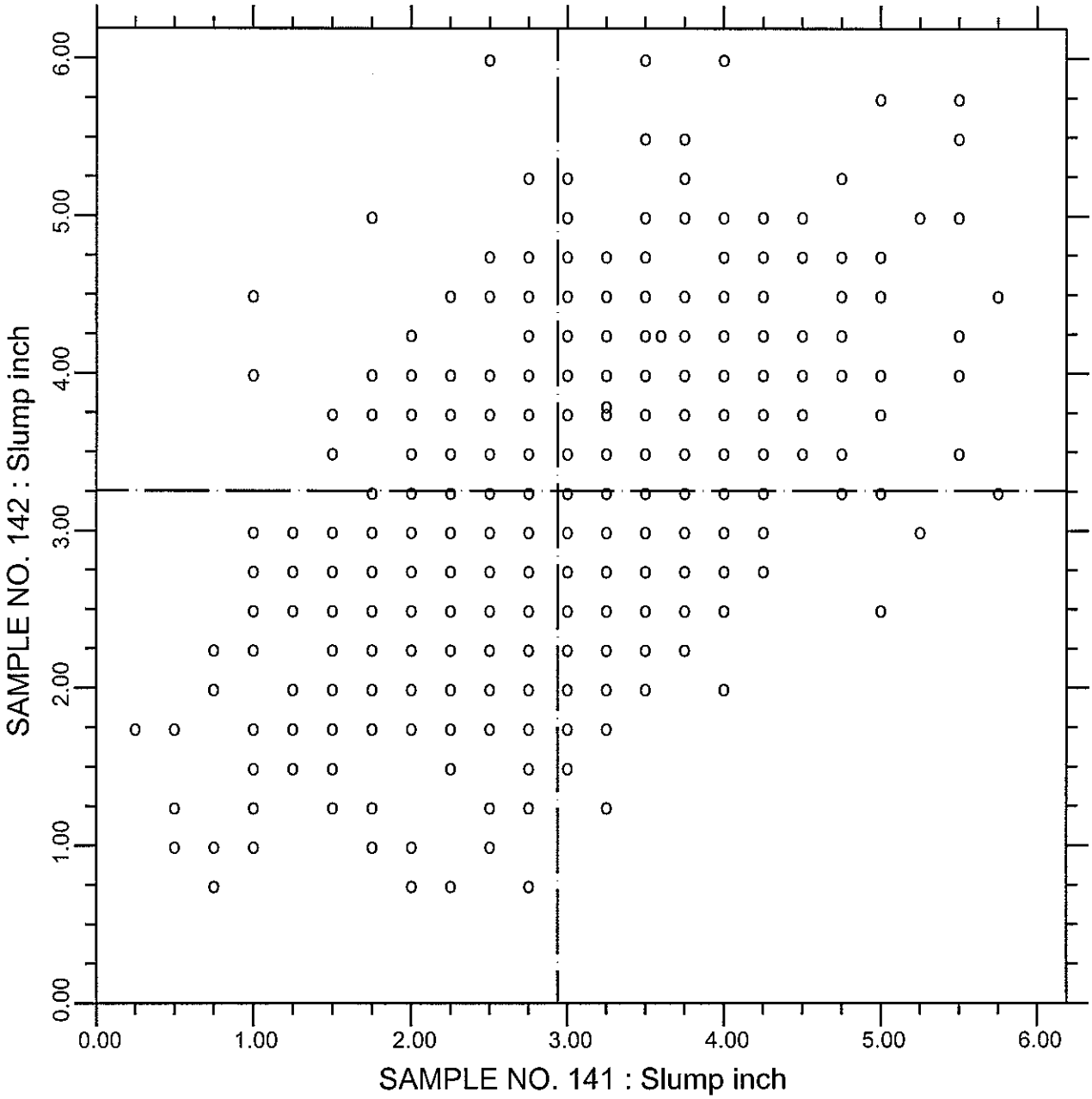
SAMPLE NO. 141 AVE 1.678 S.D. 0.34 C.V. 20.3

SAMPLE NO. 142 AVE 1.820 S.D. 0.36 C.V. 20.0

LABS ELIMINATED 636 751 795 849 897 928 1200 1247 1268 1330 1390 1487 1660 1790 2011 2062 2219 2269 2270 2411 2844 3027 3163

LABS OFF DIAGRAM 1173 1785 1823 2122

CCRL PROFICIENCY SAMPLE PROGRAM
Slump of Concrete
CONCRETE SAMPLES NO. 141 & NO. 142



TEST NO.2 Slump 1036 POINTS

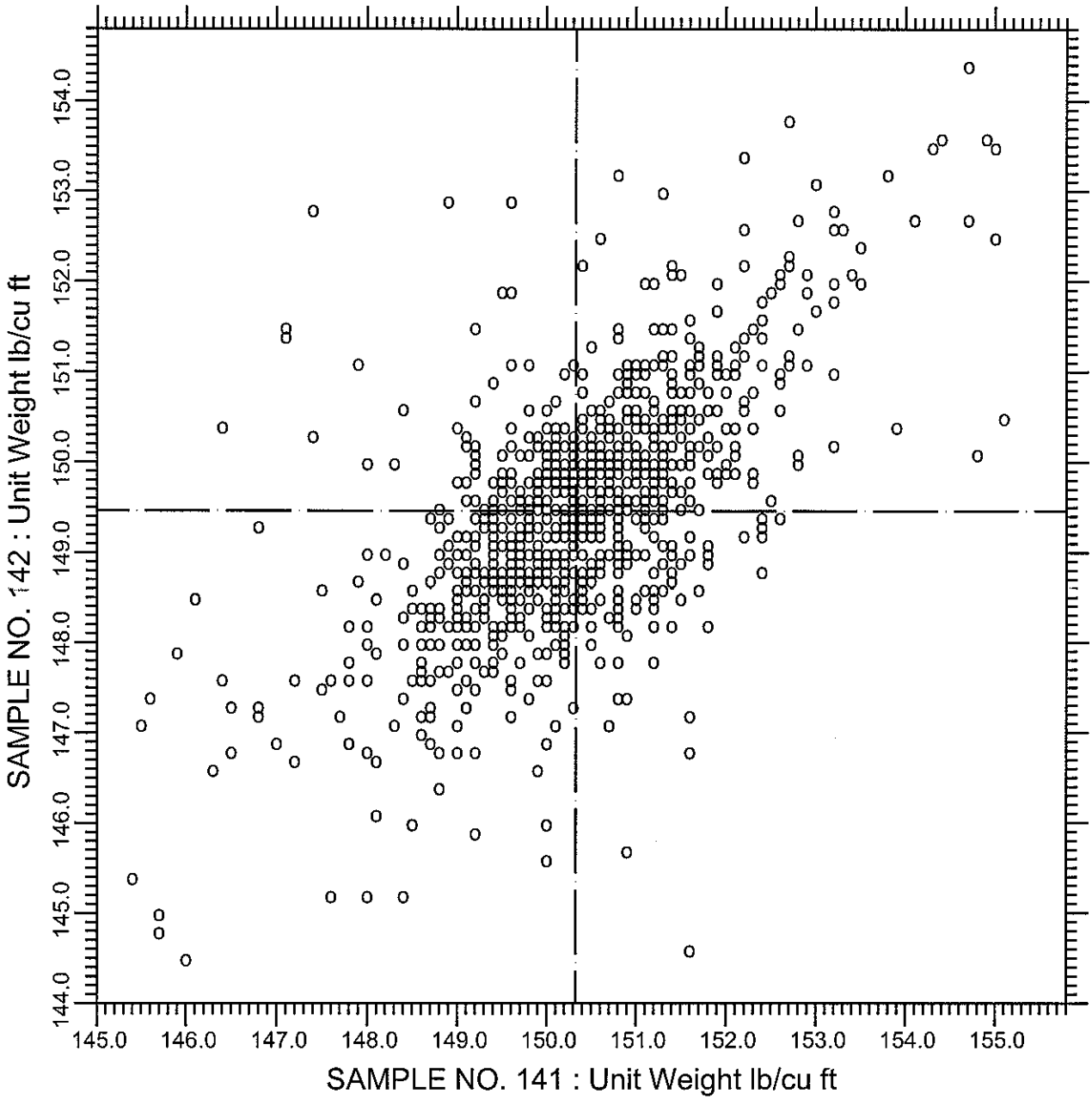
SAMPLE NO. 141 AVE 2.938 S.D. 0.84 C.V. 28.8

SAMPLE NO. 142 AVE 3.254 S.D. 0.84 C.V. 25.9

LABS ELIMINATED 180 196 565 795 1028 1154 1359 1372 1391 1392 1515 1767 1784 1901 2047 2062 2106 2146 2206 2217 2248 2276 2300 2314 2315 2376 2584 2961 3147

LABS OFF DIAGRAM 289 1528

CCRL PROFICIENCY SAMPLE PROGRAM
Unit Weight of Concrete
CONCRETE SAMPLES NO. 141 & NO. 142



TEST NO.3 Unit Weight 1017 POINTS

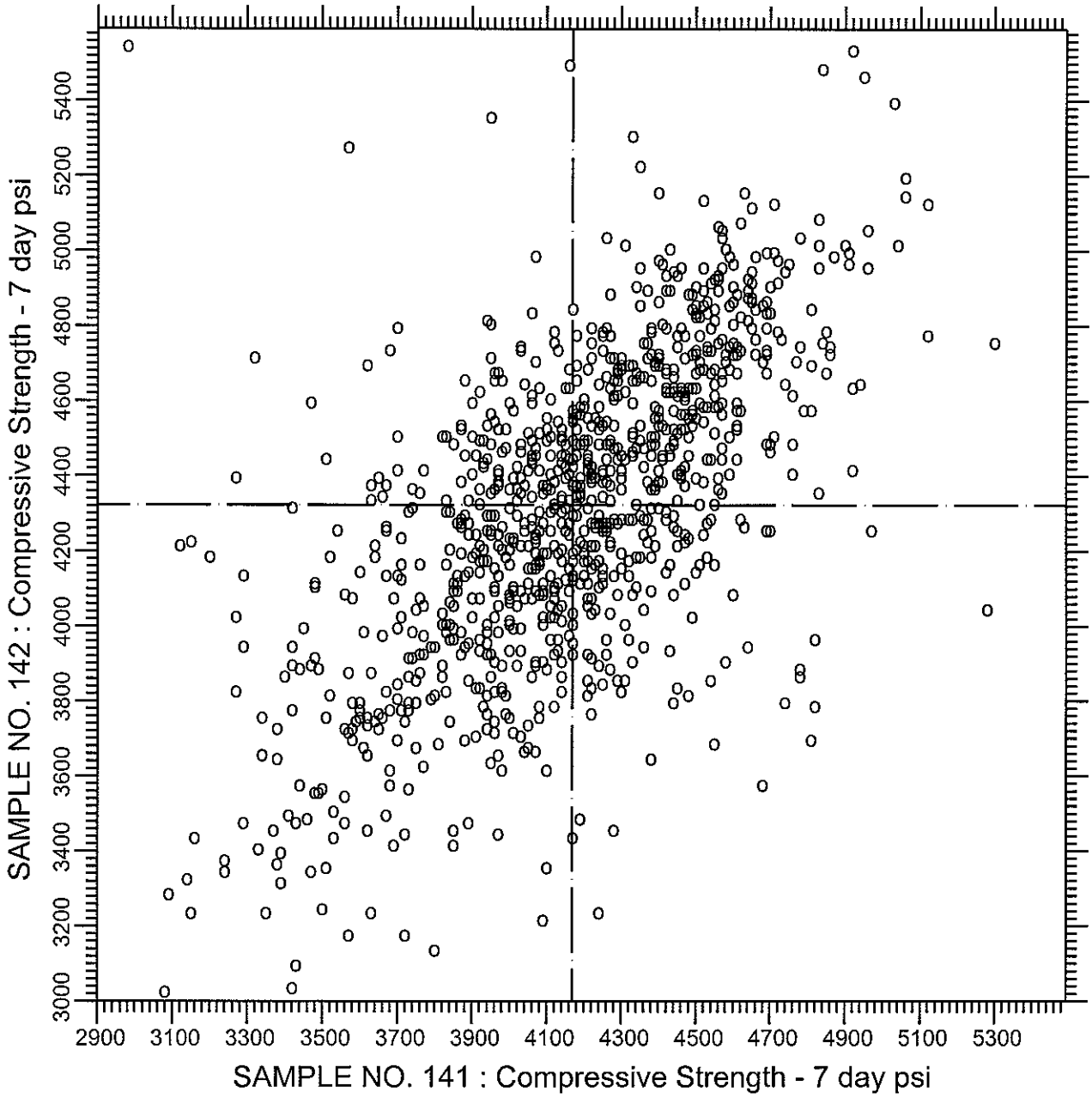
SAMPLE NO. 141 AVE 150.330 S.D. 1.3 C.V. 0.864

SAMPLE NO. 142 AVE 149.462 S.D. 1.3 C.V. 0.871

LABS ELIMINATED

See SUMMARY OF RESULTS page for list of labs.

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7 day
CONCRETE SAMPLES NO. 141 & NO. 142



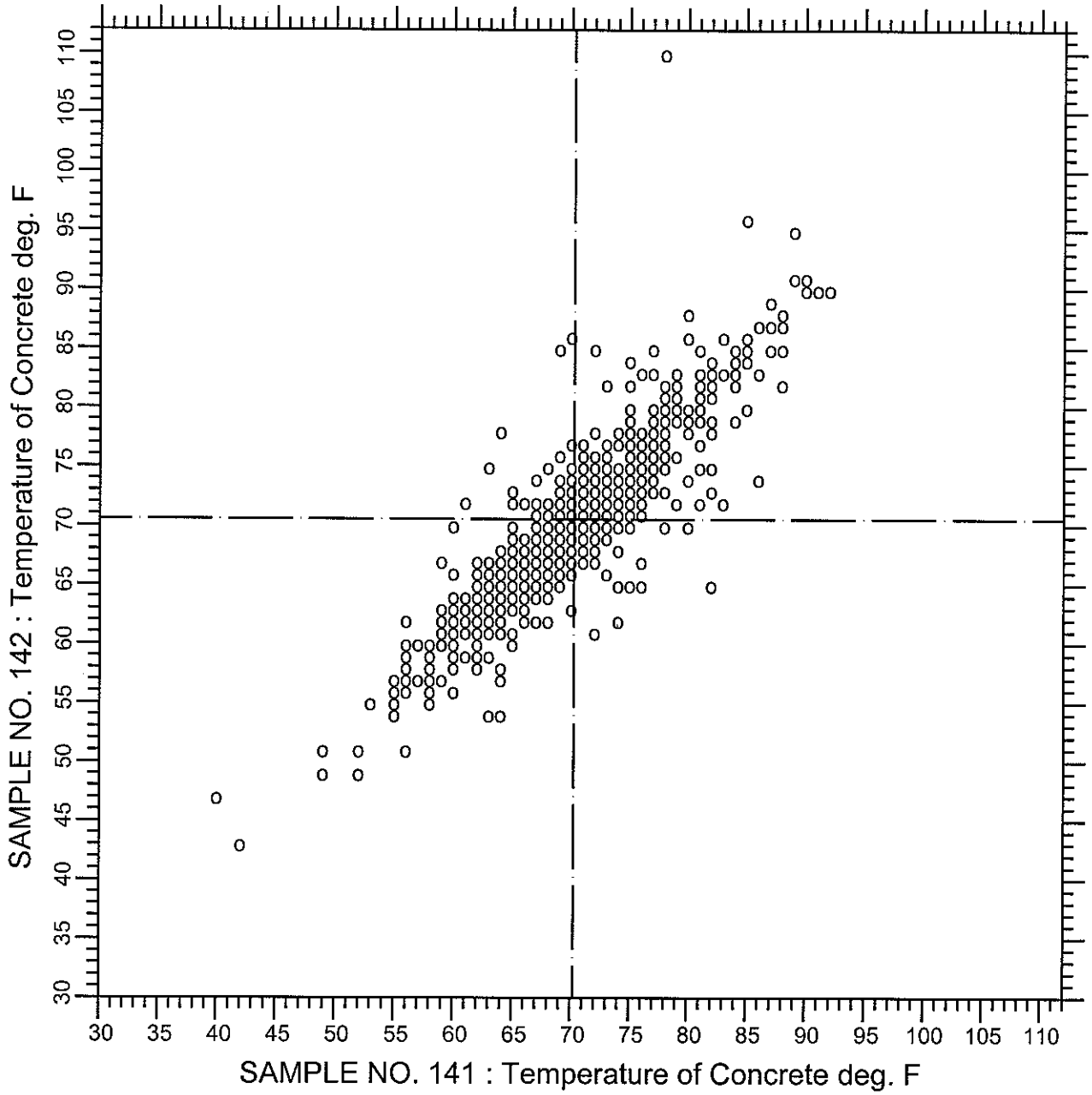
TEST NO.4 Compressive Strength - 7 day 1049 POINTS

SAMPLE NO. 141 AVE 4169.6 S.D. 363.9 C.V. 8.73

SAMPLE NO. 142 AVE 4322.6 S.D. 411.8 C.V. 9.53

LABS ELIMINATED 51 648 923 1268 1372 1391 1552 1900 1958 2022 2106 2372 2966 3069 3121 3163

CCRL PROFICIENCY SAMPLE PROGRAM
Temperature of Concrete
CONCRETE SAMPLES NO. 141 & NO. 142



TEST NO.5 Temperature of Concrete 1067 POINTS

SAMPLE NO. 141	AVE	70.25	S.D.	6.3	C.V.	9.03
SAMPLE NO. 142	AVE	70.54	S.D.	6.5	C.V.	9.27