CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
Concrete Proficiency Samples
Number 145 and Number 146

January 2008

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CCRL
Cement and Concrete Reference Laboratory

www.ccrl.us

January 11, 2008

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

SUBJECT: Concrete Proficiency Samples No. 145 and No. 146

Enclosed is your copy of the final report on the test results for the CCRL Concrete Proficiency Samples which were distributed in November 2008.

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 2008.

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. 145 and No. 146

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 2007. 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. 145 and No. 146
Final Report - January 11, 2008

SUMMARY OF RESULTS

			Sample No. 145			Sample No. 146		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
Air Cont, Volume	%	884	3.89	1.0	27.2	4.47	1.2	26.4
Air Cont, Volume	%	* 875	3.88	0.98	25.2	4.47	1.15	25.7
Air Cont, Pressure	%	1060	3.9	1.1	27.1	4.6	1.2	25.9
Air Cont, Pressure	%	*1049	3.9	0.96	24.7	4.6	1.14	24.9
Slump	inches	1075	4.31	1.2	27.5	4.18	1.1	27.4
Slump	inches	*1062	4.29	1.2	26.9	4.15	1.1	25.8
Unit Weight	lb/ft^3	1071	149.2	4.0	2.66	147.6	3.7	2.54
Unit Weight	lb/ft^3	*1034	149.2	1.8	1.24	147.5	2.0	1.36
Compressive Strength, 7 day, 6 x 12 inch specimens								
Comp Strength	psi	705	3947	355.1	9.00	3752	365.0	9.73
Comp Strength	psi	* 694	3961	322.8	8.15	3761	319.7	8.50
Compressive Strength, 7 day, 4 x 8 inch specimens								
Comp Strength	psi	366	4285	403.4	9.41	3964	394.5	9.95
Comp Strength	psi	* 360	4312	333.5	7.73	3987	339.4	8.51
Temperature of Conc	°F	1050	70	6.7	9.57	70	6.2	8.98

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

Air Content - Volume 470 546 827 841 1438 1979 2411 2989 3109

Air Content - Pressure 470 546 672 795 827 1008 1390 1392 2411 2472 3143

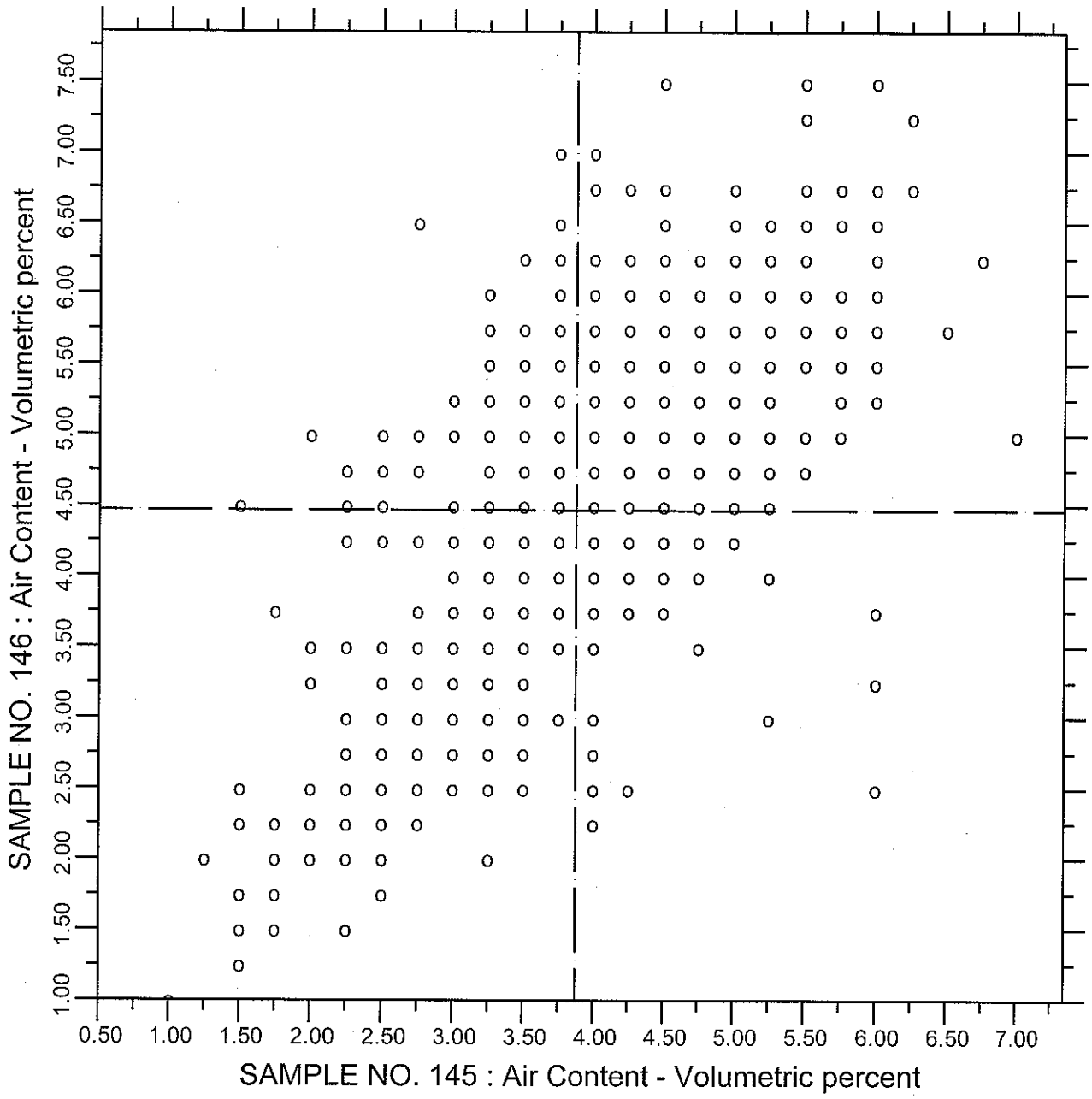
Slump 421 459 546 1154 1173 1580 1758 1837 2133 2136 2440 3149 3190

Unit Weight 827 1008 1472 1555 1614 1772 2031 2093 2366 2377 2398 2422 2679 2887 3081 3181 51 454 470 471 1158 1186 1443 1520 1536 1570 2076 2124 2132 2164 2295 2407 2411 3109 3147 3183 3272

Compressive Strength (6X12) 255 470 1008 1154 1173 1456 1472 1825 2138 2347 2472

Compressive Strength (4x8) 53 421 471 2224 3158 3181

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Volumetric Method
CONCRETE SAMPLES NO. 145 & NO. 146



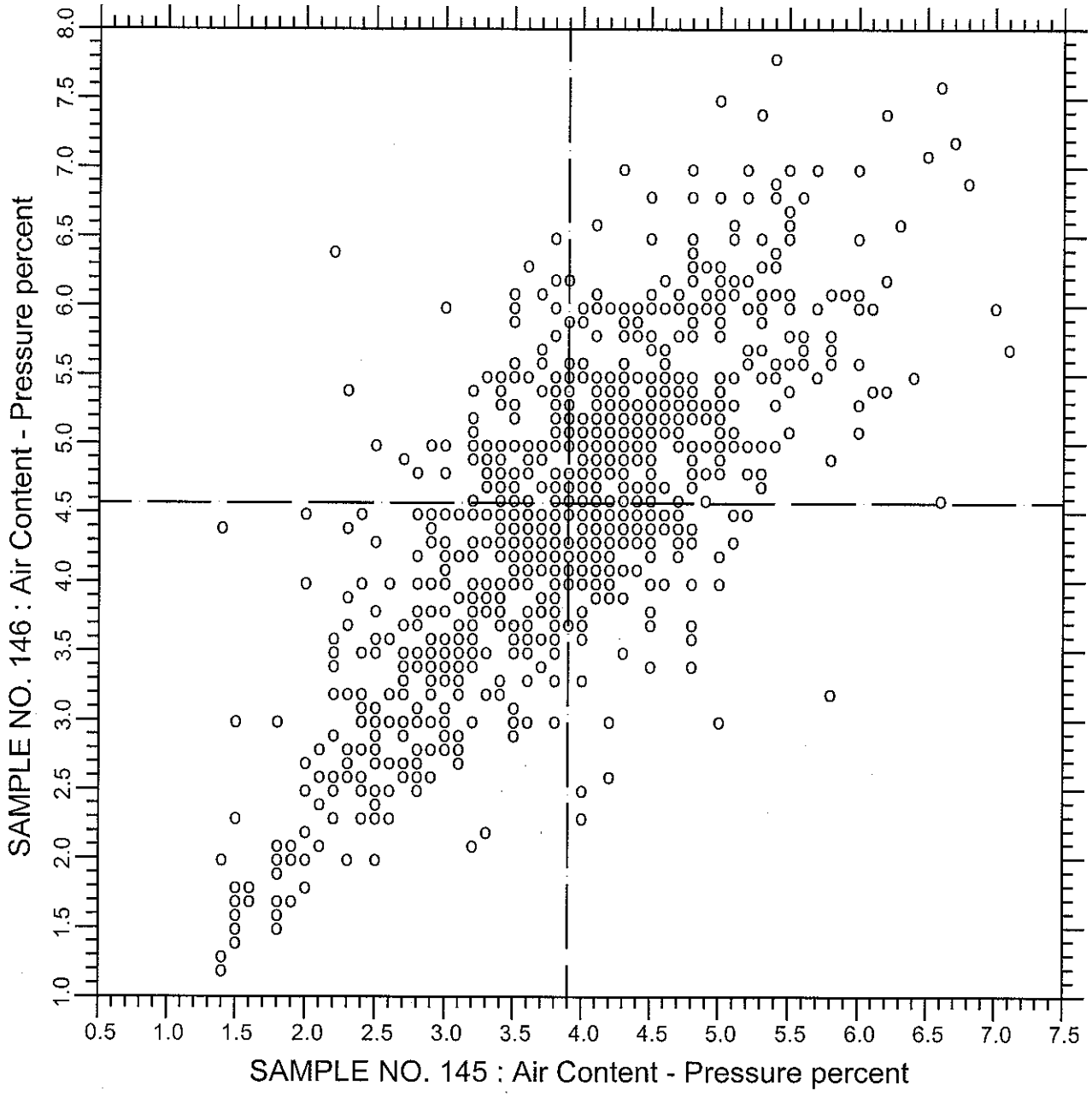
TEST NO.1 Air Content - Volumetric 875 POINTS

SAMPLE NO. 145 AVE 3.875 S.D. 0.98 C.V. 25.2

SAMPLE NO. 146 AVE 4.466 S.D. 1.15 C.V. 25.7

LABS ELIMINATED 470 546 827 841 1438 1979 2411 2989 3109

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Pressure Method
CONCRETE SAMPLES NO. 145 & NO. 146



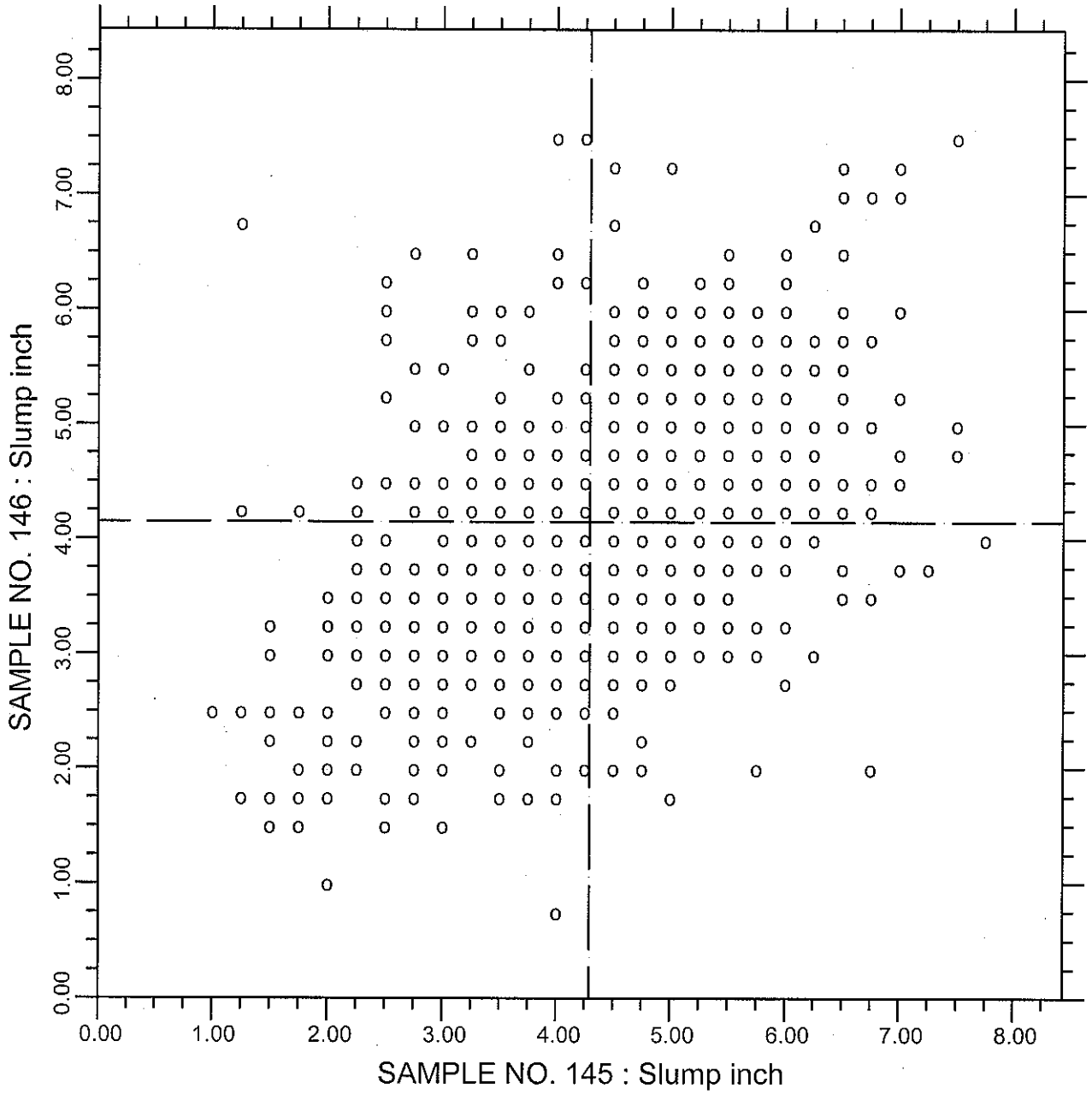
TEST NO.6 Air Content - Pressure 1049 POINTS

SAMPLE NO. 145 AVE 3.898 S.D. 0.96 C.V. 24.7

SAMPLE NO. 146 AVE 4.567 S.D. 1.14 C.V. 24.9

LABS ELIMINATED 470 546 672 795 827 1008 1390 1392 2411 2472 3143

CCRL PROFICIENCY SAMPLE PROGRAM
Slump of Concrete
CONCRETE SAMPLES NO. 145 & NO. 146



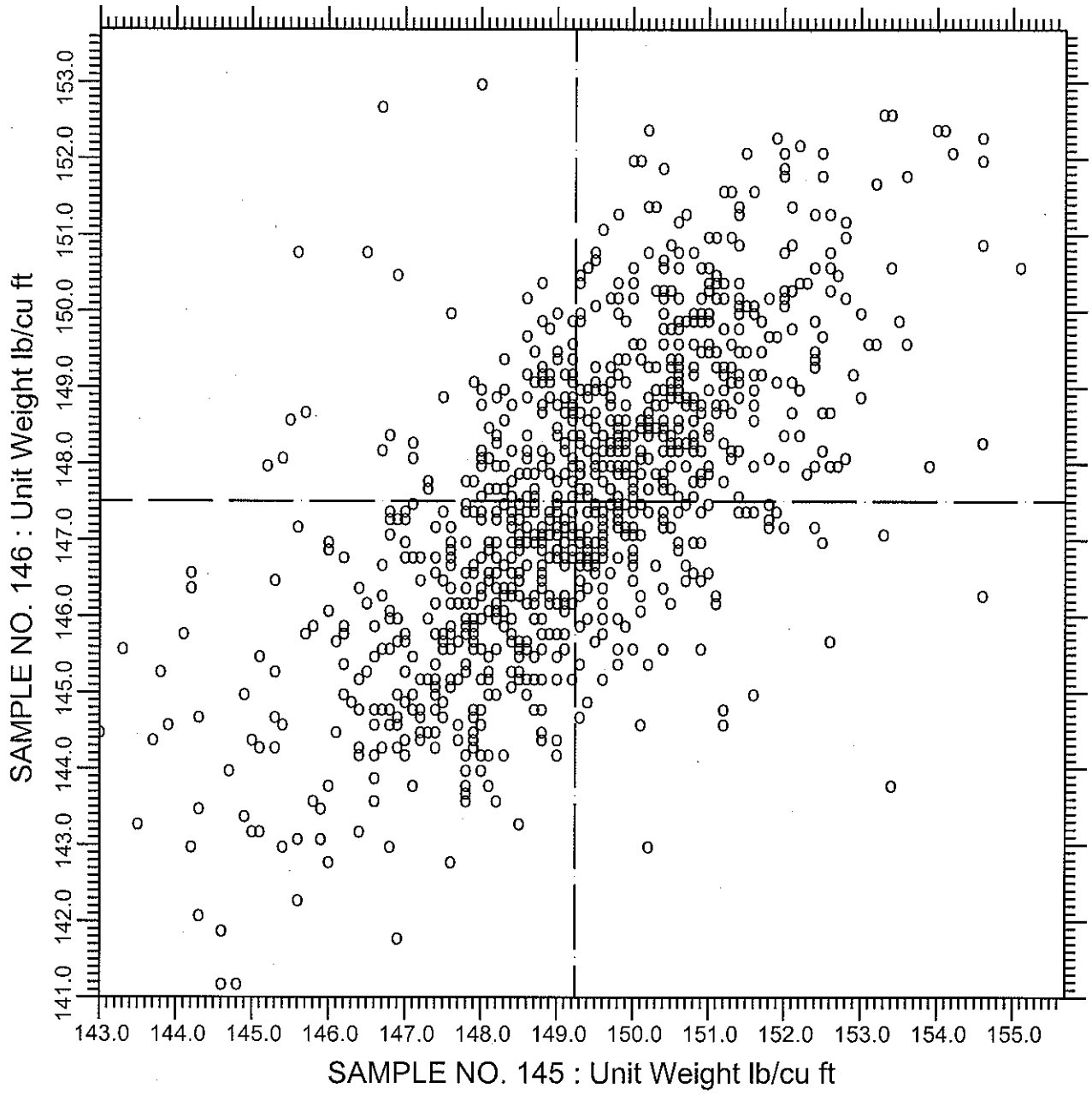
TEST NO.2 Slump 1062 POINTS

SAMPLE NO. 145 AVE 4.294 S.D. 1.2 C.V. 26.9

SAMPLE NO. 146 AVE 4.146 S.D. 1.1 C.V. 25.8

LABS ELIMINATED 421 459 546 1154 1173 1580 1758 1837 2133 2136 2440 3149 3190

CCRL PROFICIENCY SAMPLE PROGRAM
Unit Weight of Concrete
CONCRETE SAMPLES NO. 145 & NO. 146



TEST NO.3 Unit Weight 1033 POINTS

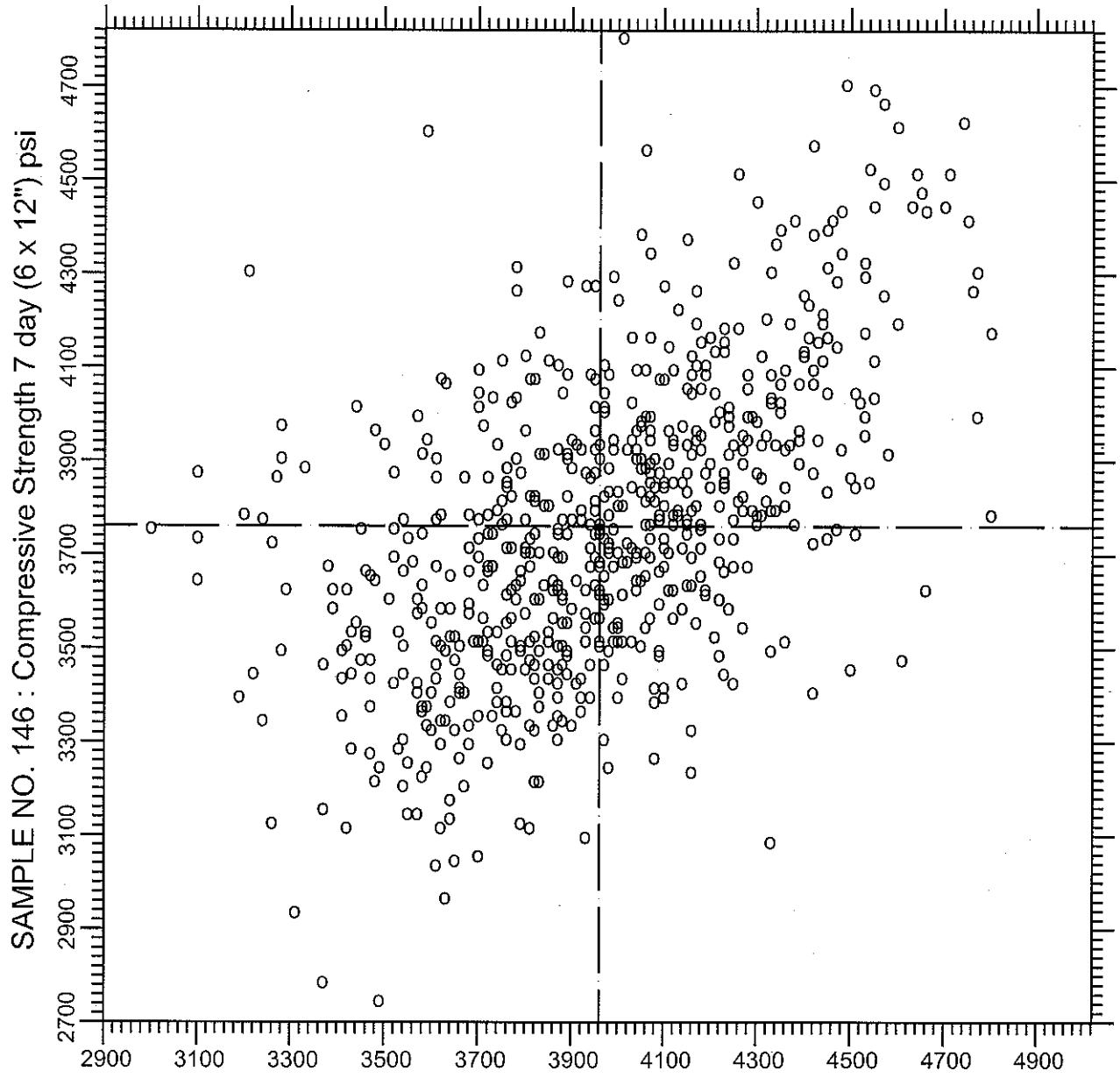
SAMPLE NO. 145 AVE 149.241 S.D. 1.8 C.V. 1.24

SAMPLE NO. 146 AVE 147.509 S.D. 2.0 C.V. 1.36

LABS ELIMINATED 827 1008 1472 1555 1614 1772 2031 2093 2366 2377 2398 2422 2679 2887 3081 3181 51 454 470 471 1158 1186 1443 1520 1536 1570 2076 2124 2132 2164 2295 2407 2411 3109 3147 3183 3272

LABS OFF DIAGRAM 2374

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength 6 X 12 - 7 day
CONCRETE SAMPLES NO. 145 & NO. 146



TEST NO.4 Compressive Strength 7 day (6 x 12")693 POINTS

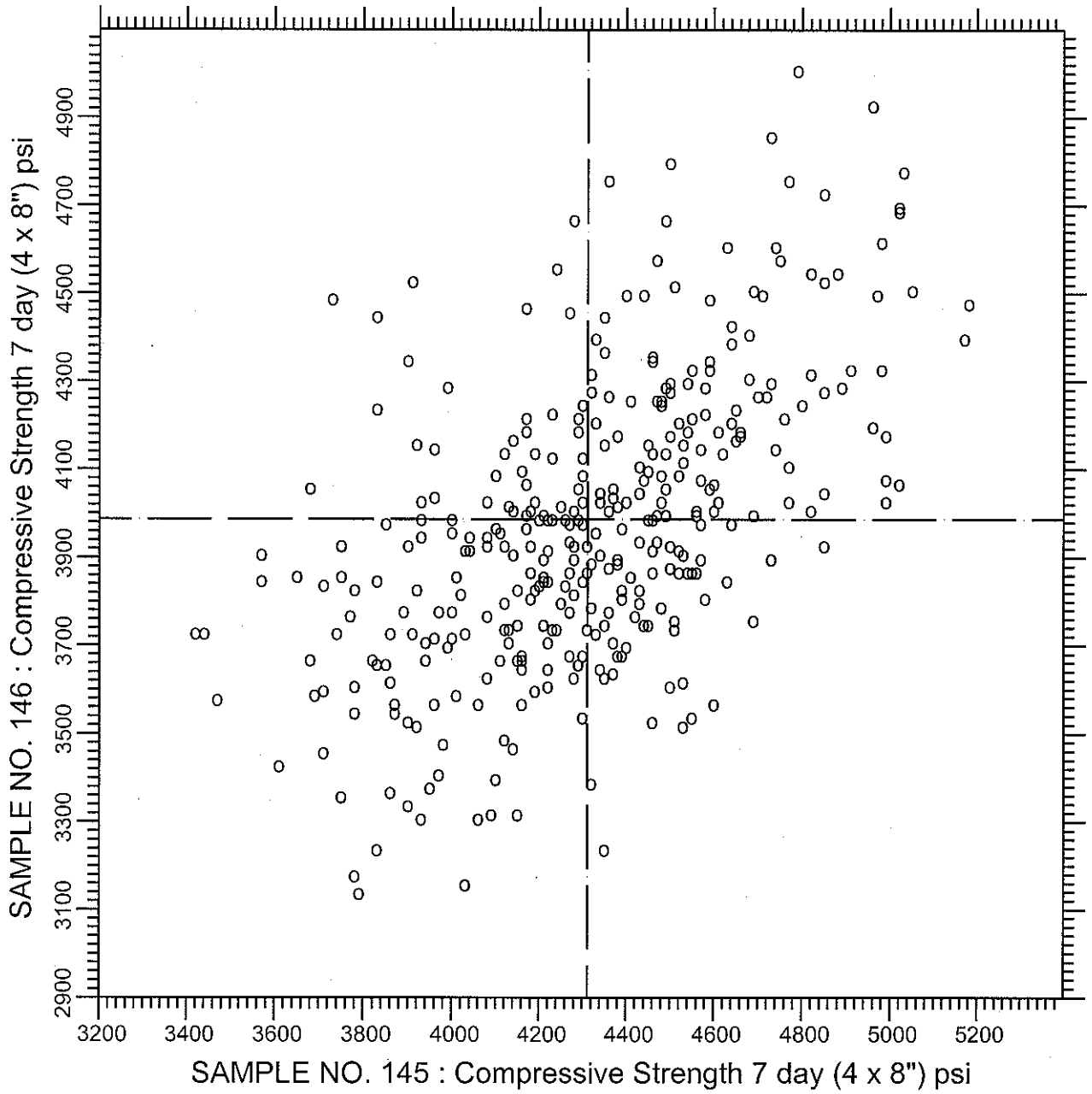
SAMPLE NO. 145 AVE 3960.6 S.D. 322.8 C.V. 8.15

SAMPLE NO. 146 AVE 3761.4 S.D. 319.7 C.V. 8.50

LABS ELIMINATED 255 470 1008 1154 1173 1456 1472 1825 2138 2347 2472

LABS OFF DIAGRAM 3130

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength 4 x 8 - 7 day
CONCRETE SAMPLES NO. 145 & NO. 146



TEST NO.4 Compressive Strength 7 day (4 x 8") 357 POINTS

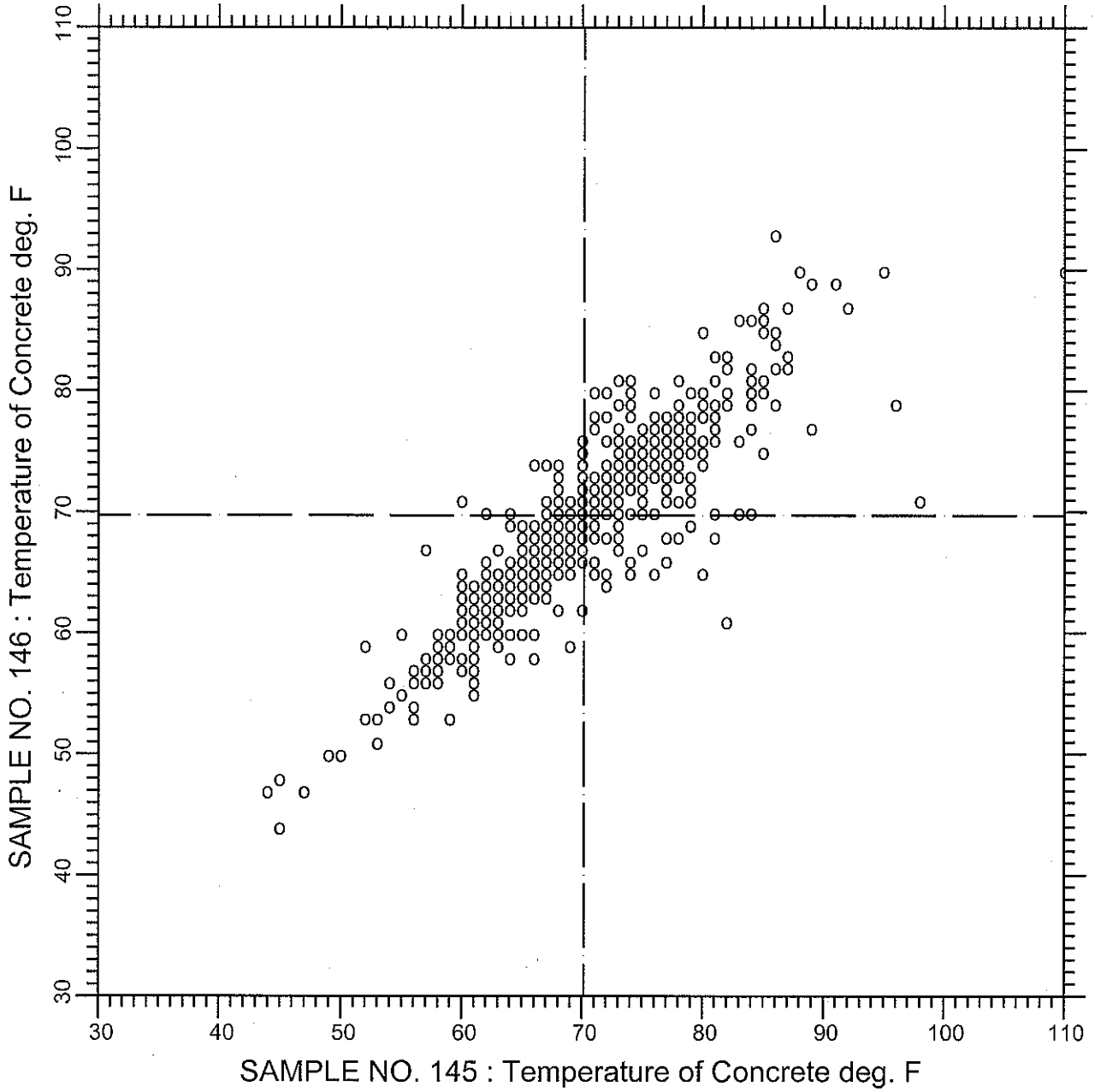
SAMPLE NO. 145 AVE 4311.6 S.D. 333.5 C.V. 7.73

SAMPLE NO. 146 AVE 3987.1 S.D. 339.4 C.V. 8.51

LABS ELIMINATED 53 421 471 2224 3158 3181

LABS OFF DIAGRAM 3003 3109 3156

CCRL PROFICIENCY SAMPLE PROGRAM
Temperature of Concrete
CONCRETE SAMPLES NO. 145 & NO. 146



TEST NO.5 Temperature of Concrete 1050 POINTS

SAMPLE NO. 145	AVE	70.16	S.D.	6.7	C.V.	9.57
SAMPLE NO. 146	AVE	69.71	S.D.	6.2	C.V.	8.98