CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report

Masonry Cement Proficiency Samples

Number 51 and Number 52

November 2003

CCRL CEMENT AND CONCRETE REFERENCE LABORATORY

CEMENT AND CONCRETE REFERENCE LABORATORY
AT THE
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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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November 14, 2003

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

SUBJECT: Final Report on Masonry Cement Proficiency Samples No. 51 and No. 52

Enclosed is your copy of the final report on the test results for the pair of CCRL **Masonry Cement** Proficiency Samples which were distributed in August 2003.

This report consists of Table of Results for individual laboratory data, a statistical Summary of Results, a set of general Scatter Diagrams, and associated detailed information.

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 use.

It is presently anticipated that the next Masonry Cement Proficiency Samples will be distributed in August 2004.

Sincerely,

Robin K. Haupt

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

Enclosure

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests on Masonry Cement Proficiency Samples No. 51 and No. 52

This letter, and the material included with it, constitute the final report and summary of results for the current pair of Masonry Cement Proficiency Samples, which were distributed in August 2003. This material includes a Table of Results for individual laboratory data, a statistical Summary of Results, and a set of general Scatter Diagrams. Your unique laboratory number is displayed at the top of the Individual Table of Results.

An explanation of the program is contained in the paper: "Statistical Evaluation of Interlaboratory Cement Tests" by J. R. Crandall and R. L. Blaine, and "Statistical Aspects of the Cement Testing Program" by W.J. Youden, 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.

Laboratory Ratings

Each laboratory receives an individualized Table of Results. The Table of Results shows the test title and the reporting unit in the first two columns. After that it lists the laboratory's 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.

The ratings for the 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 merely shows 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.*

Continued on Reverse Side

In cases where some laboratories' results are eliminated, averages, standard deviations, coefficients of variation, and the ratings of the other 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, 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

Usually, averages, standard deviations, and coefficients of variation are given with all results reported, and then with one or more outlying results omitted. Sometimes, two or more recalculations with laboratories omitted, have been done for the same 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. Each laboratory will receive a complete set of diagrams according to their participation in the program.

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. To find your point, just plot as you would when plotting any scatter diagram. 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 $\pm$ 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 may indicate strong evidence of bias in many cases.

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 51 and No. 52
Final Report - November 14, 2003

SUMMARY OF RESULTS

Test		#Labs	Sample No. 51 Average	S.D.	C.V.	Sample No. 52 Average	S.D.	C.V.
N.C. Water	prcnt	67	24.3	1.3	5.38	25.9	1.1	4.31
N.C. Water	prcnt	* 65	24.1	0.52	2.16	25.8	0.48	1.87
Gillmore TS Initial	min	64	149	28.8	19.3	162	37.3	23.0
Gillmore TS Initial	min	* 62	147	25.5	17.4	158	28.4	18.0
Gillmore TS Final	min	64	257	45.7	17.8	267	44.1	16.5
Gillmore TS Final	min	* 63	254	41.7	16.4	265	40.2	15.2
Autoclave Expan	prcnt	63	0.03	0.046	175	0.01	0.024	349
Autoclave Expan	prcnt	* 58	0.02	0.014	72.4	0.00	0.012	428.8
Air Content	prcnt	66	17.5	1.0	6.06	17.3	1.2	7.11
Air Content	prcnt	* 64	17.5	0.89	5.06	17.3	0.89	5.14
AC Mix Water	prcnt	67	47.6	6.1	12.9	46.6	6.0	12.8
AC Mix Water	prcnt	* 64	48.5	1.5	3.08	47.5	1.2	2.64
AC Flow	prcnt	67	109	2.2	2.02	111	2.6	2.35
Comp Str 7 day	psi	67	1716	626.3	36.5	1795	646.5	36.0
Comp Str 7 day	psi	* 66	1643	190.6	11.6	1720	194.4	11.3
Comp Str 28 day	psi	57	2144	1088.3	50.7	2381	1238.4	52.0
Comp Str 28 day	psi	* 55	1942	189.0	9.73	2151	212.6	9.89

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

N.C. Water	142 1200
Gillmore TS Intial	125 1466
Gillmore TS Final	694
Autoclave Expansion	244 56 151 690 1200
Air Content	441 1379
AC Mix Water	148 1200 1466
Comp Str 7-day	289
Comp Str 28-day	20 289

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 51 and No. 52
Final Report - November 14, 2003

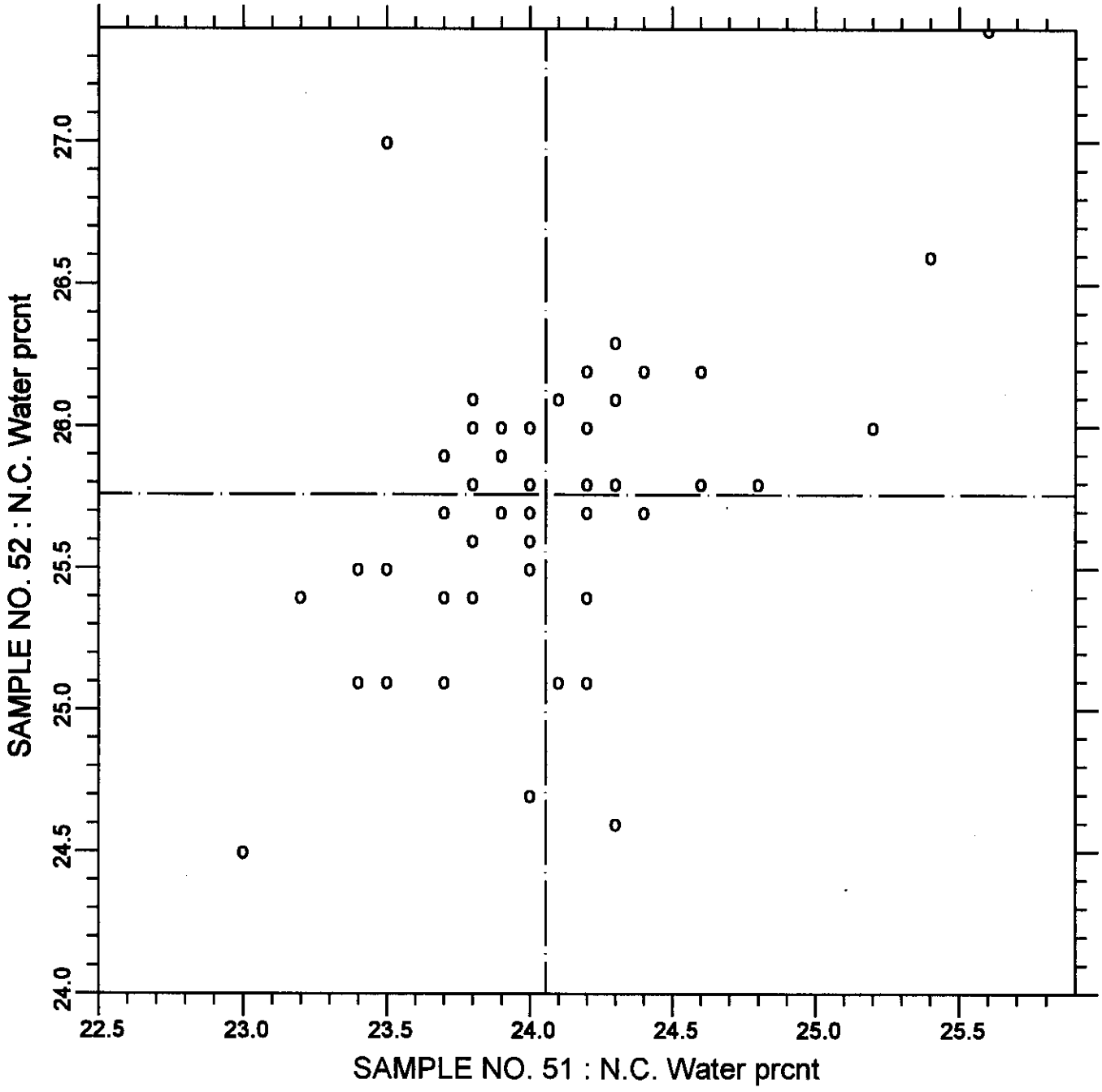
SUMMARY OF RESULTS

				Sample No. 51			Sample No. 52		
Test			#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
45 μm Sieve	prcnt		66	14.36	2.01	14.0	1.93	0.78	40.3
45 μm Sieve	prcnt	*	62	14.49	1.60	11.0	1.80	0.38	21.3
Density	g/cm^3		56	2.93	0.060	2.06	2.90	0.066	2.26
Density	g/cm^3	*	55	2.93	0.038	1.30	2.90	0.044	1.53
Water Sol Alkali	prcnt		8	0.12	0.059	47.9	0.24	0.088	36.1
WATER RETENTION									
WR Mix Water	prcnt		59	47.4	7.2	15.3	46.4	7.0	15.0
WR Mix Water	prcnt	*	55	48.6	1.3	2.70	47.5	1.2	2.58
WR Intl Flow	prcnt		60	110	2.6	2.33	111	2.5	2.26
WR Intl Flow	prcnt	*	59	110	2.4	2.14	111	2.4	2.12
WR Final Flow	prcnt		60	95	5.3	5.59	95	5.8	6.12
Water Retention	prcnt		60	86	4.3	4.95	85	5.2	6.12

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

45 μm Sieve	54 201 1200 1466
Density	201
WR Mix Water	148 289 694 1466
WR Initial Flow	162

CCRL PROFICIENCY SAMPLE PROGRAM
Normal Consistency - Water
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.110 **N.C. Water** **64 POINTS**

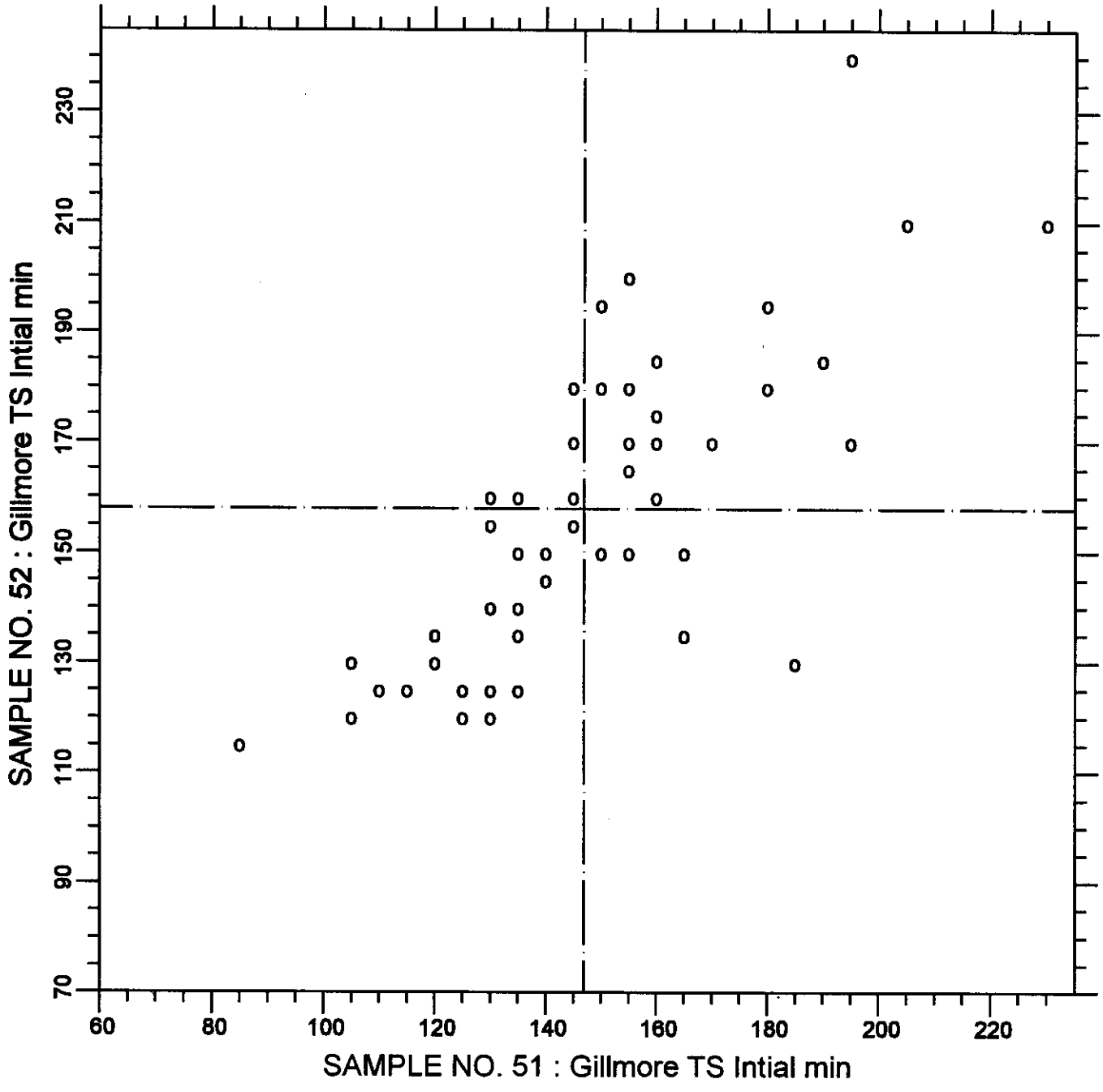
SAMPLE NO. 51 AVE 24.055 S.D. 0.52 C.V. 2.16

SAMPLE NO. 52 AVE 25.760 S.D. 0.48 C.V. 1.87

LABS ELIMINATED 142 1200

LABS OFF DIAGRAM 1053

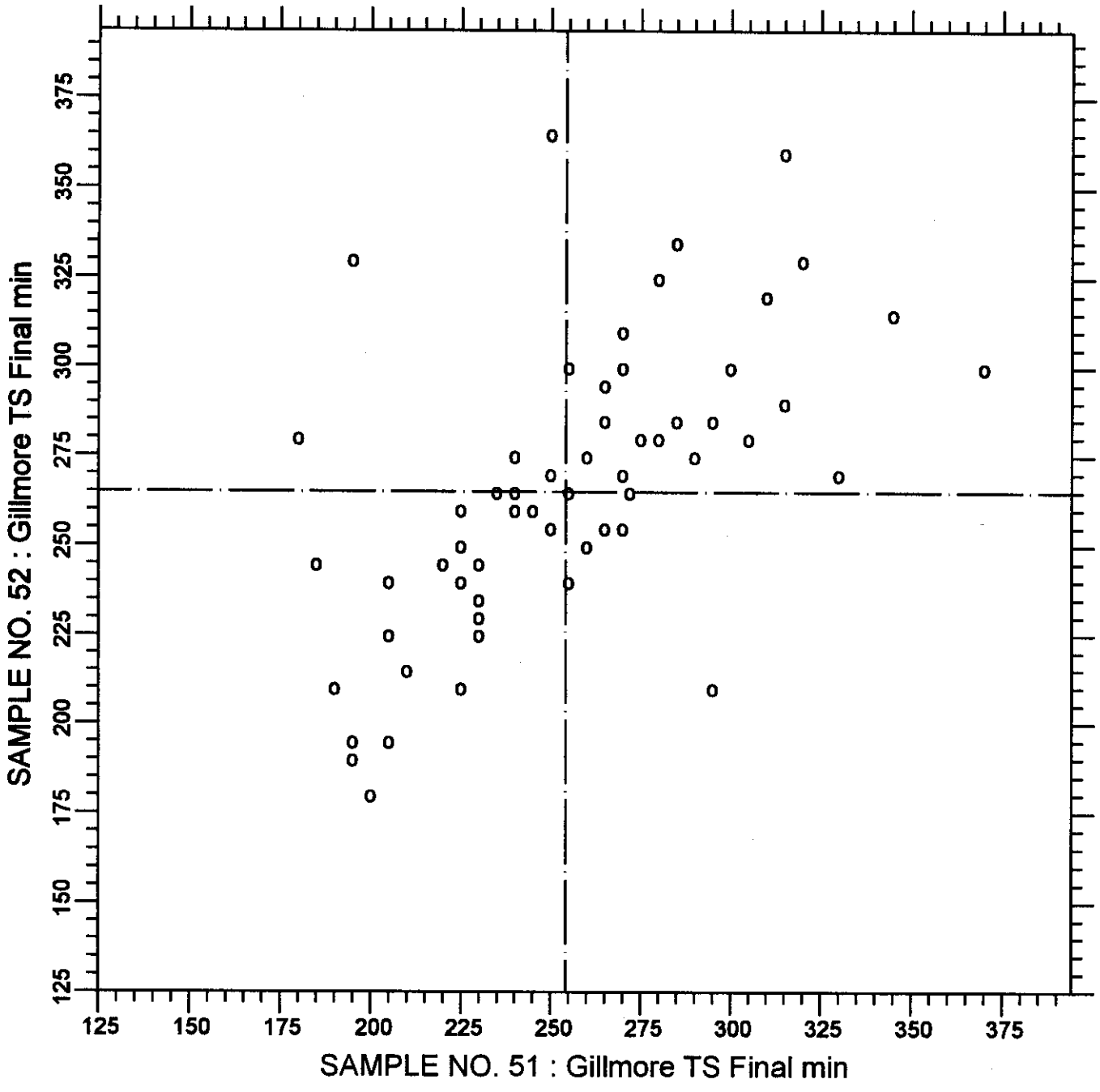
CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Initial
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.130 Gillmore TS Intial 61 POINTS

SAMPLE NO. 51 AVE 146.9 S.D. 25.5 C.V. 17.4
SAMPLE NO. 52 AVE 158.0 S.D. 28.4 C.V. 18.0
LABS ELIMINATED 125 1466
LABS OFF DIAGRAM 197

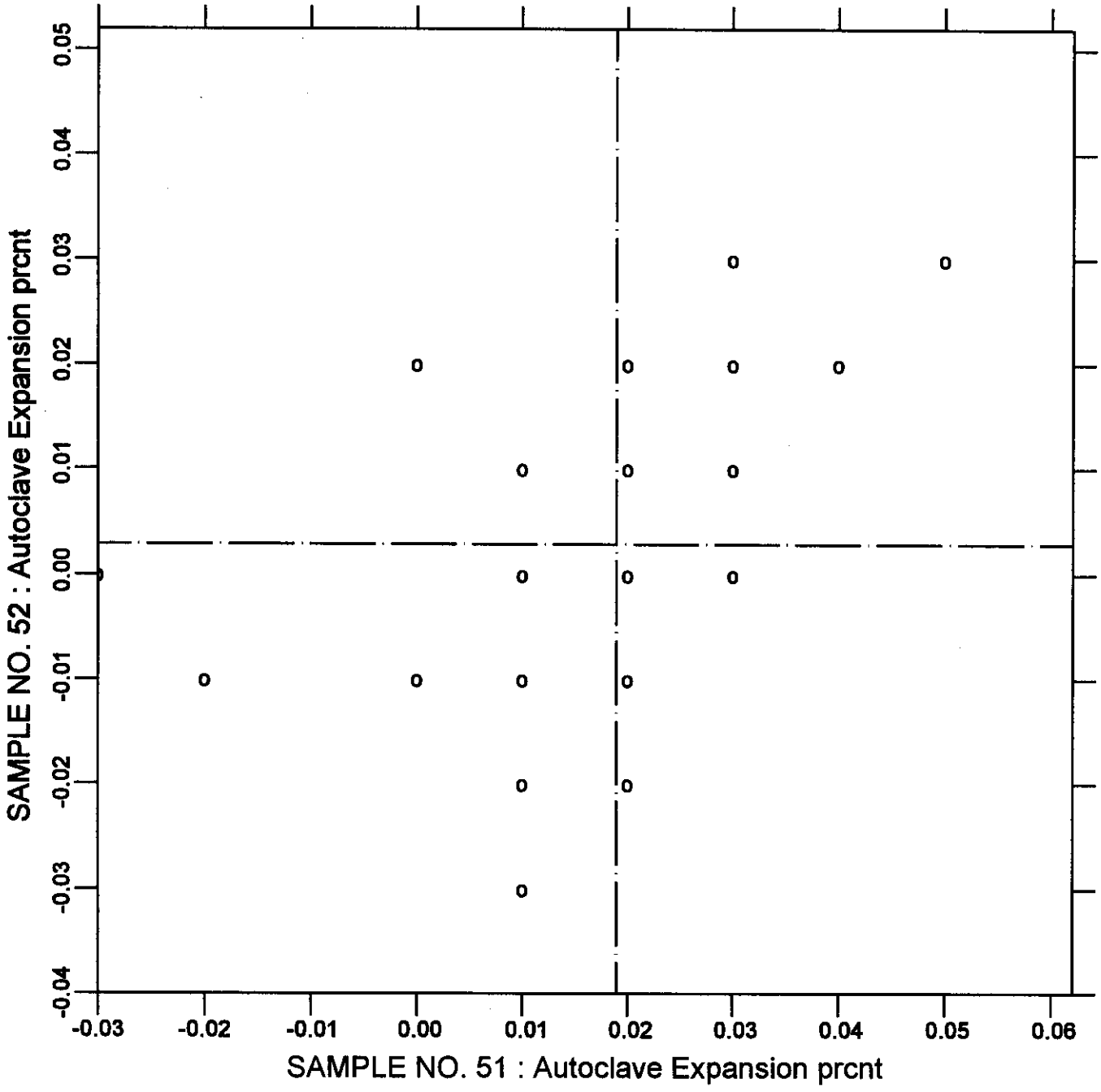
CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Final
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.140 **Gillmore TS Final** **63 POINTS**

SAMPLE NO. 51 AVE 254.2 S.D. 41.7 C.V. 16.4
SAMPLE NO. 52 AVE 265.0 S.D. 40.2 C.V. 15.2
LABS ELIMINATED 694

CCRL PROFICIENCY SAMPLE PROGRAM
Autoclave Expansion
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



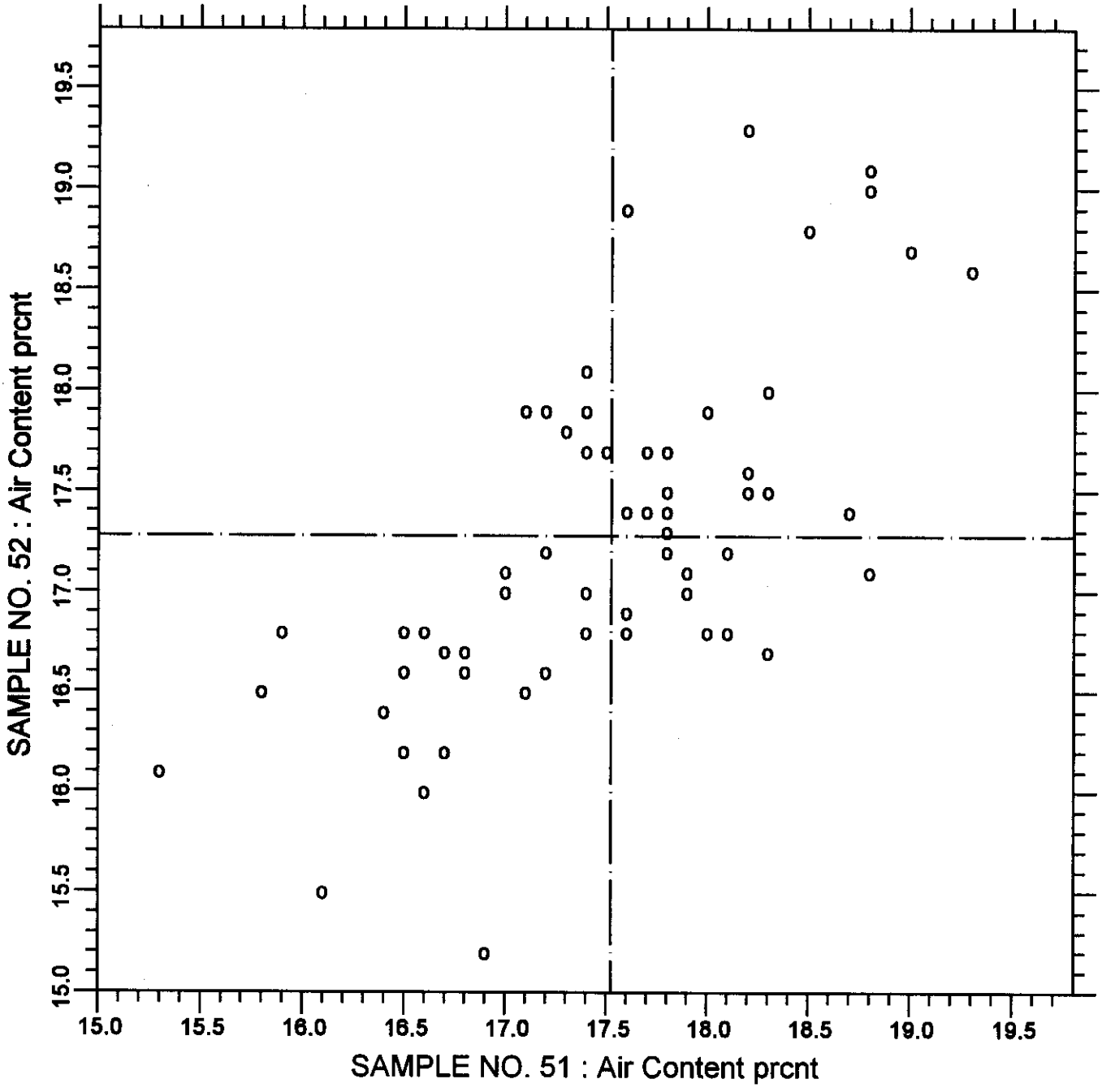
TEST NO.160 **Autoclave Expansion** **58 POINTS**

SAMPLE NO. 51 AVE 0.0190 S.D. 0.014 C.V. 72.4

SAMPLE NO. 52 AVE 0.0029 S.D. 0.012 C.V. 428.8

LABS ELIMINATED 244 56 151 690 1200

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.170 **Air Content** **63 POINTS**

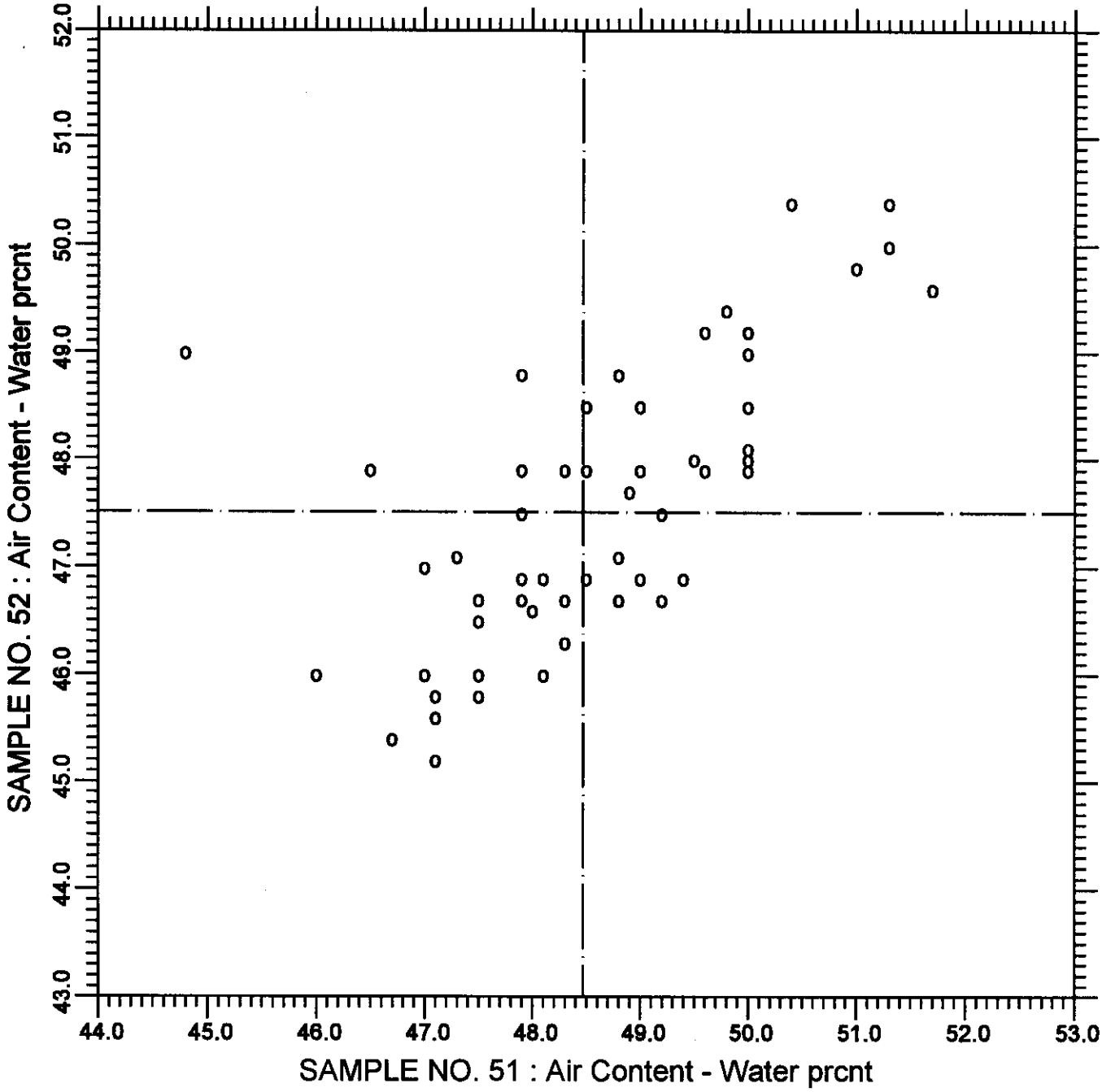
SAMPLE NO. 51 AVE 17.52 S.D. 0.89 C.V. 5.06

SAMPLE NO. 52 AVE 17.28 S.D. 0.89 C.V. 5.14

LABS ELIMINATED 441 1379

LABS OFF DIAGRAM 52

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Water
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.180 **Air Content - Water** **63 POINTS**

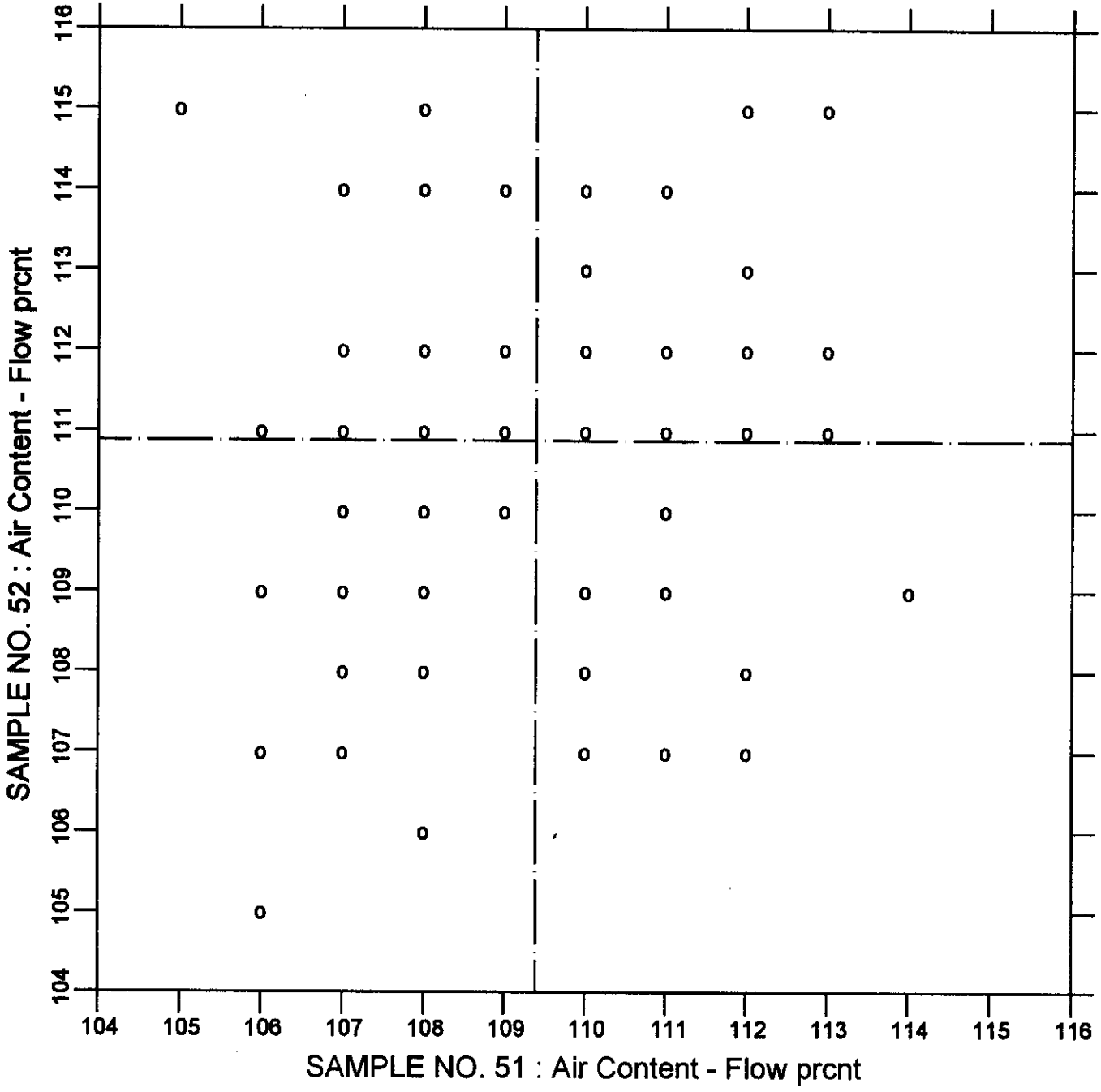
SAMPLE NO. 51 AVE 48.47 S.D. 1.5 C.V. 3.08

SAMPLE NO. 52 AVE 47.50 S.D. 1.2 C.V. 2.64

LABS ELIMINATED 148 1200 1466

LABS OFF DIAGRAM 692

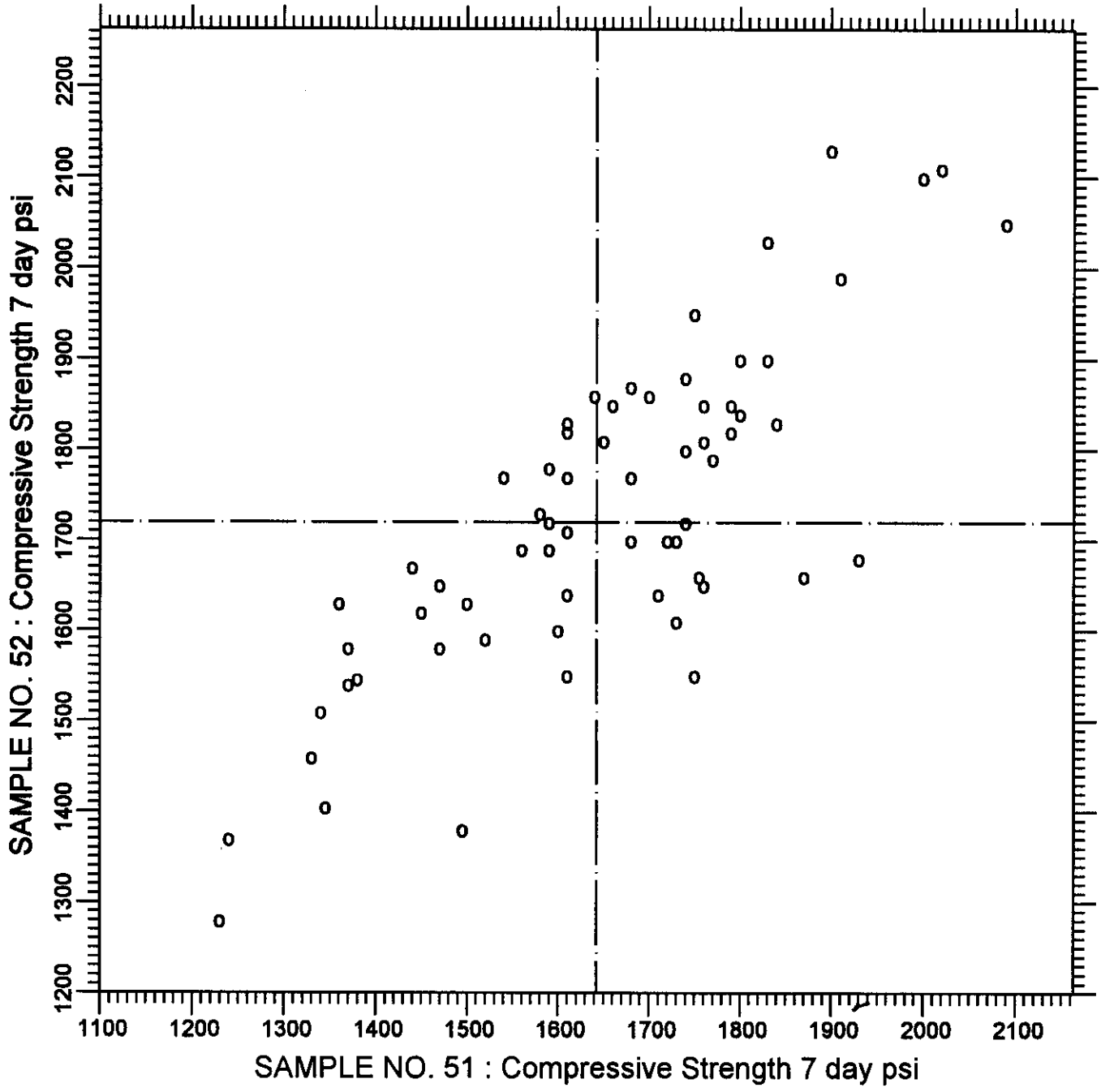
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Flow
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.190 **Air Content - Flow** **67 POINTS**

SAMPLE NO. 51	AVE	109.39	S.D.	2.2	C.V. 2.02
SAMPLE NO. 52	AVE	110.88	S.D.	2.6	C.V. 2.35

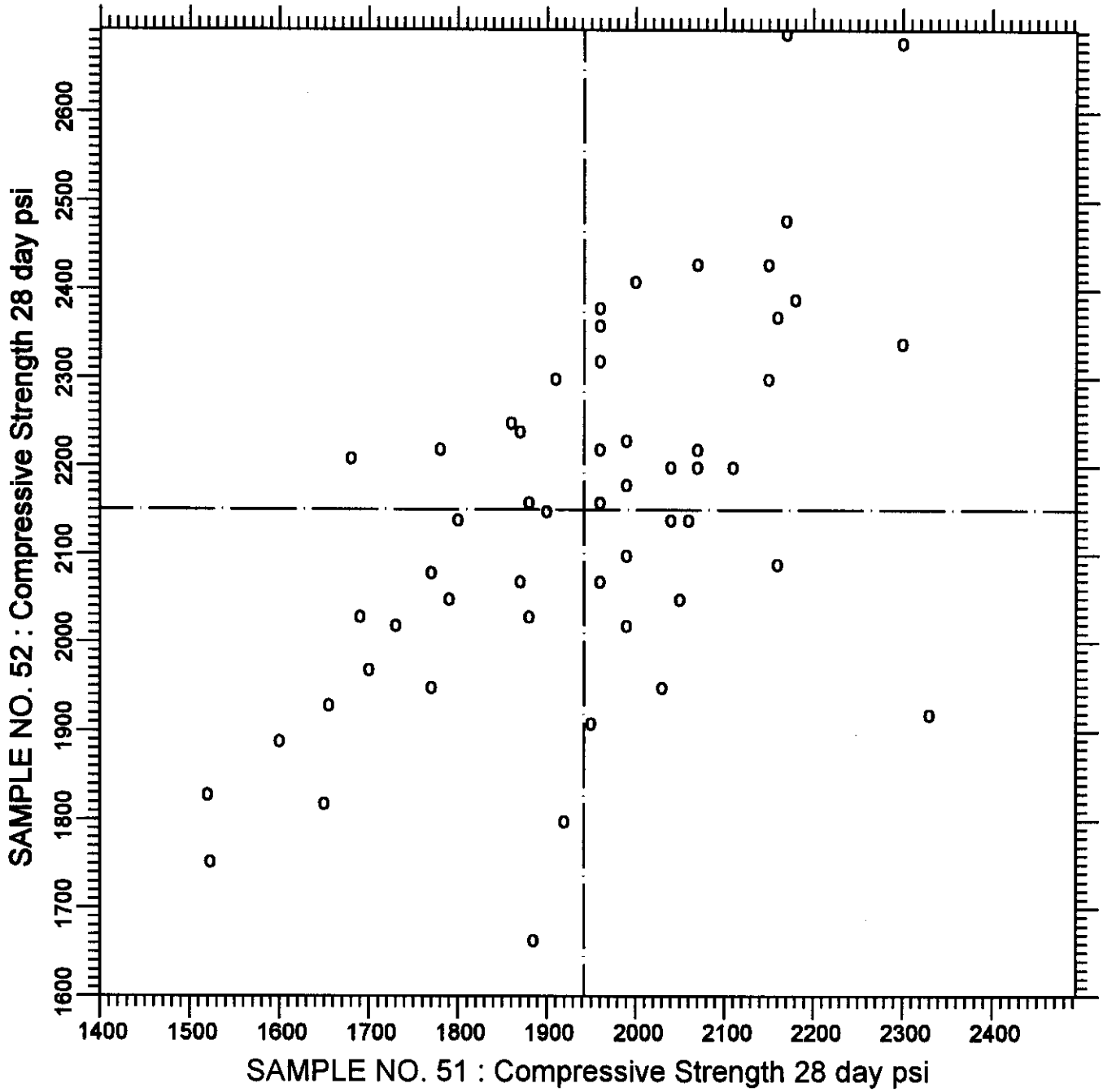
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7 day
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.210 Compressive Strength 7 day 65 POINTS

SAMPLE NO. 51 AVE 1642.6 S.D. 190.6 C.V. 11.6
SAMPLE NO. 52 AVE 1719.6 S.D. 194.4 C.V. 11.3
LABS ELIMINATED 289
LABS OFF DIAGRAM 9

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28 day
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



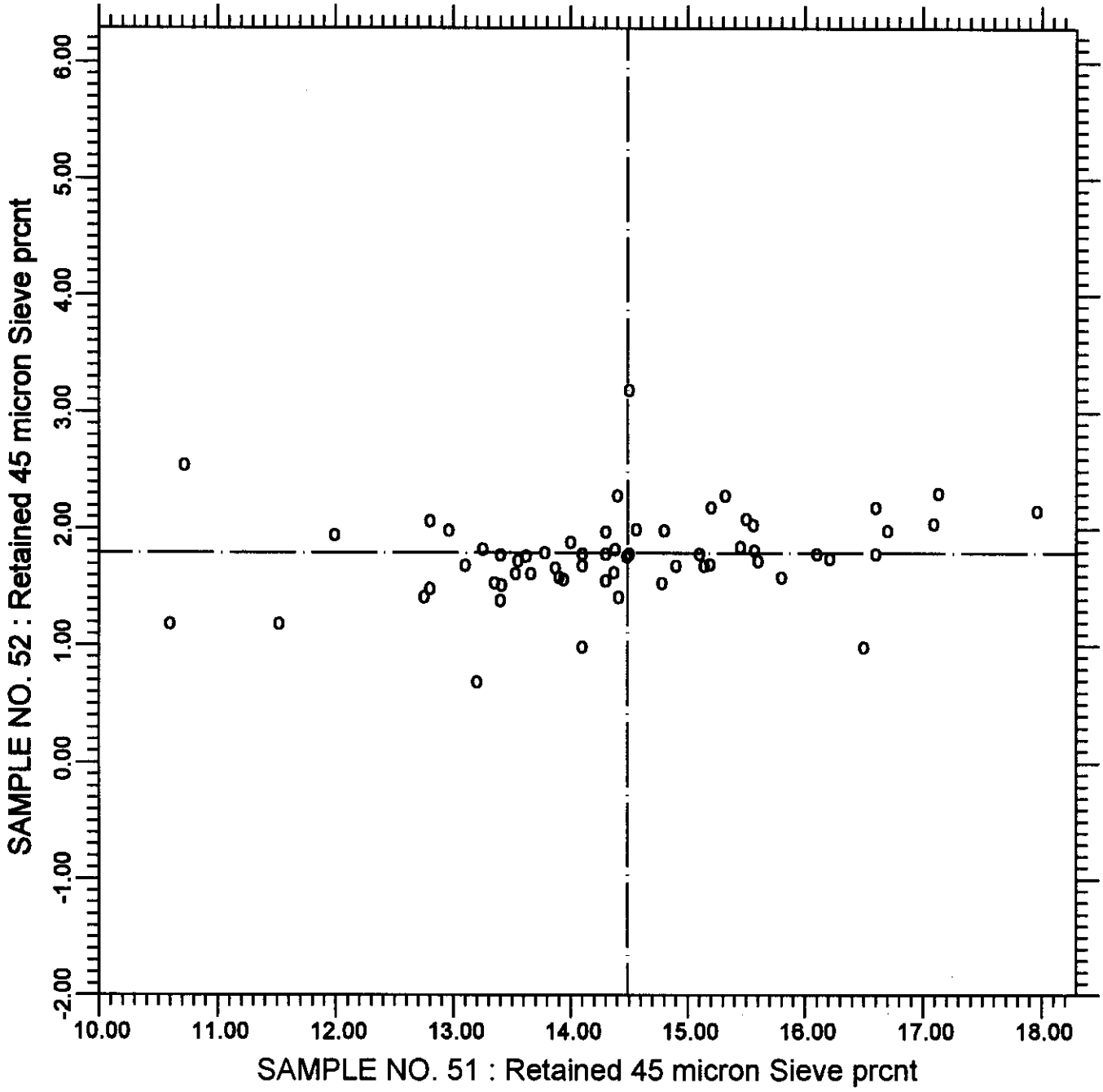
TEST NO.211 Compressive Strength 28 day 55 POINTS

SAMPLE NO. 51 AVE 1942.0 S.D. 189.0 C.V. 9.73

SAMPLE NO. 52 AVE 2150.7 S.D. 212.6 C.V. 9.89

LABS ELIMINATED 20 289

CCRL PROFICIENCY SAMPLE PROGRAM
Fineness - 45 micron Sieve Retained
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.281 Retained 45 micron Sieve 61 POINTS

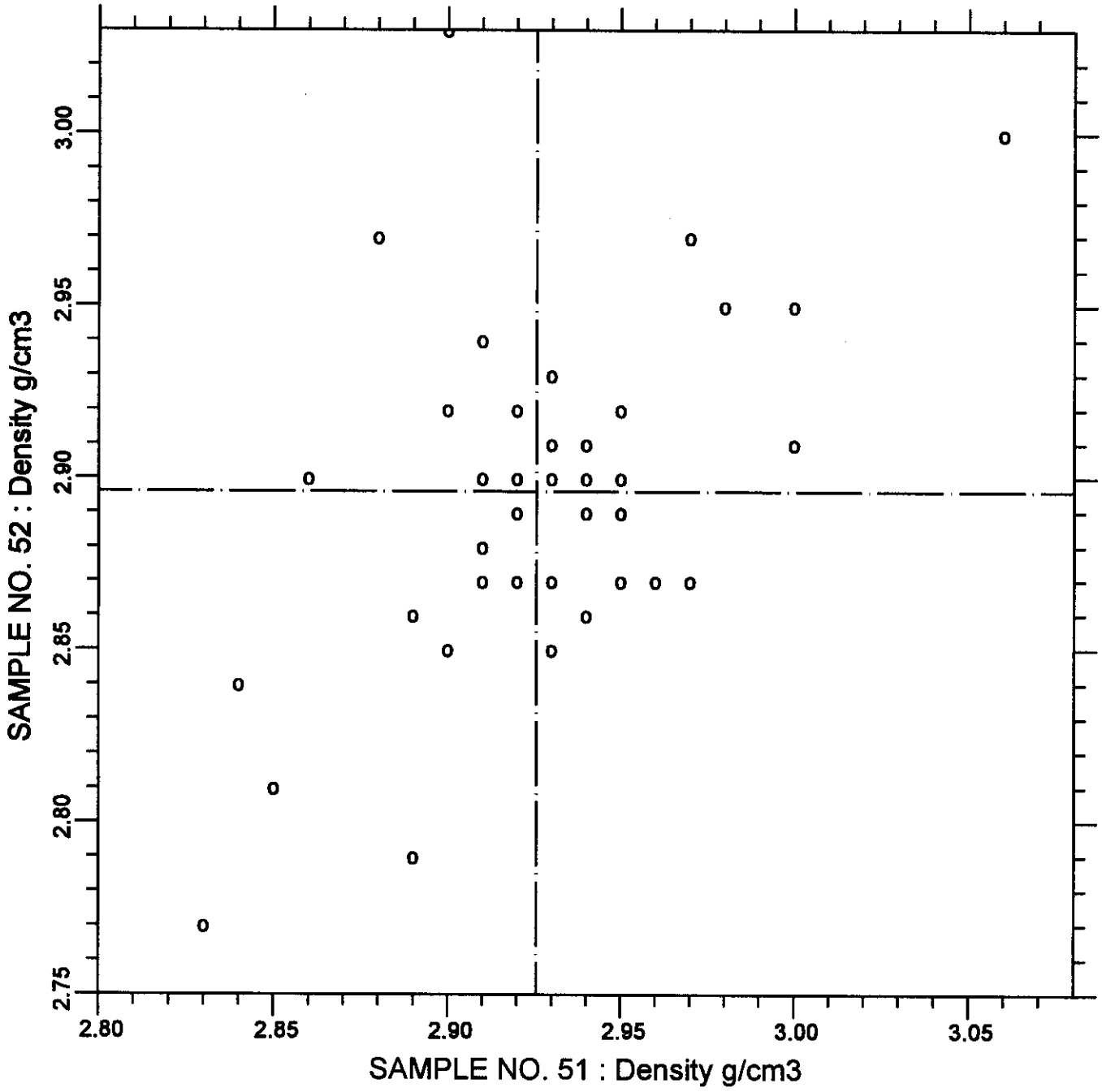
SAMPLE NO. 51 AVE 14.487 S.D. 1.60 C.V. 11.0

SAMPLE NO. 52 AVE 1.795 S.D. 0.38 C.V. 21.3

LABS ELIMINATED 54 201 1200 1466

LABS OFF DIAGRAM 125

CCRL PROFICIENCY SAMPLE PROGRAM
Density
MASONRY CEMENT SAMPLES NO. 51 & NO. 52

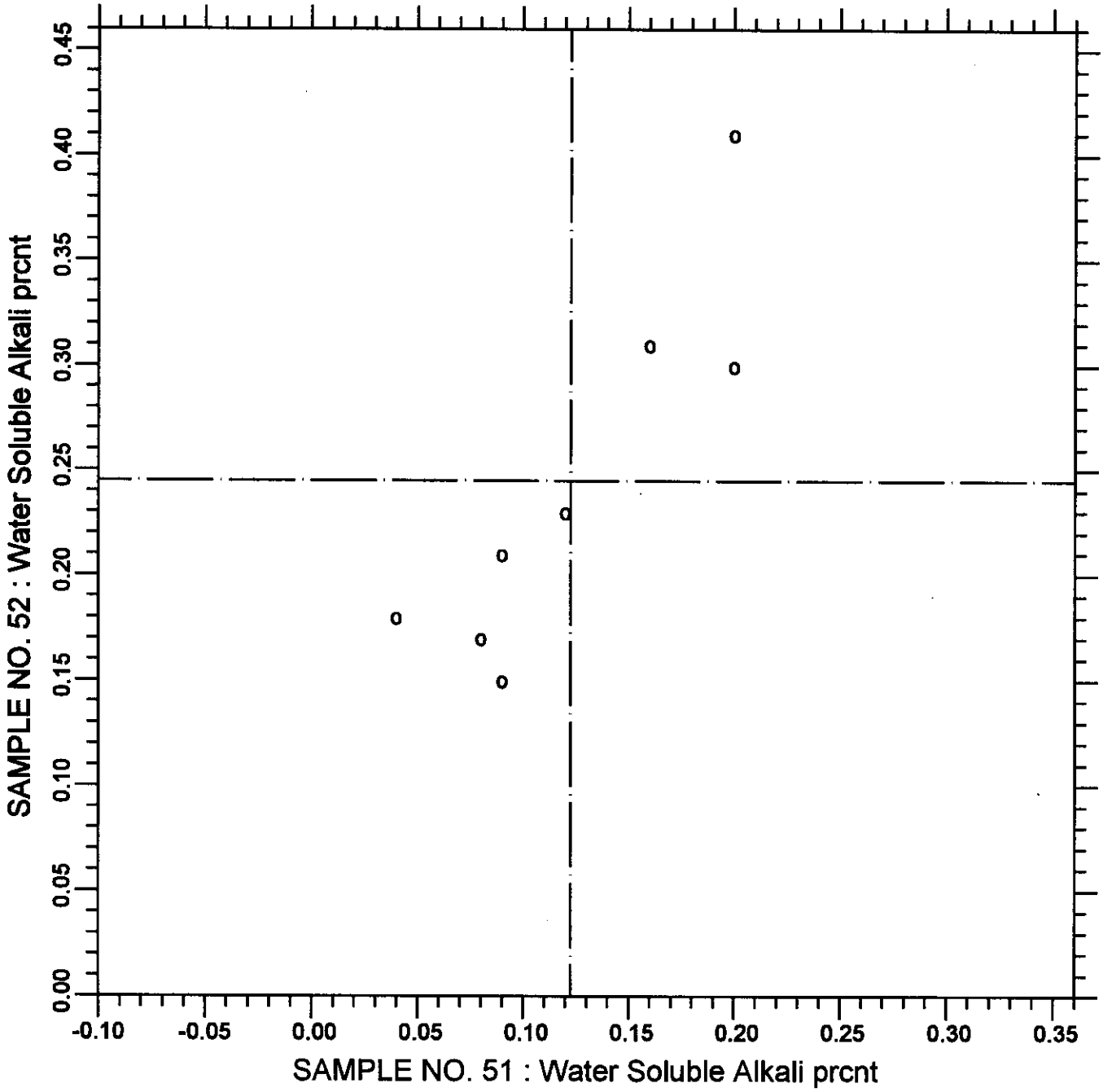


TEST NO.310 **Density** **55 POINTS**

SAMPLE NO. 51	AVE	2.9256	S.D.	0.038	C.V.	1.30
SAMPLE NO. 52	AVE	2.8960	S.D.	0.044	C.V.	1.53

LABS ELIMINATED 201

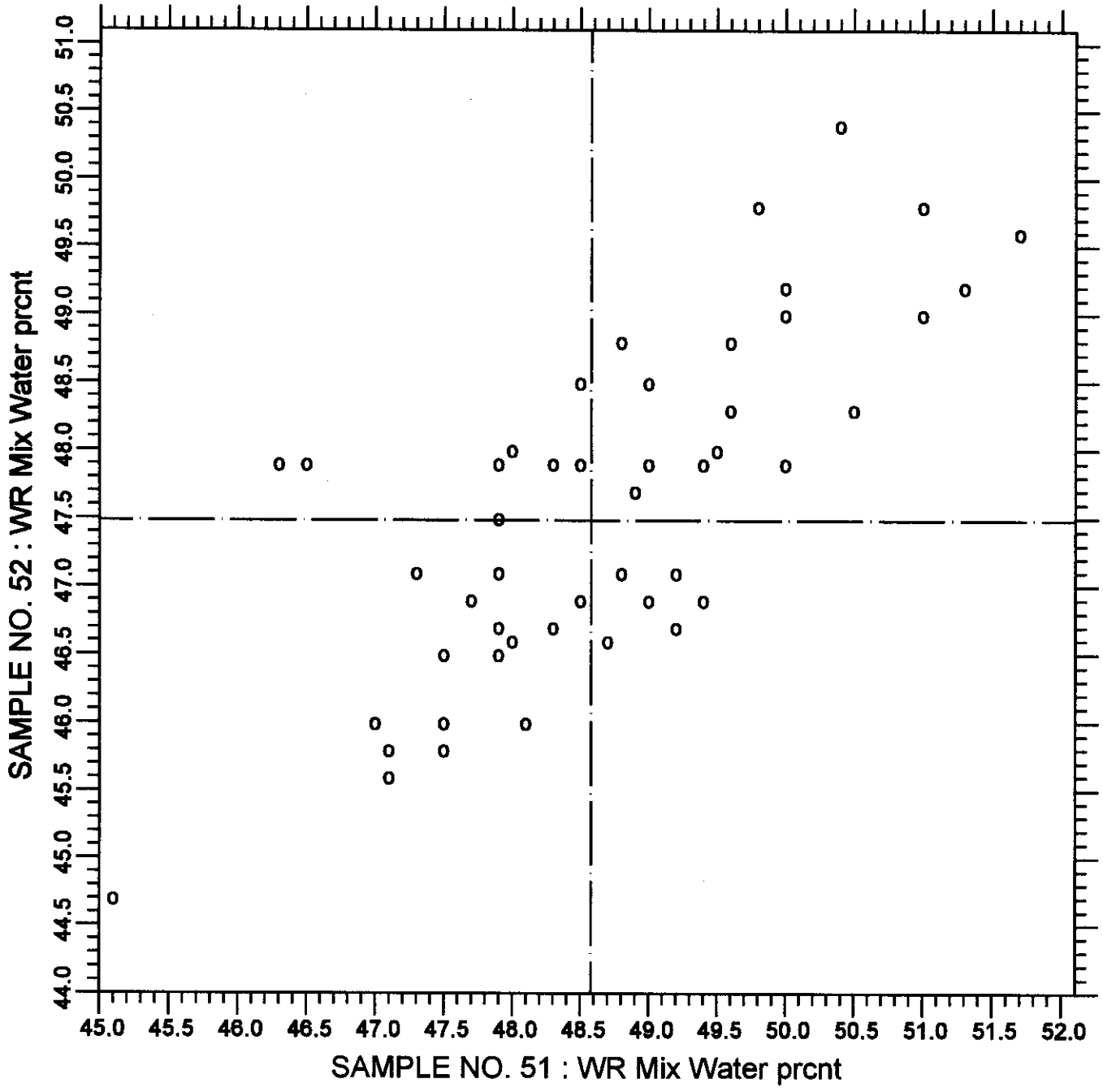
CCRL PROFICIENCY SAMPLE PROGRAM
Water-Soluble Alkali
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.320 **Water Soluble Alkali** **8 POINTS**

SAMPLE NO. 51	AVE	0.122	S.D.	0.059	C.V.	47.9
SAMPLE NO. 52	AVE	0.245	S.D.	0.088	C.V.	36.1

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Water
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



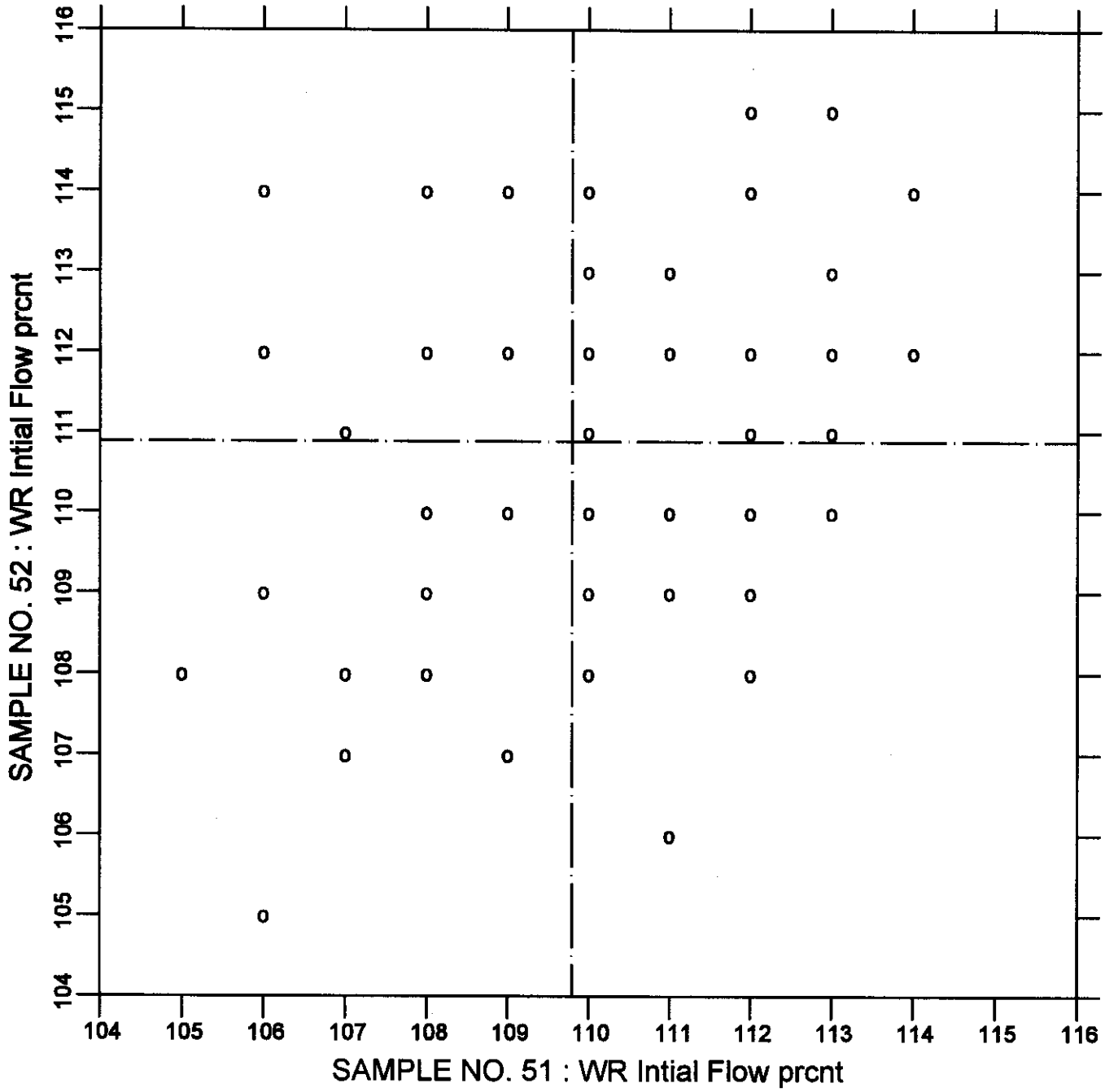
TEST NO.330 **WR Mix Water** **55 POINTS**

SAMPLE NO. 51 AVE 48.58 S.D. 1.3 C.V. 2.70

SAMPLE NO. 52 AVE 47.48 S.D. 1.2 C.V. 2.58

LABS ELIMINATED 148 289 694 1466

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Initial Flow
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



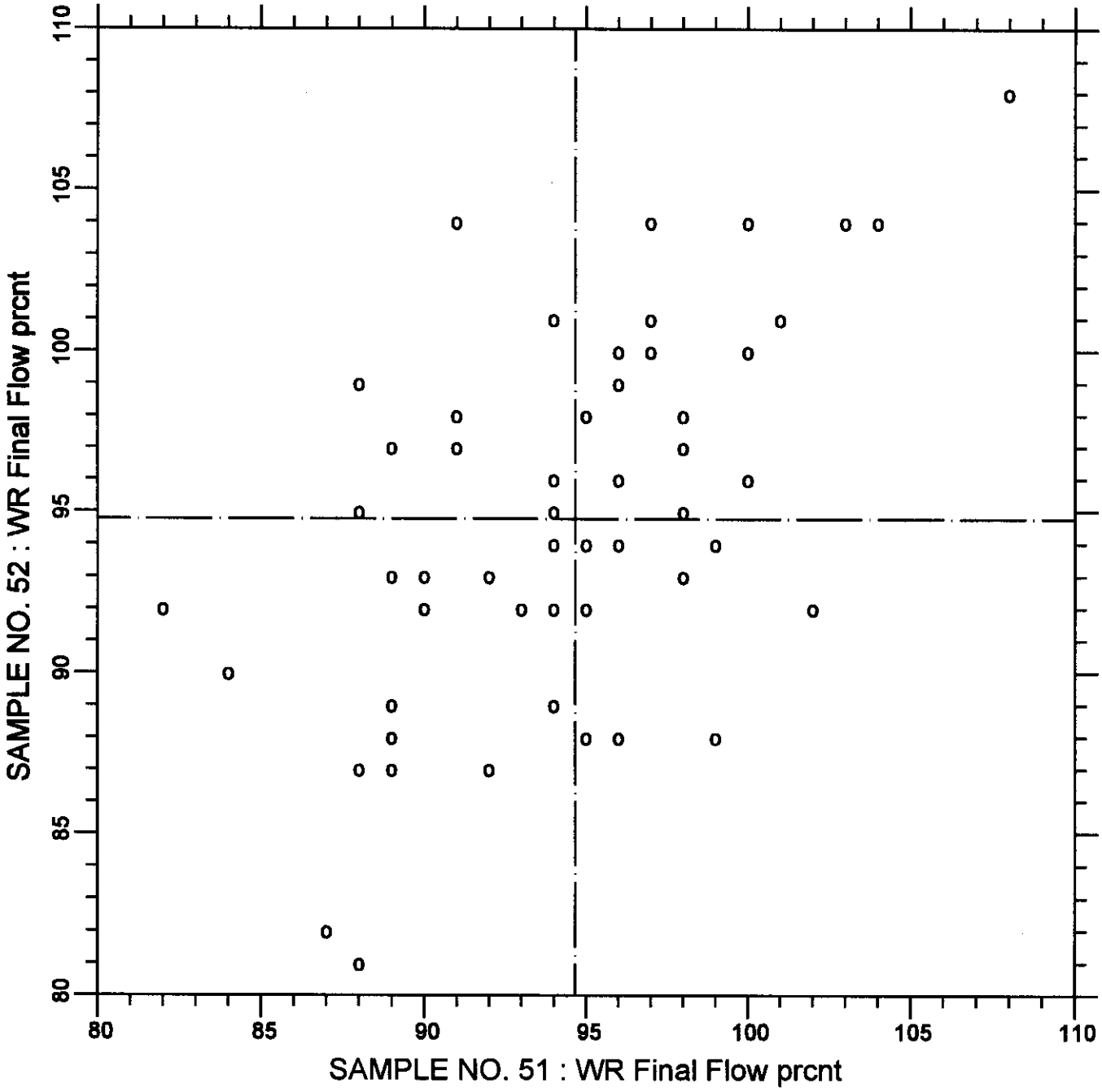
TEST NO.331 **WR Intial Flow** **59 POINTS**

SAMPLE NO. 51 AVE 109.80 S.D. 2.4 C.V. 2.14

SAMPLE NO. 52 AVE 110.88 S.D. 2.4 C.V. 2.12

LABS ELIMINATED 162

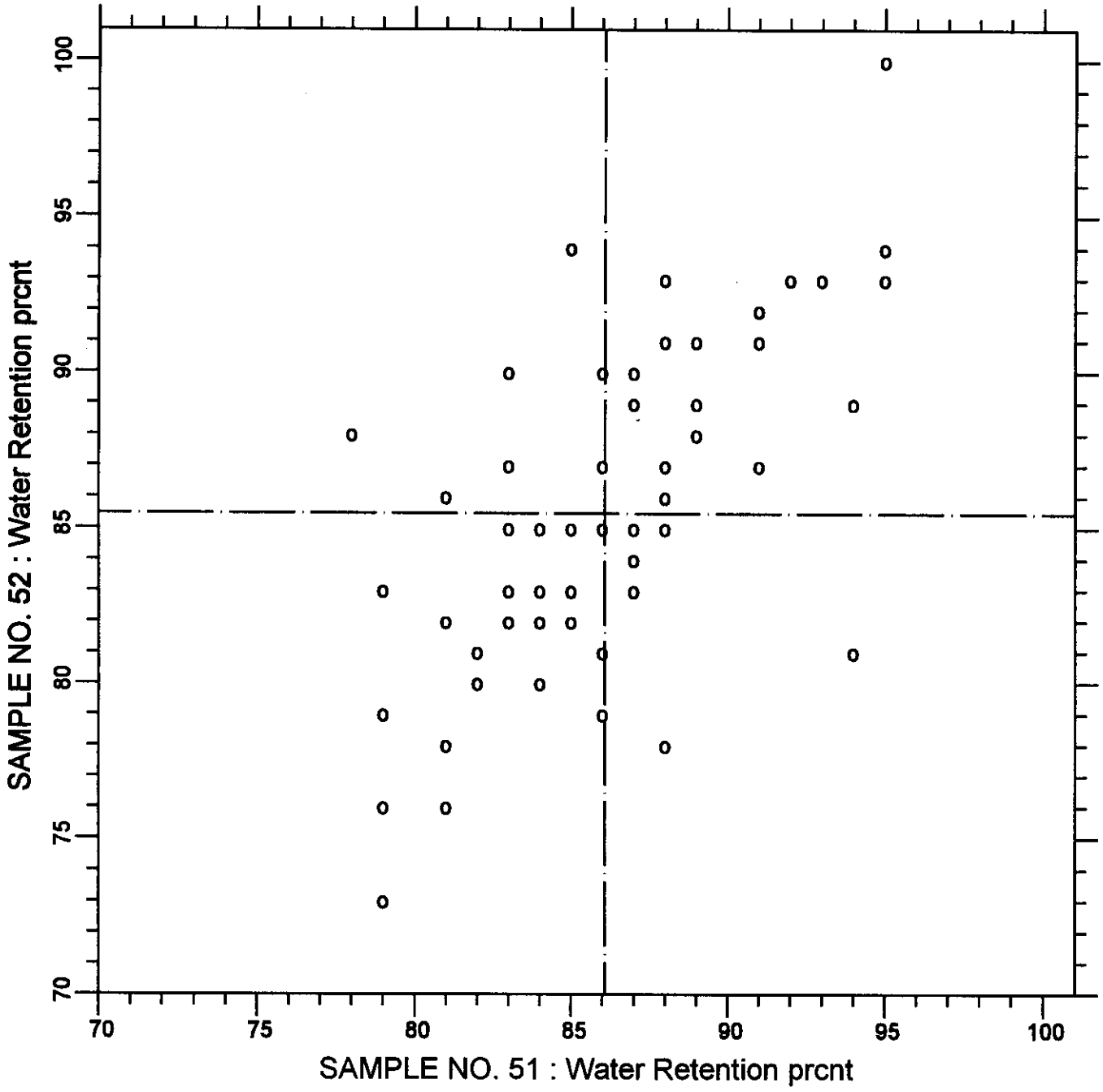
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Final Flow
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.332 **WR Final Flow** **60 POINTS**

SAMPLE NO. 51	AVE	94.67	S.D.	5.3	C.V. 5.59
SAMPLE NO. 52	AVE	94.77	S.D.	5.8	C.V. 6.12

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention Value
MASONRY CEMENT SAMPLES NO. 51 & NO. 52



TEST NO.333 **Water Retention** **60 POINTS**

SAMPLE NO. 51	AVE	86.08	S.D.	4.3	C.V.	4.95
SAMPLE NO. 52	AVE	85.47	S.D.	5.2	C.V.	6.12