CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report

Masonry Cement Proficiency Samples

Number 49 and Number 50

October 2002

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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October 25, 2002

TO: Participants in the CCRL Masonry Cement Proficiency Sample Program

SUBJECT: Final Report on Masonry Cement Proficiency Samples No. 49 and No. 50

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 2002.

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 2003.

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. 49 and No. 50

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 2002. 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.

Each laboratory receives an individualized Table of Results. The Table of Results shows the test number, test title and the reporting unit in the first three columns. After that it lists in order, 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. (See reverse for an explanation of the scatter diagrams.)

Laboratory ratings, shown in the Table of Results 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 - General

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 subscription to the given 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 indicates strong evidence of bias on many tests.

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 49 and No. 50
Final Report - October 25, 2002

SUMMARY OF RESULTS

Test		#Labs	Sample No. 49 Average	S.D.	C.V.	Sample No. 50 Average	S.D.	C.V.
N.C. Water	prcnt	62	24.1	0.60	2.51	28.3	0.65	2.30
N.C. Water	prcnt	* 58	24.0	0.45	1.86	28.4	0.47	1.65
Gillmore TS Initial	min	60	210	36.1	17.2	302	54.1	17.9
Gillmore TS Final	min	58	329	42.2	12.8	448	83.2	18.6
Gillmore TS Final	min	* 56	332	39.0	11.7	440	53.0	12.0
Autoclave Expan	prcnt	59	0.04	0.11	288	0.01	0.11	837
Autoclave Expan	prcnt	* 57	0.02	0.016	84	0.00	0.020	-619
Air Content	prcnt	61	18.9	1.5	7.92	17.0	1.7	10.05
Air Content	prcnt	* 60	18.8	1.3	6.81	16.9	1.4	8.62
AC Mix Water	prcnt	61	43.3	8.8	20.2	45.6	9.1	20.0
AC Mix Water	prcnt	* 57	44.2	1.4	3.26	46.5	1.3	2.90
AC Flow	prcnt	62	109	9.5	8.72	109	3.5	3.26
AC Flow	prcnt	* 59	111	2.7	2.47	109	2.2	2.04
Comp Str 7-day	psi	62	2148	359.4	16.7	1677	249.5	14.9
Comp Str 28-day	psi	56	2704	403.8	14.9	2178	621.5	28.5
Comp Str 28-day	psi	* 52	2732	365.1	13.4	2071	246.0	11.9

CONTINUED ON REVERSE SIDE

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

N.C. Water	148 162 438 1053
Gillmore TS Final	93 178
Autoclave Expansion	289 1200
Air Content	103
AC Mix Water	148 103 1200 1466
AC Flow	74 103 255
Comp Str 28-day	440 98 494 1200

CCRL PROFICIENCY SAMPLE PROGRAM
Masonry Cement Proficiency Samples No. 49 and No. 50
Final Report - October 25, 2002

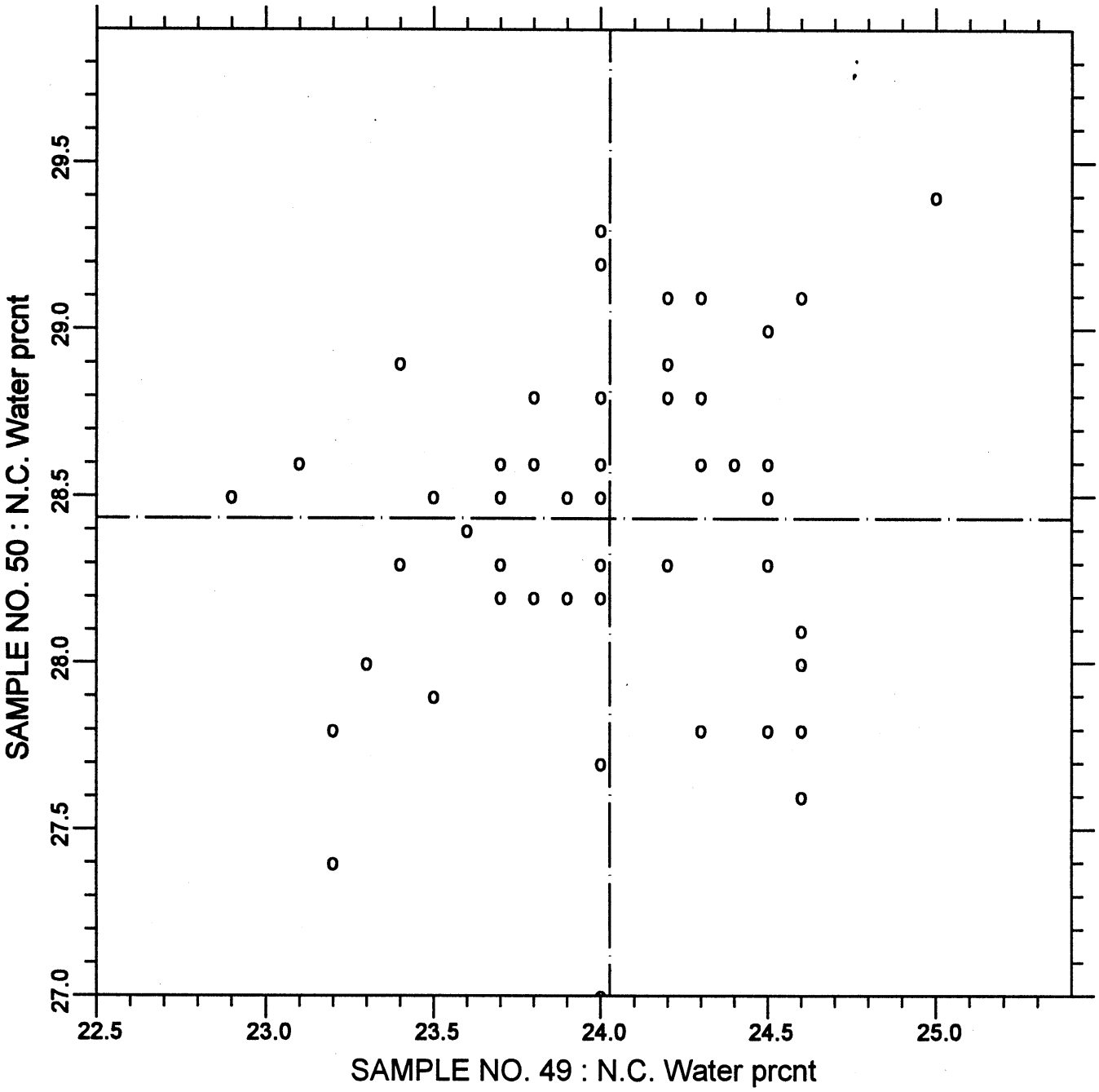
SUMMARY OF RESULTS

			Sample No. 49			Sample No. 50		
Test		#Labs	Average	S.D.	C.V.	Average	S.D.	C.V.
45μm sieve	prcnt	62	7.07	1.00	14.1	5.64	0.87	15.4
45μm sieve	prcnt	* 59	7.05	0.75	10.64	5.66	0.51	8.99
Density	g/cm^3	49	2.96	0.089	3.02	2.88	0.070	2.42
Density	g/cm^3	* 46	2.96	0.045	1.52	2.86	0.045	1.57
Water Sol Alkali	prcnt	9	0.08	0.061	78.4	0.08	0.048	62.2
WATER RETENTION								
WR Mix Water	prcnt	53	45.1	14.5	32.1	46.2	11.4	24.7
WR Mix Water	prcnt	* 48	44.2	1.5	3.40	46.7	1.3	2.85
WR Initial Flow	prcnt	53	111	3.7	3.35	109	4.6	4.21
WR Initial Flow	prcnt	* 51	111	2.6	2.36	109	2.8	2.52
WR Final Flow	prcnt	53	95	6.4	6.77	92	5.7	6.18
Water Retention	prcnt	54	85	4.8	5.69	84	4.7	5.62
Water Retention	prcnt	* 53	85	4.1	4.80	84	4.7	5.62

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

45μm sieve	493 56 1200
Density	159 96 244
WR Mix Water	56 148 440 1200 1466
WR Initial Flow	309 162
Water Retention	413

CCRL PROFICIENCY SAMPLE PROGRAM
Normal Consistency - Water
MASONRY CEMENT SAMPLE NOS. 49 & 50



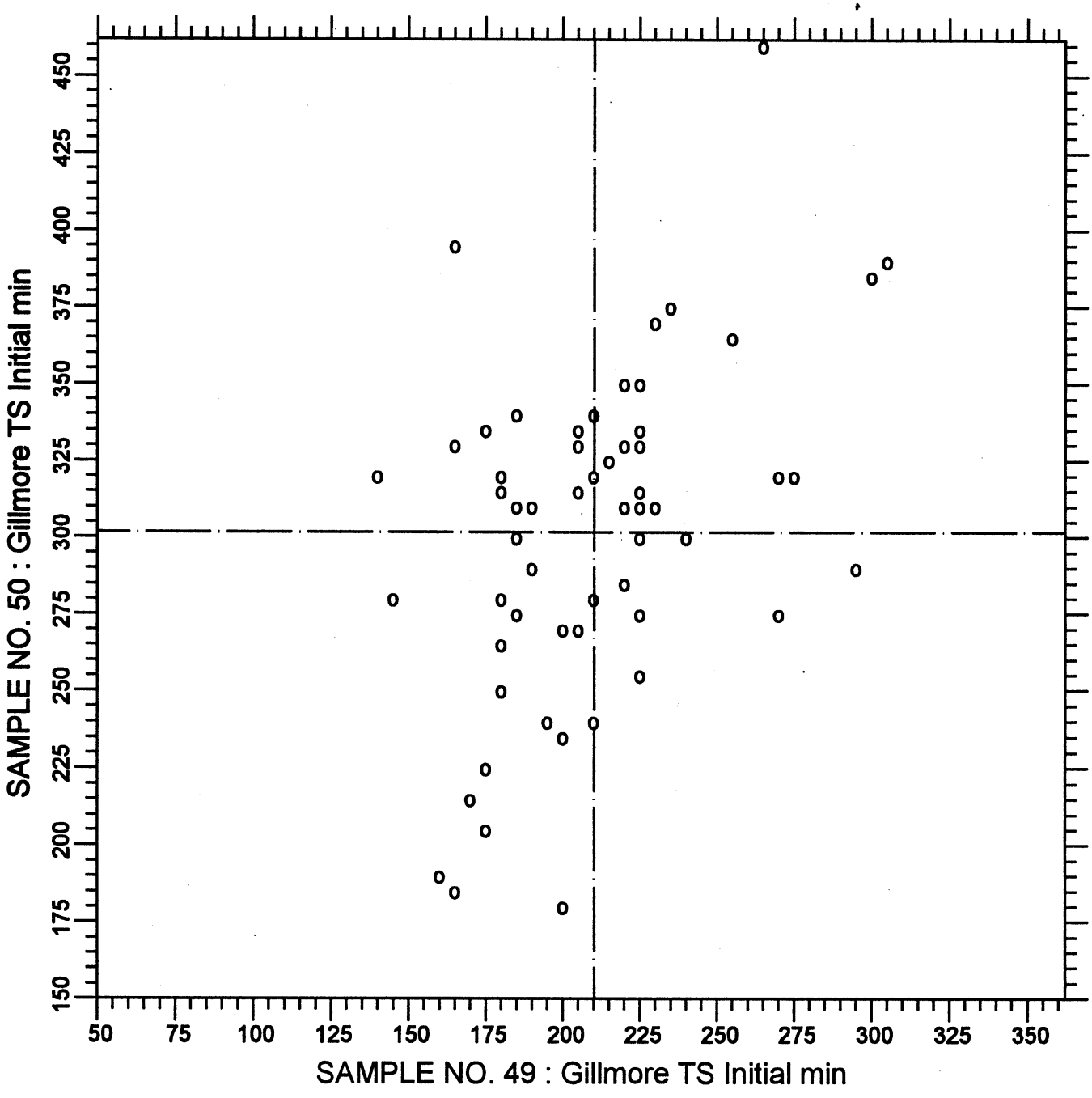
TEST NO.110 **N.C. Water** **58 POINTS**

SAMPLE NO. 49 AVE 24.028 S.D. 0.45 C.V. 1.86

SAMPLE NO. 50 AVE 28.434 S.D. 0.47 C.V. 1.65

LABS ELIMINATED 148 162 438 1053

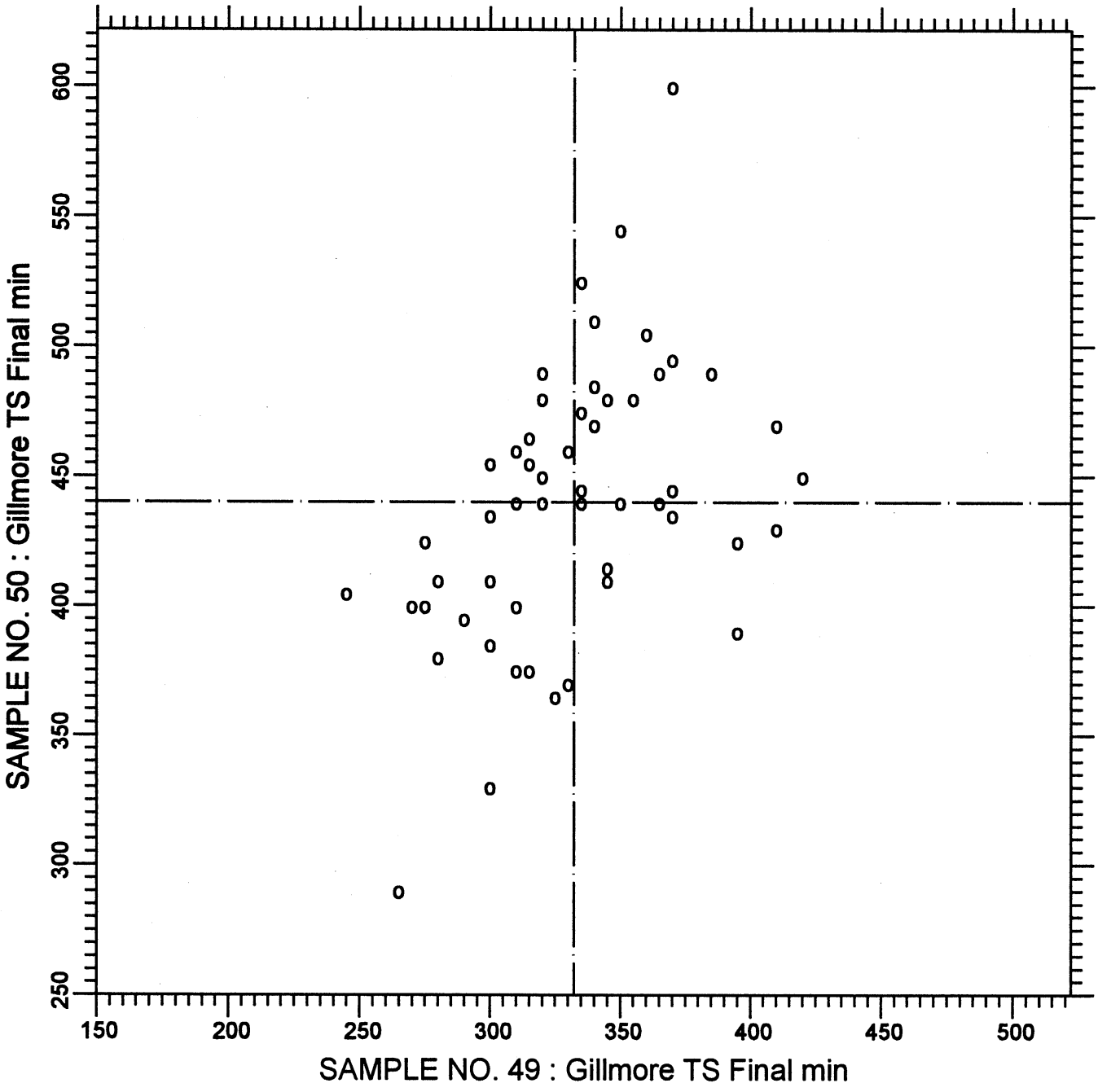
CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Initial
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.130 **Gillmore TS Initial** **60 POINTS**

SAMPLE NO. 49	AVE 210.2	S.D. 36.1	C.V. 17.2
SAMPLE NO. 50	AVE 301.6	S.D. 54.1	C.V. 17.9

CCRL PROFICIENCY SAMPLE PROGRAM
Gillmore Time of Set - Final
MASONRY CEMENT SAMPLE NOS. 49 & 50



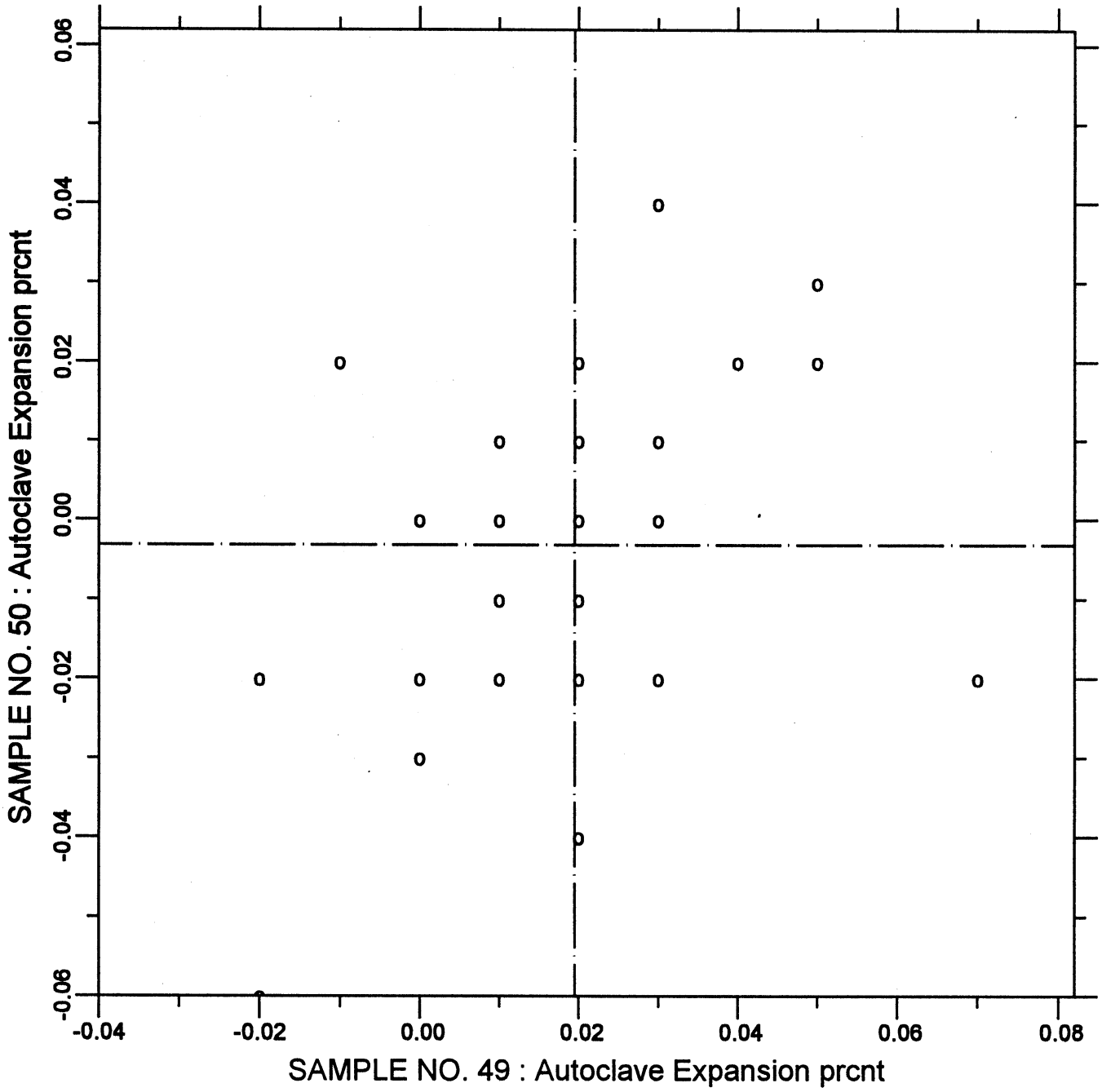
TEST NO.140 **Gillmore TS Final** **56 POINTS**

SAMPLE NO. 49 AVE 332.1 S.D. 39.0 C.V. 11.7

SAMPLE NO. 50 AVE 440.2 S.D. 53.0 C.V. 12.0

LABS ELIMINATED 93 178

CCRL PROFICIENCY SAMPLE PROGRAM
Autoclave Expansion
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.160 **Autoclave Expansion** **56 POINTS**

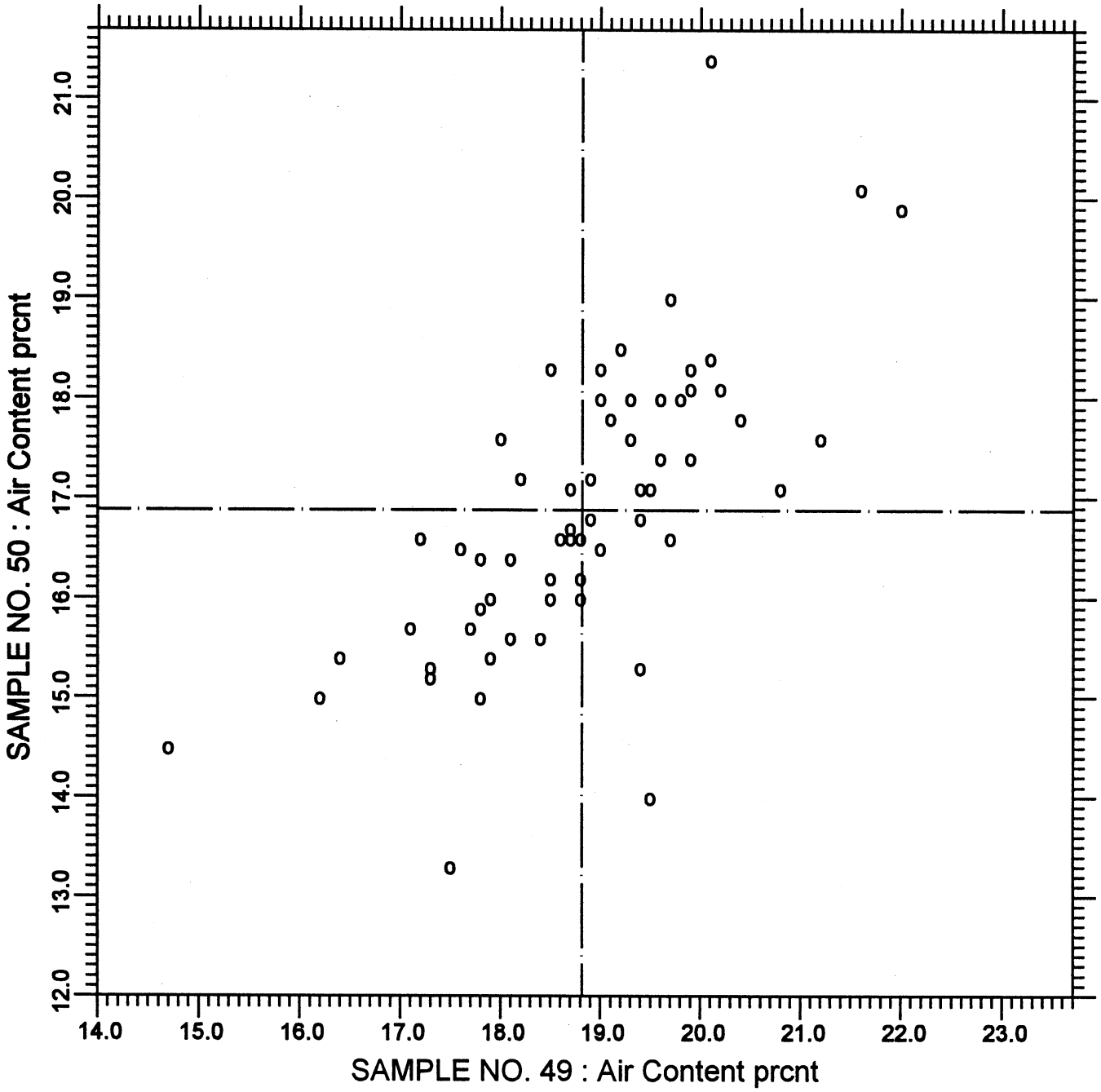
SAMPLE NO. 49 AVE 0.0195 S.D. 0.016 C.V. 84.279

SAMPLE NO. 50 AVE -0.0032 S.D. 0.020 C.V. -619.492

LABS ELIMINATED 289 1200

LABS OFF DIAGRAM 178

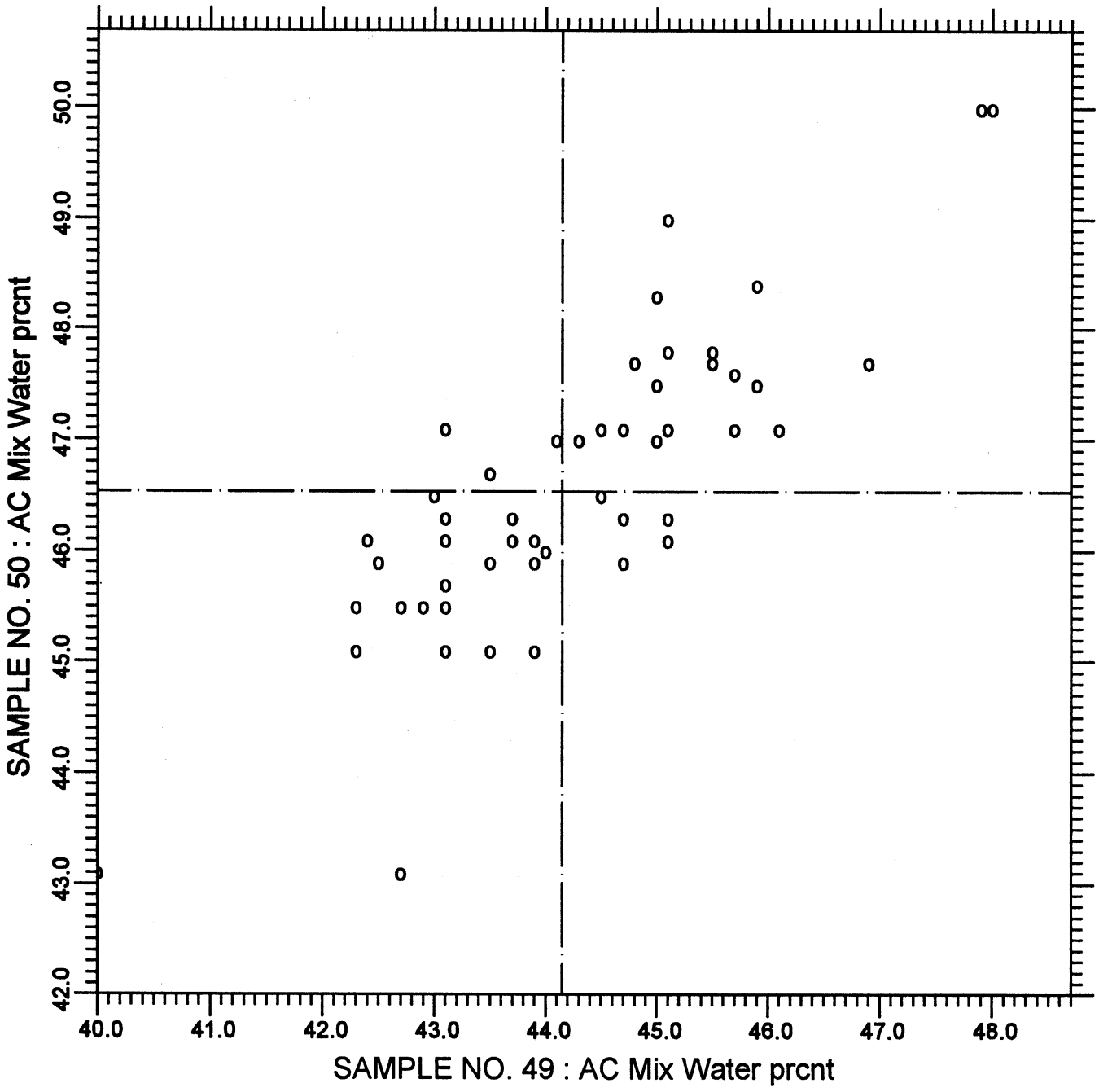
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.170 **Air Content** **60 POINTS**

SAMPLE NO. 49 AVE 18.82 S.D. 1.3 C.V. 6.81
SAMPLE NO. 50 AVE 16.88 S.D. 1.4 C.V. 8.62
LABS ELIMINATED 103

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Water
MASONRY CEMENT SAMPLE NOS. 49 & 50



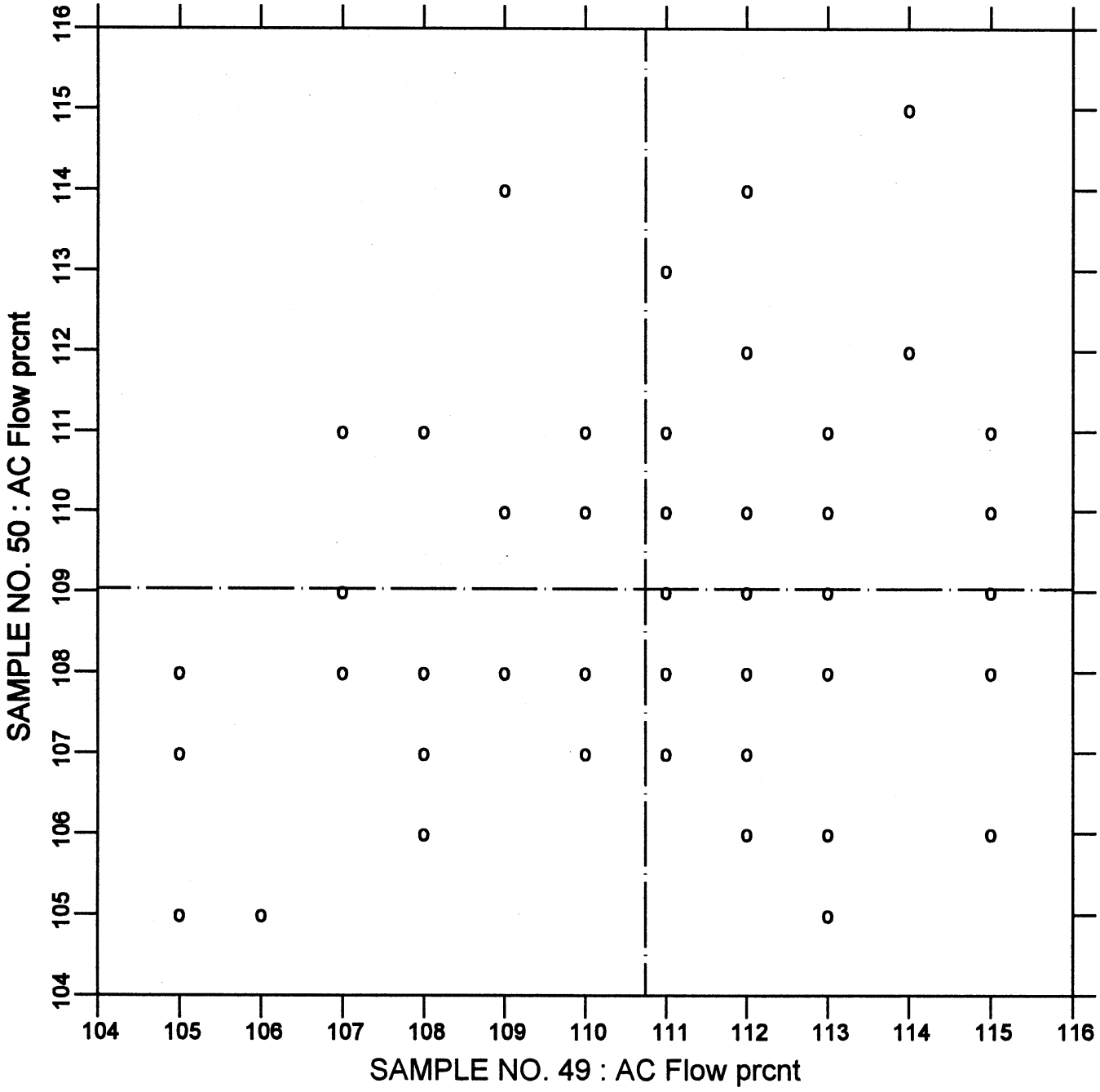
TEST NO.180 **AC Mix Water** **57 POINTS**

SAMPLE NO. 49 AVE 44.15 S.D. 1.4 C.V. 3.26

SAMPLE NO. 50 AVE 46.54 S.D. 1.3 C.V. 2.90

LABS ELIMINATED 148 103 1200 1466

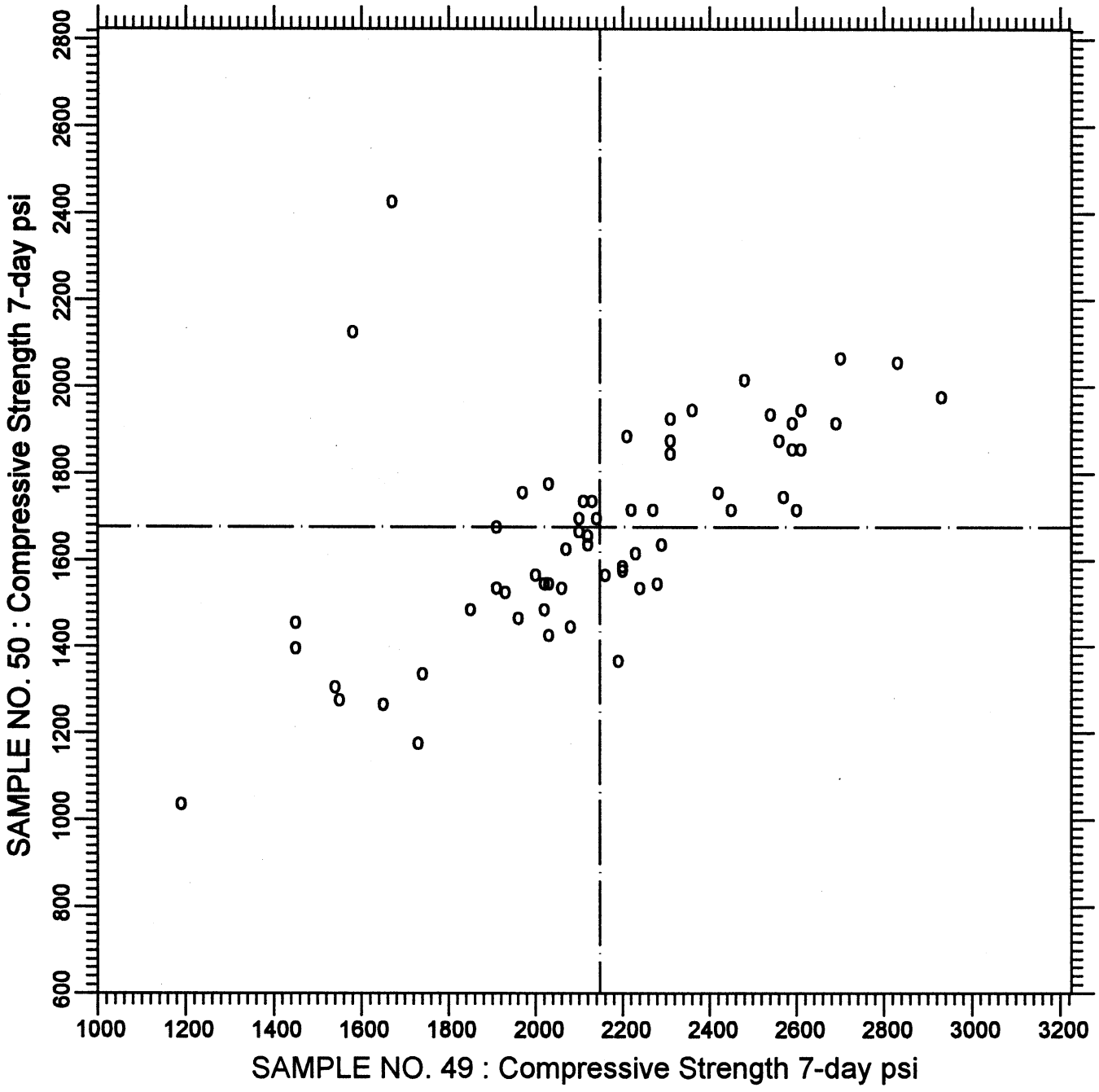
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Flow
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.190 **AC Flow** **59 POINTS**

SAMPLE NO. 49 AVE 110.74 S.D. 2.7 C.V. 2.47
SAMPLE NO. 50 AVE 109.03 S.D. 2.2 C.V. 2.04
LABS ELIMINATED 74 103 255

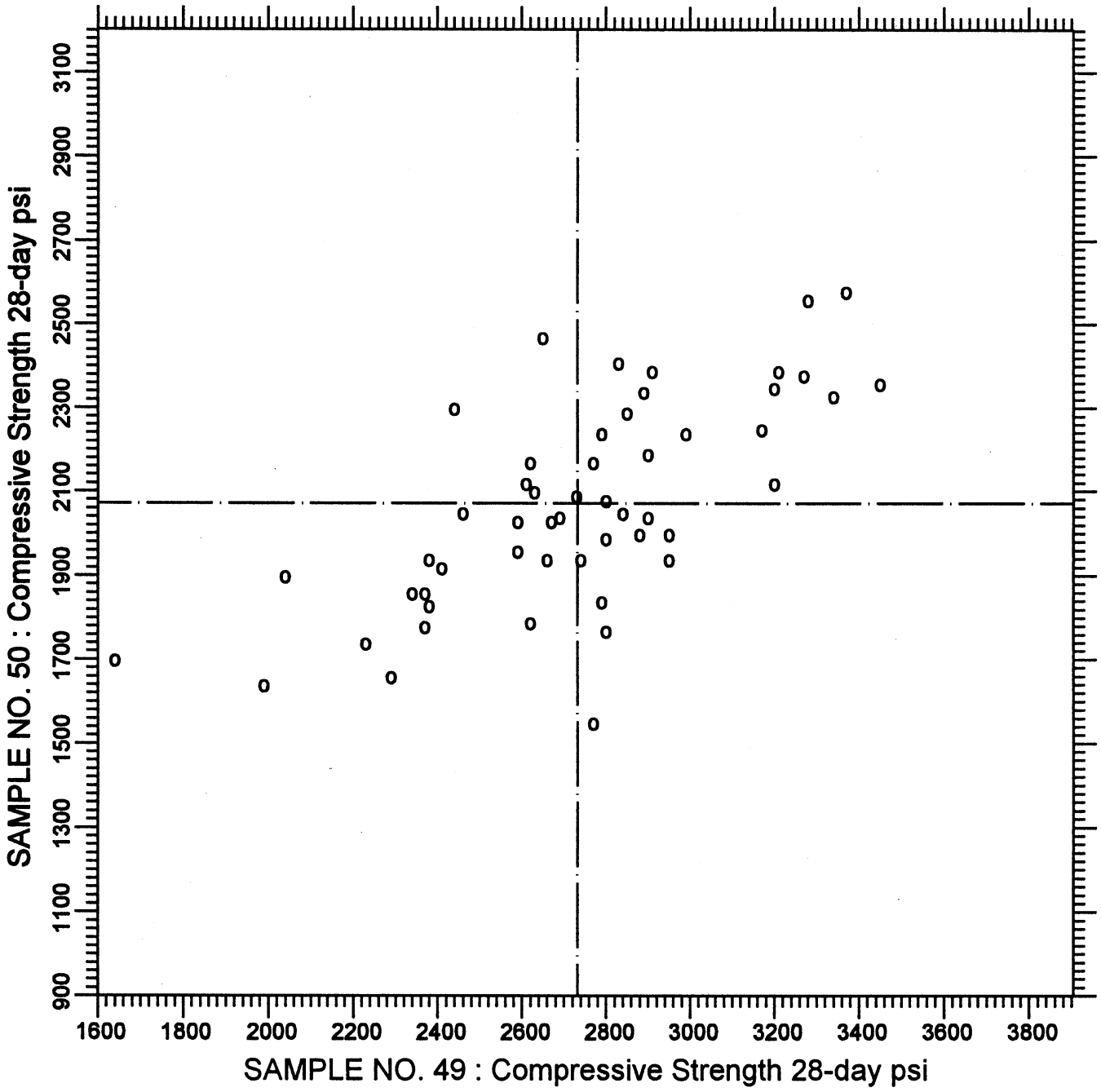
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7-day
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.210 Compressive Strength 7-day 62 POINTS

SAMPLE NO. 49	AVE	2148.2	S.D.	359.4	C.V.	16.7
SAMPLE NO. 50	AVE	1676.8	S.D.	249.5	C.V.	14.9

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28-day
MASONRY CEMENT SAMPLE NOS. 49 & 50



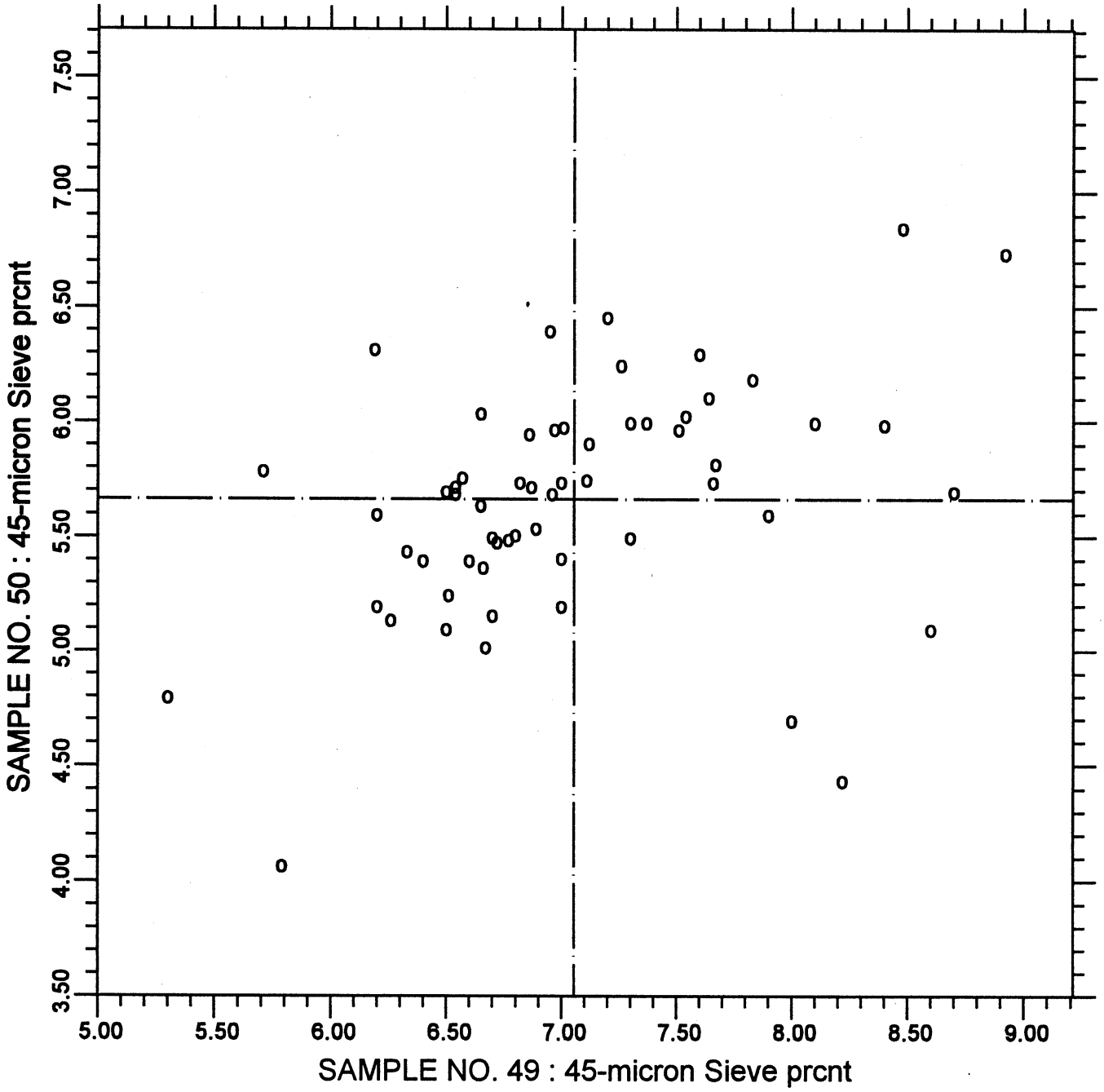
TEST NO.211 Compressive Strength 28-day 52 POINTS

SAMPLE NO. 49 AVE 2731.5 S.D. 365.1 C.V. 13.4

SAMPLE NO. 50 AVE 2071.3 S.D. 246.0 C.V. 11.9

LABS ELIMINATED 440 98 494 1200

CCRL PROFICIENCY SAMPLE PROGRAM
45-micron Sieve - Retained
MASONRY CEMENT SAMPLE NOS. 49 & 50



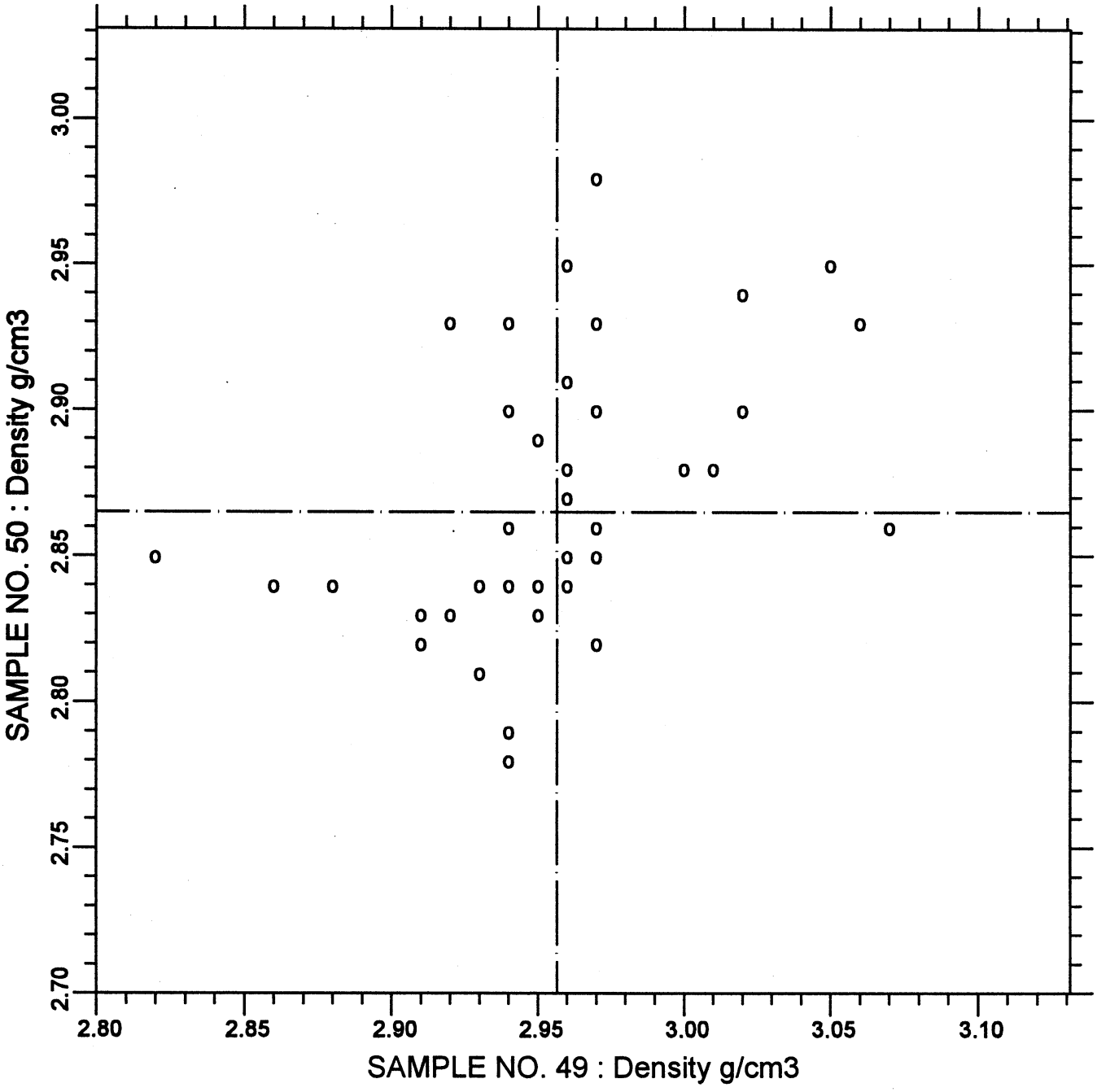
TEST NO.281 **45-micron Sieve** **59 POINTS**

SAMPLE NO. 49 AVE 7.054 S.D. 0.75 C.V. 10.64

SAMPLE NO. 50 AVE 5.662 S.D. 0.51 C.V. 8.99

LABS ELIMINATED 493 56 1200

CCRL PROFICIENCY SAMPLE PROGRAM
Density
MASONRY CEMENT SAMPLE NOS. 49 & 50

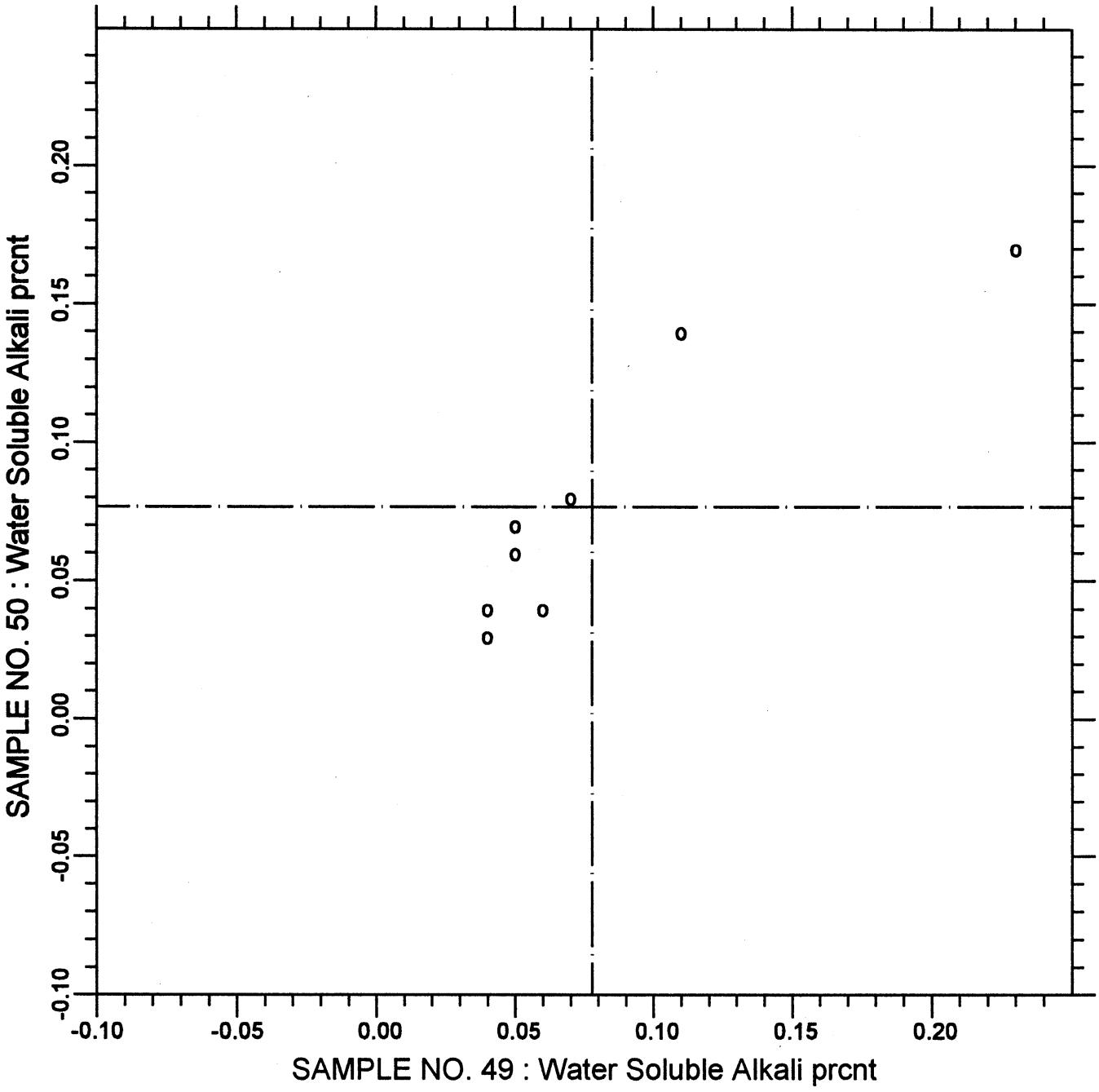


TEST NO.310 **Density** **46 POINTS**

SAMPLE NO. 49	AVE	2.9565	S.D.	0.045	C.V.	1.52
SAMPLE NO. 50	AVE	2.8650	S.D.	0.045	C.V.	1.57

LABS ELIMINATED 159 96 244

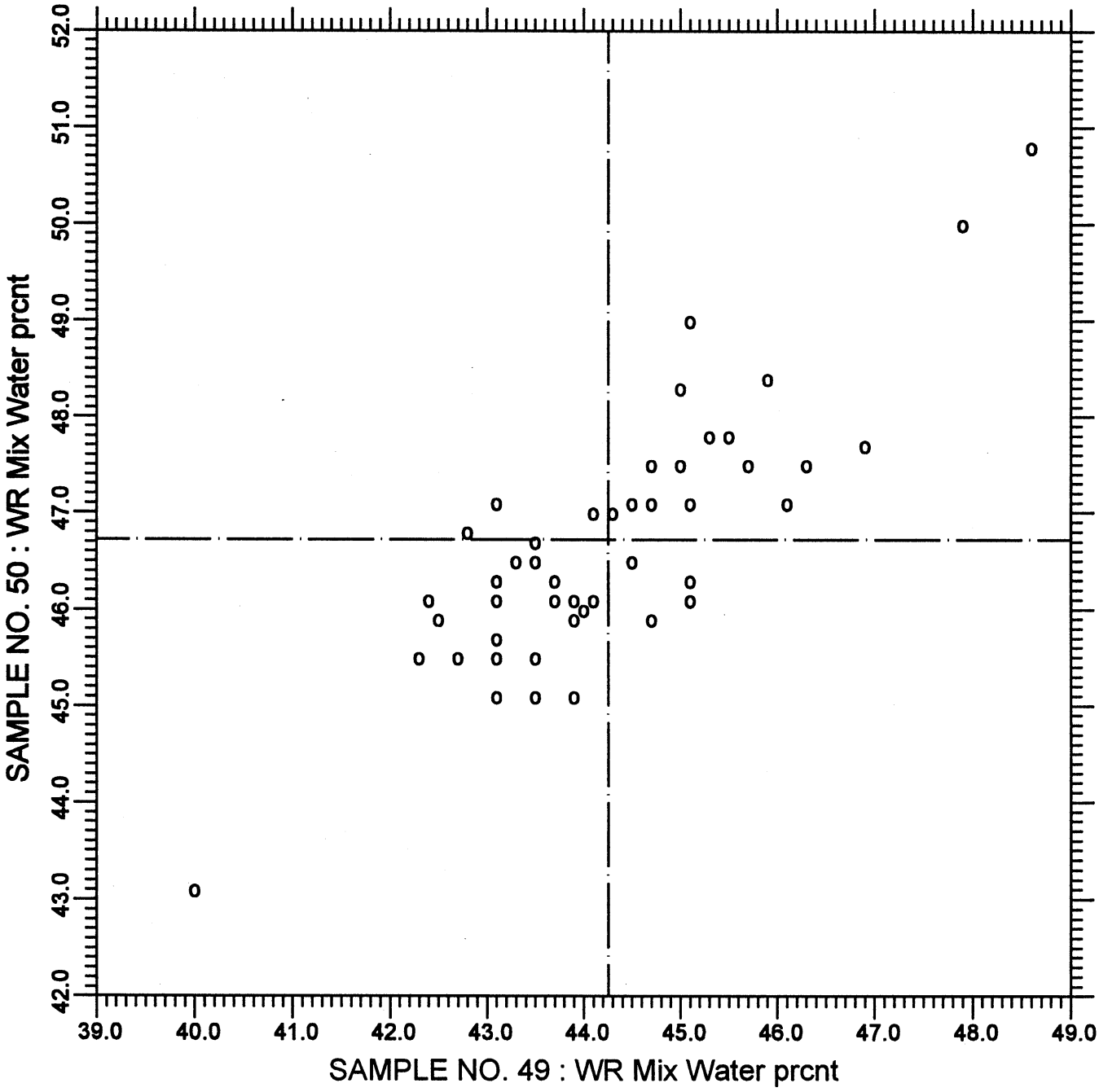
CCRL PROFICIENCY SAMPLE PROGRAM
Water-Soluble Alkali
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.320 **Water Soluble Alkali** **9 POINTS**

SAMPLE NO. 49	AVE	0.078	S.D.	0.061	C.V.	78.4
SAMPLE NO. 50	AVE	0.077	S.D.	0.048	C.V.	62.2

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Water
MASONRY CEMENT SAMPLE NOS. 49 & 50



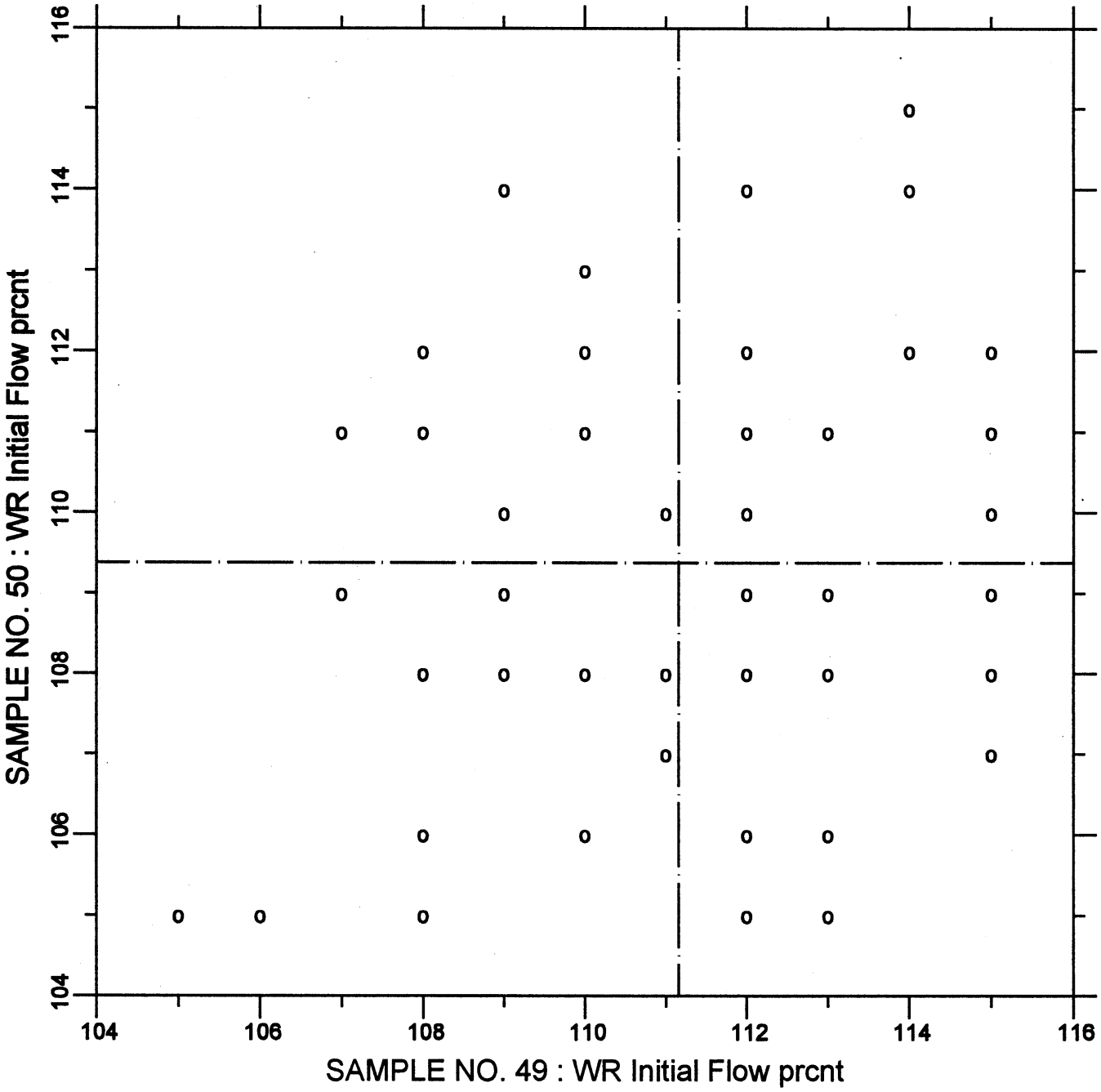
TEST NO.330 **WR Mix Water** **48 POINTS**

SAMPLE NO. 49 AVE 44.25 S.D. 1.5 C.V. 3.40

SAMPLE NO. 50 AVE 46.72 S.D. 1.3 C.V. 2.85

LABS ELIMINATED 56 148 440 1200 1466

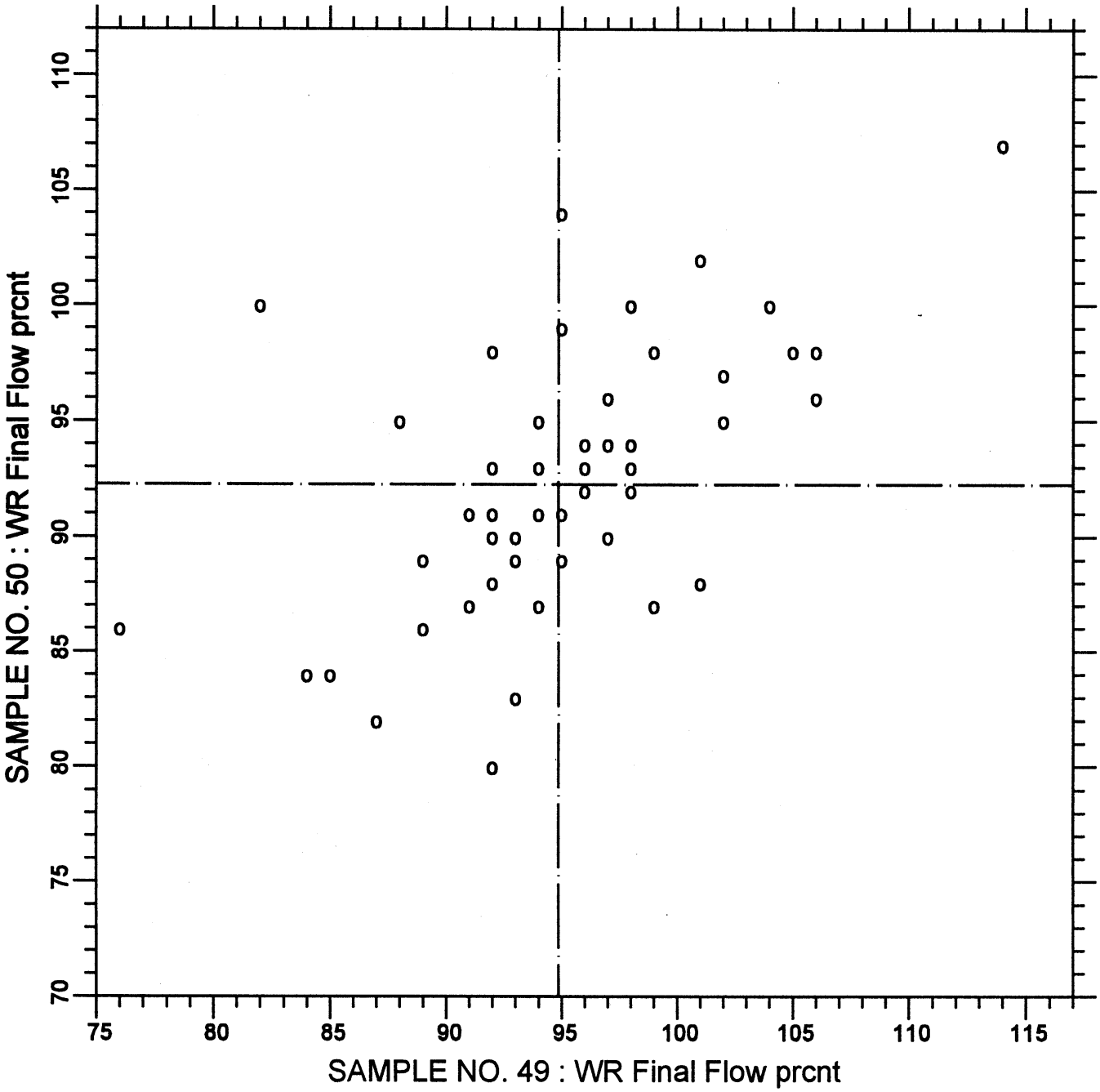
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Initial Flow
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.331 **WR Initial Flow** **50 POINTS**

SAMPLE NO. 49 AVE 111.16 S.D. 2.6 C.V. 2.30
SAMPLE NO. 50 AVE 109.38 S.D. 2.7 C.V. 2.44
LABS ELIMINATED 309 162 605

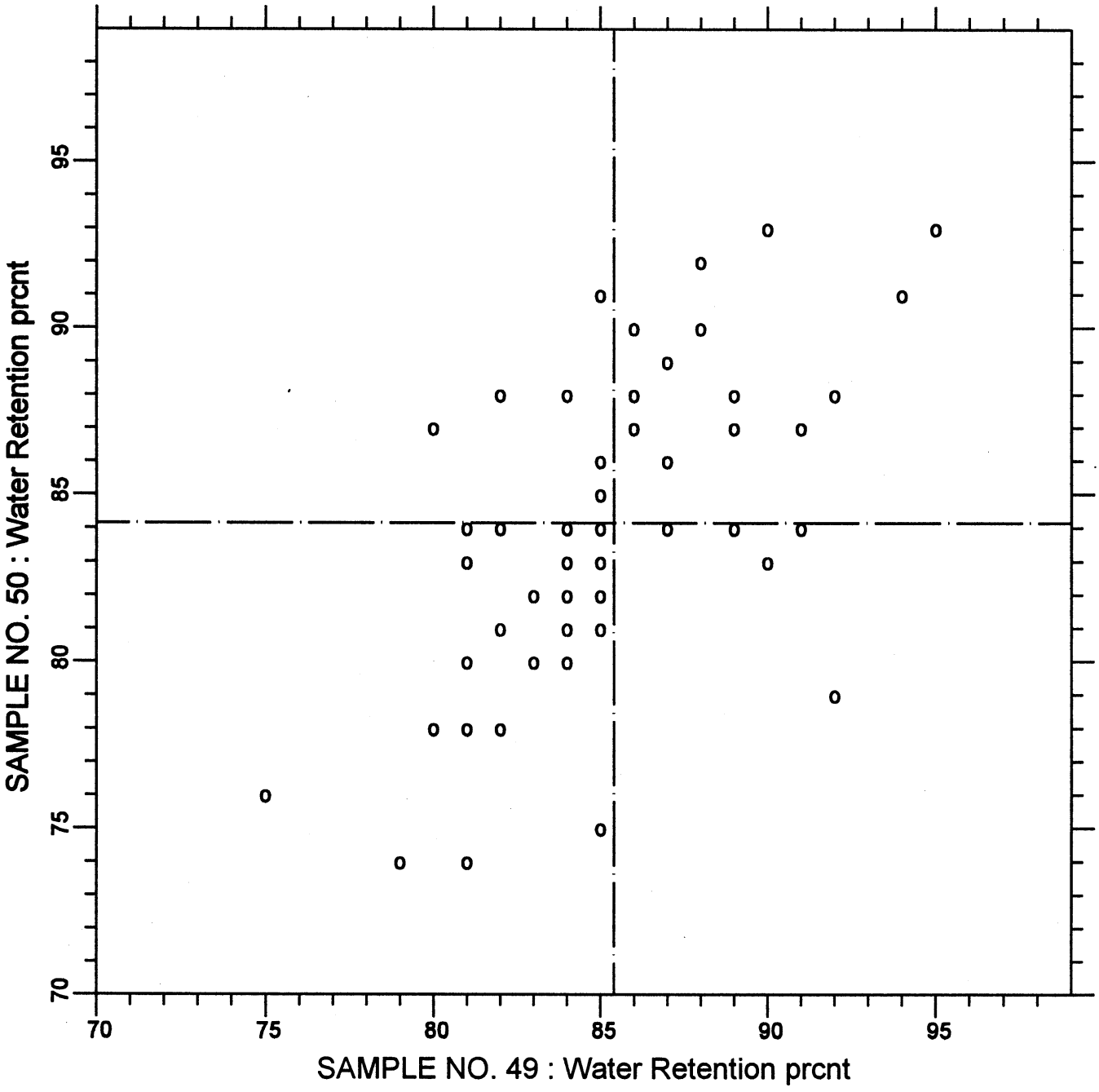
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Final Flow
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.332 **WR Final Flow** **53 POINTS**

SAMPLE NO. 49	AVE	94.87	S.D.	6.4	C.V.	6.77
SAMPLE NO. 50	AVE	92.26	S.D.	5.7	C.V.	6.18

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention Value
MASONRY CEMENT SAMPLE NOS. 49 & 50



TEST NO.333 **Water Retention** **53 POINTS**

SAMPLE NO. 49 AVE 85.40 S.D. 4.1 C.V. 4.80
SAMPLE NO. 50 AVE 84.15 S.D. 4.7 C.V. 5.62
LABS ELIMINATED 413