CEMENT AND CONCRETE REFERENCE LABORATORY

PROFICIENCY SAMPLE PROGRAM

Final Report
C270 Masonry Mortar Proficiency Samples
Number 19 and Number 20

December 2004

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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January12, 2005

TO: Participants in the CCRL C270 Masonry Mortar Proficiency Sample Program

SUBJECT: Final Report on C270 Masonry Mortar Proficiency Samples No. 19 and No. 20

Enclosed is your copy of the final report on the test results for the pair of CCRL **C270 Masonry Mortar** Proficiency Samples which were distributed in September 2005

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 use.

Additional samples of these two cements 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 Masonry Mortar Proficiency Samples will be distributed in September 2005.

Sincerely,

Robin K. Haupt

Robin K. Haupt, Supervisor
CCRL Proficiency Sample Programs

Enclosure

TO: Participants in the CCRL C270 Masonry Mortar Proficiency Sample Program

FROM: Robin K. Haupt, Supervisor, PSP

SUBJECT: Explanation of Final Report on Results of Tests on C270 Masonry Mortar Proficiency Samples No. 19 and No. 20

This letter, and the material included with it, constitute the final report and summary of results for the current pair of Masonry Mortar Proficiency Samples, which were distributed in September 2004. 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 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.

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

Note: 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.*

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Please note that individual laboratory ratings were not given for the flow of air content, compressive strength mortar, and initial water retention flow. Mortar flows in the range of 110 ± 5 are satisfactory, labs with flow values outside this range will be flagged as a "Labs Eliminated" on the scatter diagram. Averages, standard deviations, and a scatter diagram are provided for your information. This information may be a helpful indicator of a problem with flow table apparatus or mortar mixing procedures.

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 or worst 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
C270 Masonry Mortar Proficiency Samples No. 19 and No. 20
Final Report - December 27 2004

SUMMARY OF RESULTS

Test		#Labs	Sample No. 19 Average	S.D.	C.V.	Sample No. 20 Average	S.D.	C.V.
AIR CONTENT								
Air Content	prcnt	25	21.6	4.6	21.4	19.0	3.5	18.4
Air Content	prcnt	* 24	22.2	3.9	17.4	19.5	2.6	13.4
AC Mix Water	prcnt	26	62.9	3.6	5.78	65.3	3.6	5.55
AC Mix Water	prcnt	* 24	62.0	1.7	2.80	64.5	2.1	3.26
AC Flow	prcnt	26	110	2.7	2.46	109	3.0	2.74
AC Flow	prcnt	* 25	110	2.7	2.49	109	2.6	2.37
COMPRESSIVE STRENGTH								
Comp Str 7 day	psi	26	680	195.4	28.8	605	184.7	30.5
Comp Str 28 day	psi	25	881	247.4	28.1	802	238.1	29.7
CS Mix Water	prcnt	27	63.4	4.6	7.24	64.4	7.2	11.27
CS Mix Water	prcnt	* 26	63.4	4.7	7.35	65.4	5.0	7.71
Comp Str Flow	prcnt	28	111	3.5	3.13	108	3.9	3.63
Comp Str Flow	prcnt	* 27	110	2.7	2.46	109	2.6	2.39
WATER RETENTION								
WR Mix Water	prcnt	22	62.7	3.4	5.38	65.1	3.7	5.62
WR Mix Water	prcnt	* 21	62.1	1.7	2.71	64.4	2.2	3.34
WR Intial Flow	prcnt	22	110	2.7	2.43	109	2.7	2.46
WR Final Flow	prcnt	22	86	12.4	14.4	85	11.7	13.8
WR Final Flow	prcnt	* 21	88	8.3	9.51	86	11.2	13.08
Water Retention	prcnt	22	78	11.3	14.6	78	10.0	12.8
Water Retention	prcnt	* 21	80	7.5	9.47	79	9.6	12.18

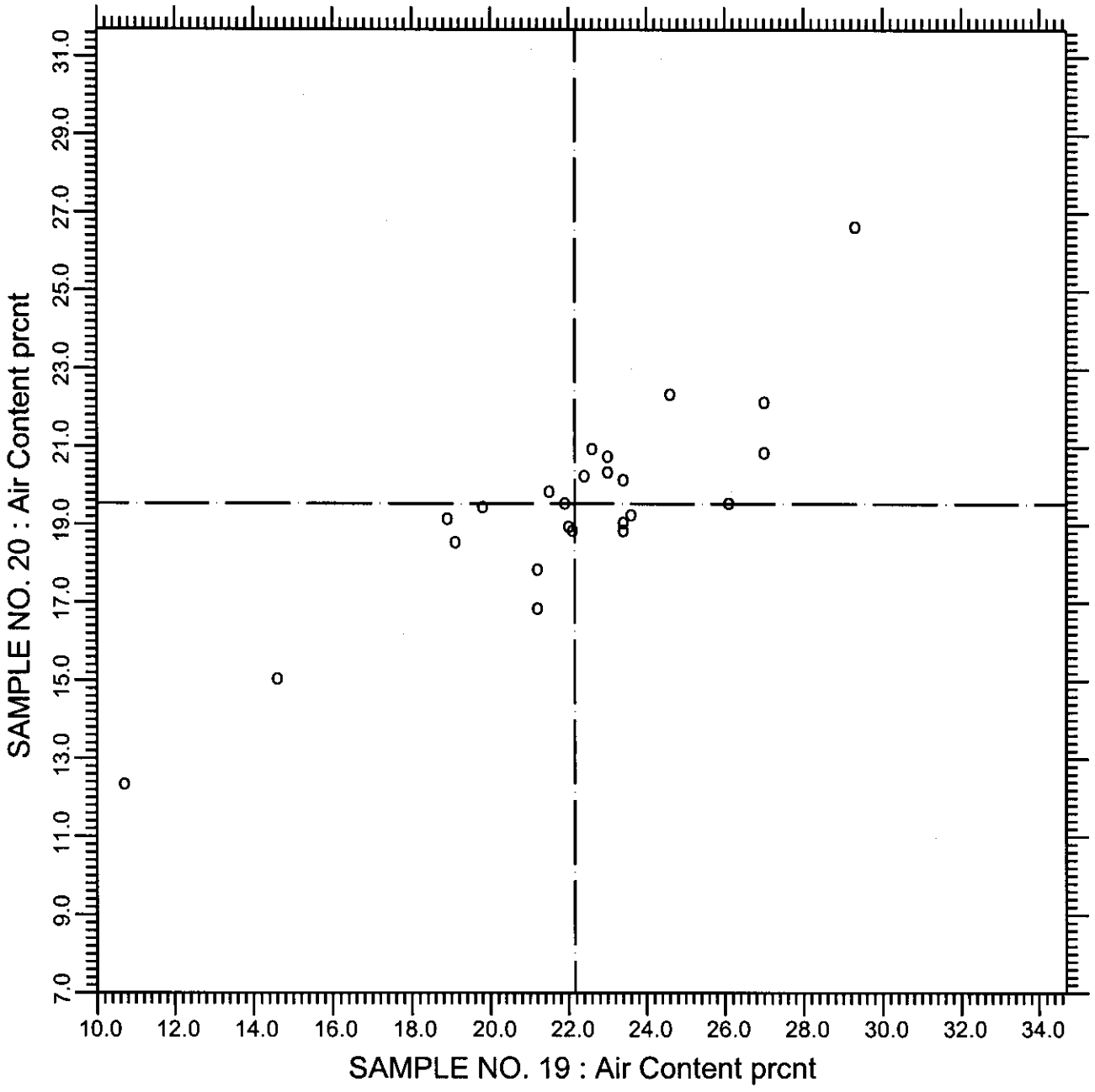
* ELIMINATED LABS: Data over three S.D. from the mean

Air Content	273
AC Mix Water	1097 1151
AC Flow	1097
CS Mix Water	176
CS Flow	1097
WR Mix Water	1151
WR Final Flow	840
Water Retention	840

CCRL PROFICIENCY SAMPLE PROGRAM

Air Content

C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



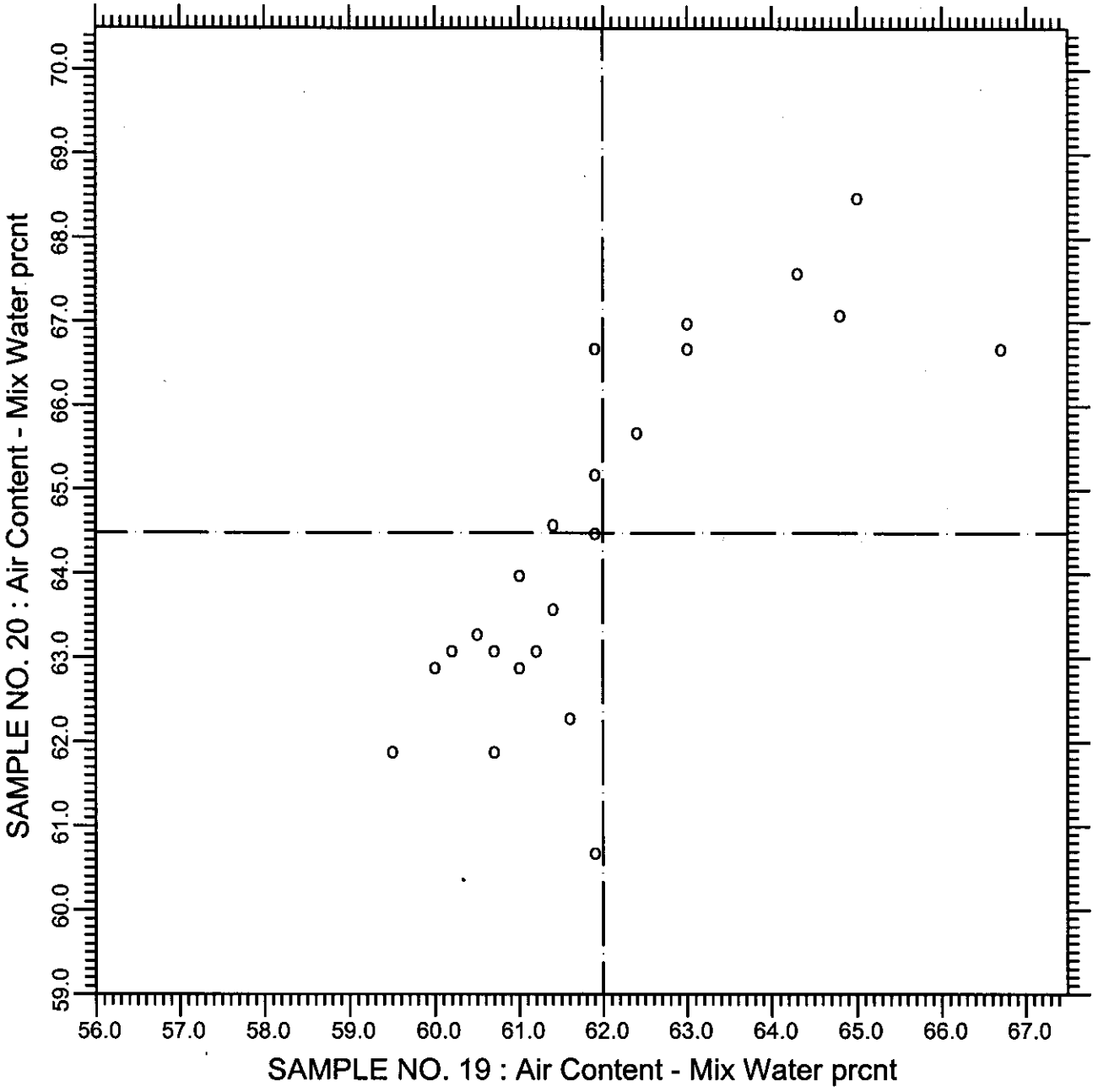
TEST NO.170 Air Content 24 POINTS

SAMPLE NO. 19 AVE 22.16 S.D. 3.9 C.V. 17.4

SAMPLE NO. 20 AVE 19.53 S.D. 2.6 C.V. 13.4

LABS ELIMINATED 273

CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Water
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



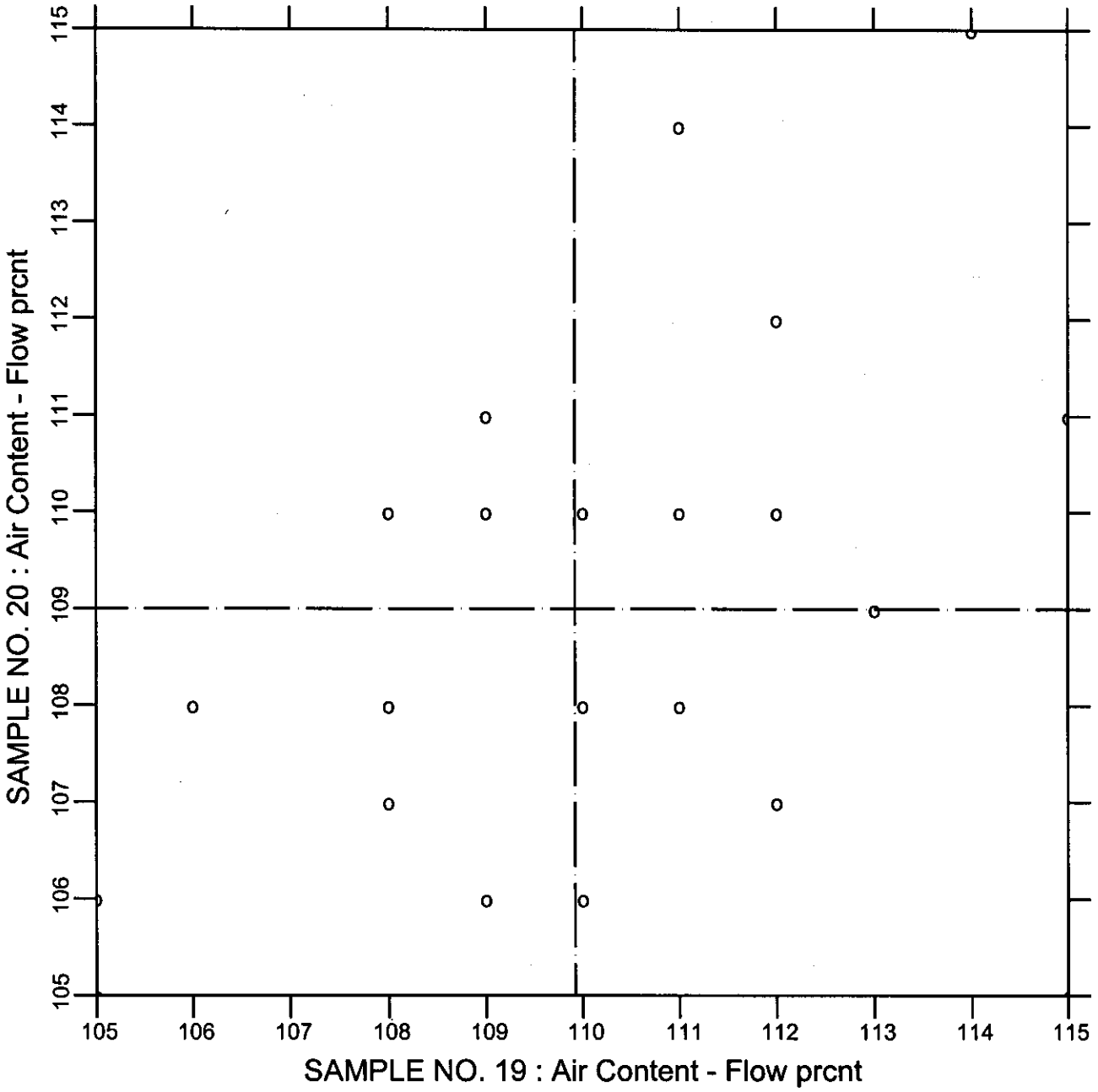
TEST NO.180 Air Content - Mix Water 24 POINTS

SAMPLE NO. 19 AVE 62.00 S.D. 1.7 C.V. 2.80

SAMPLE NO. 20 AVE 64.48 S.D. 2.1 C.V. 3.26

LABS ELIMINATED 1097 1151

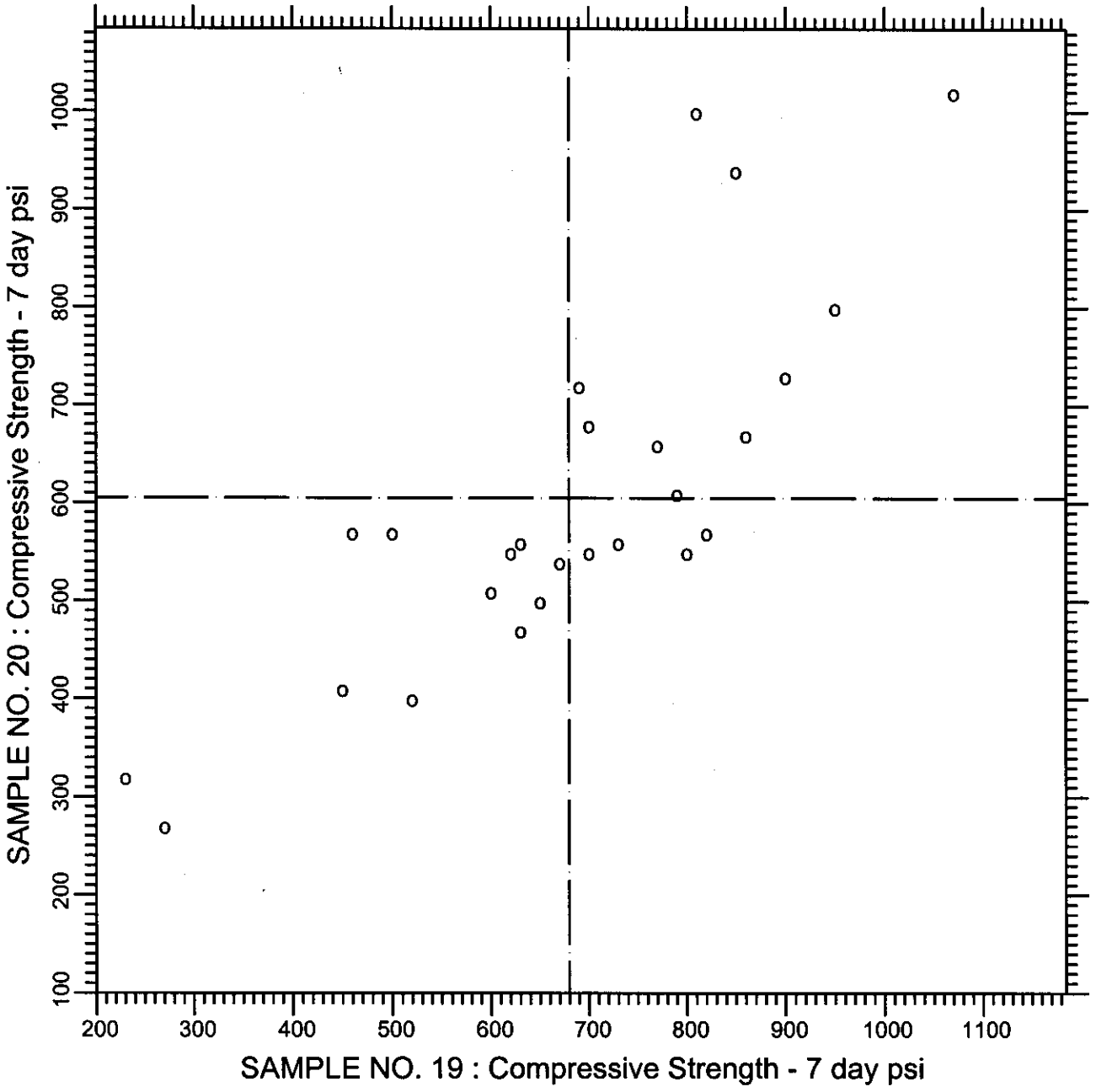
CCRL PROFICIENCY SAMPLE PROGRAM
Air Content - Flow
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.190 Air Content - Flow 25 POINTS

SAMPLE NO. 19 AVE 109.92 S.D. 2.7 C.V. 2.49
SAMPLE NO. 20 AVE 109.00 S.D. 2.6 C.V. 2.37
LABS ELIMINATED 1097

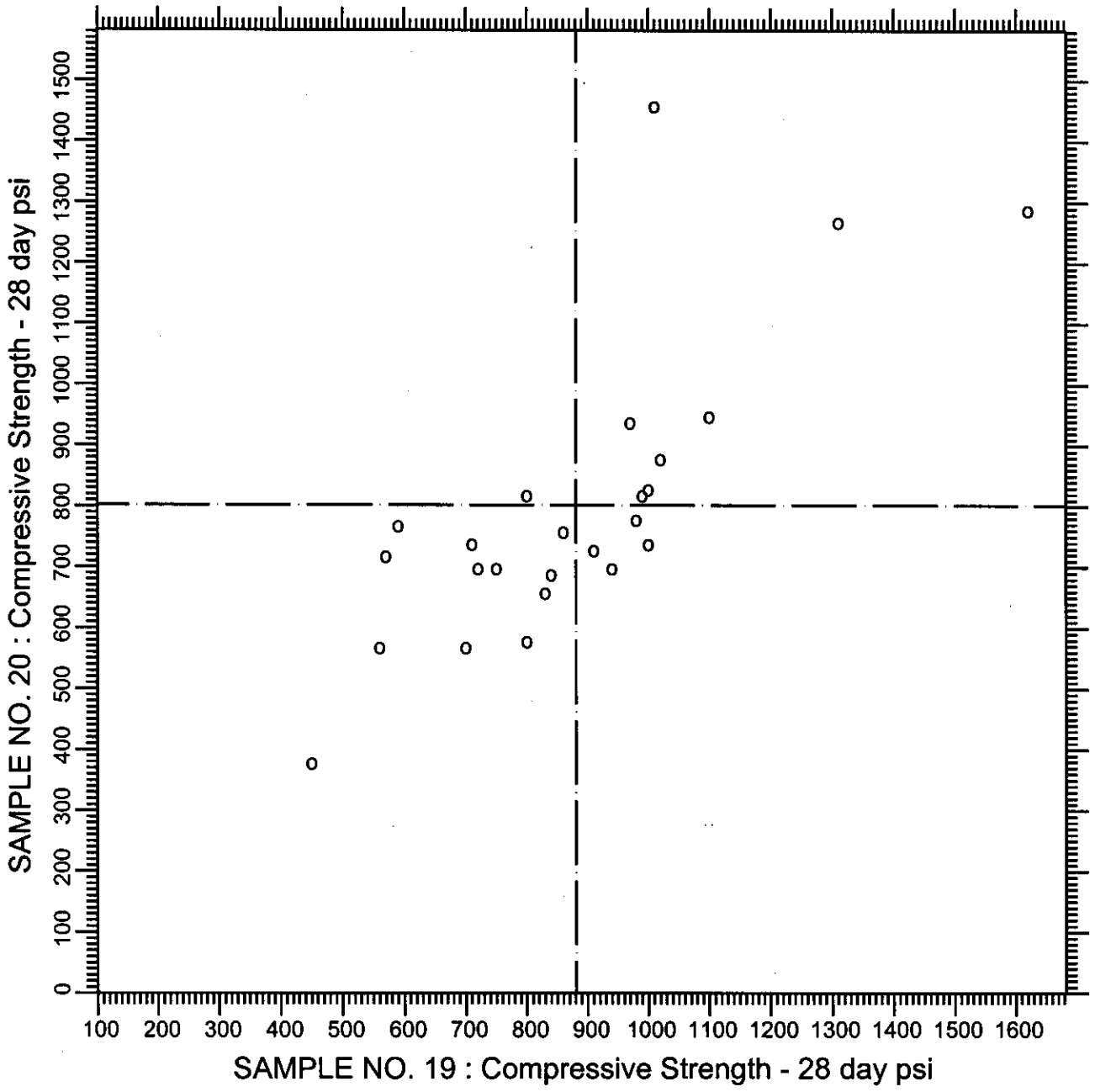
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 7 day
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.210 Compressive Strength - 7 day 26 POINTS

SAMPLE NO. 19	AVE	679.6	S.D.	195.4	C.V.	28.8
SAMPLE NO. 20	AVE	605.0	S.D.	184.7	C.V.	30.5

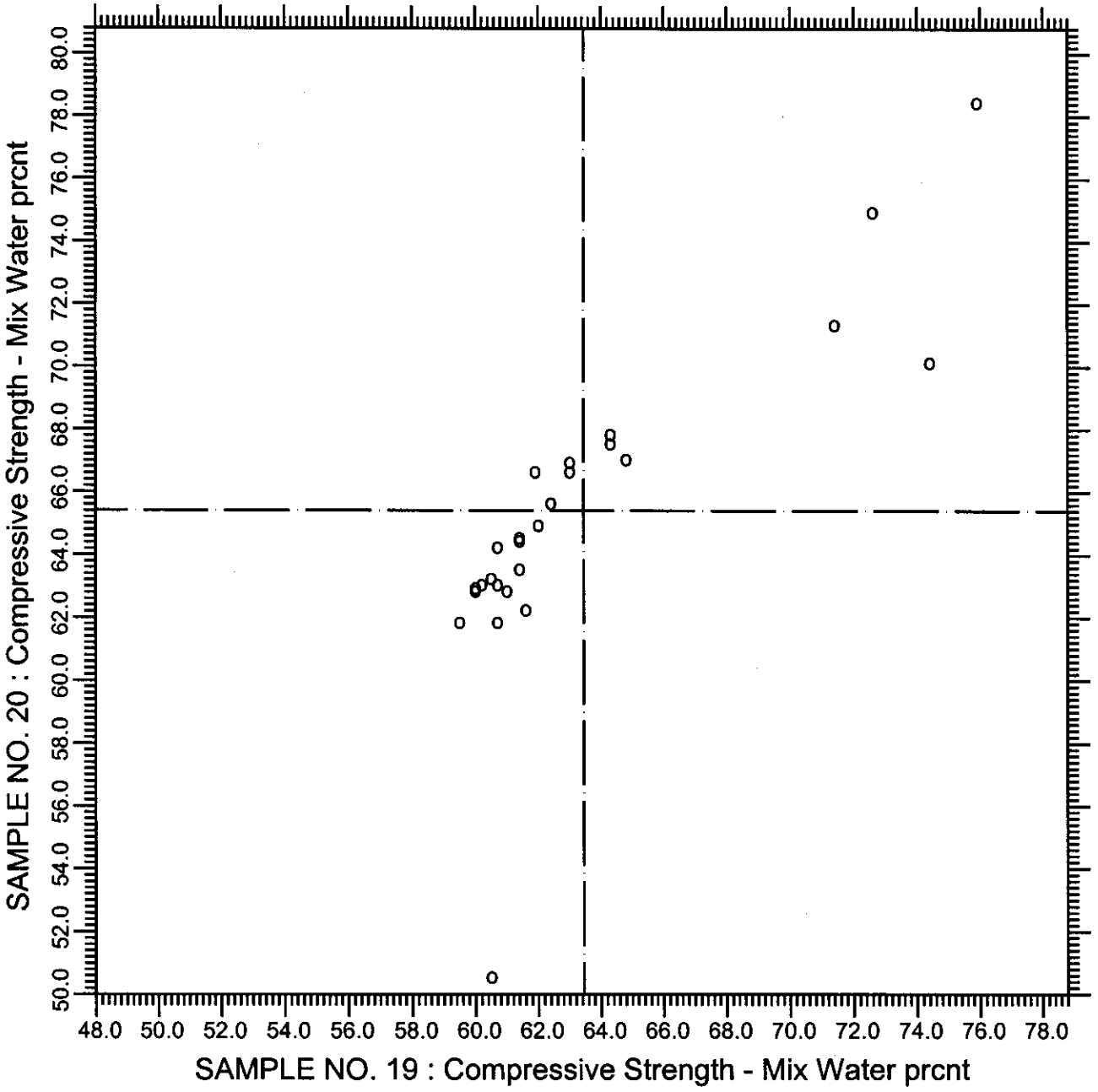
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - 28 day
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.211 Compressive Strength - 28 day 25 POINTS

SAMPLE NO. 19	AVE	881.2	S.D.	247.4	C.V.	28.1
SAMPLE NO. 20	AVE	802.0	S.D.	238.1	C.V.	29.7

CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - Mix Water
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



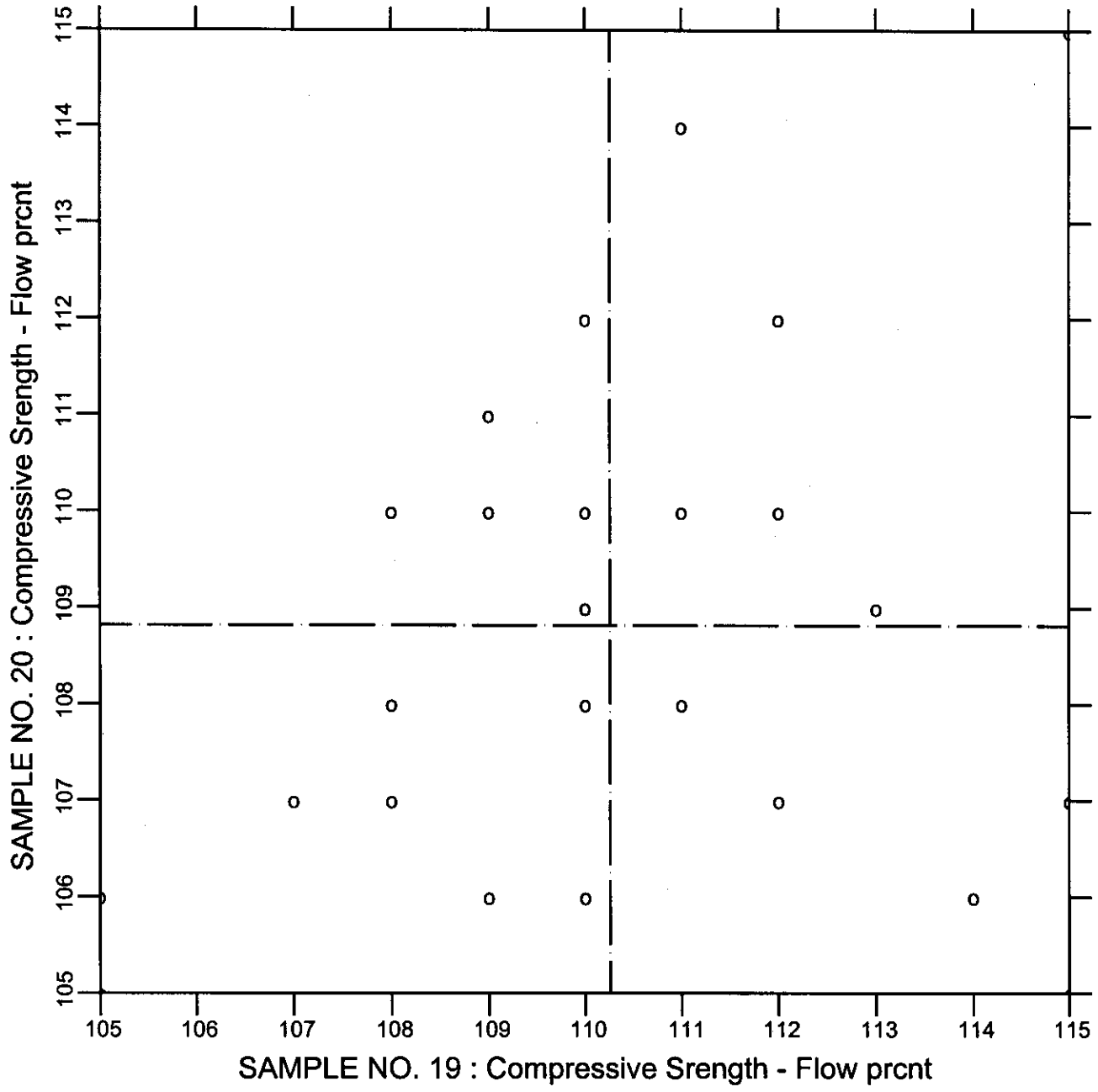
TEST NO.220 Compressive Strength - Mix Water 26 POINTS

SAMPLE NO. 19 AVE 63.45 S.D. 4.7 C.V. 7.35

SAMPLE NO. 20 AVE 65.42 S.D. 5.0 C.V. 7.71

LABS ELIMINATED 176

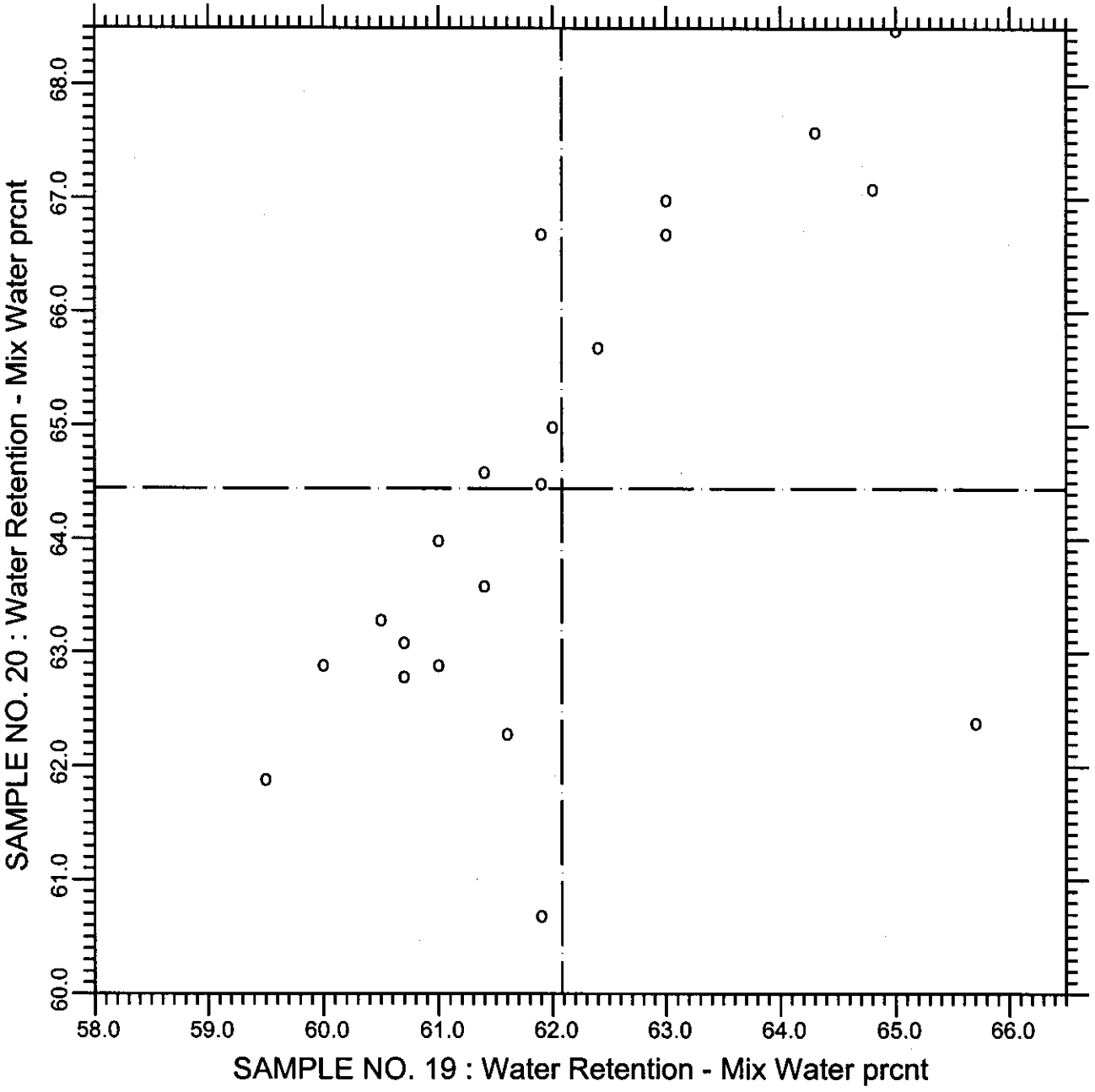
CCRL PROFICIENCY SAMPLE PROGRAM
Compressive Strength - Flow
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.230 Compressive Srength - Flow 27 POINTS

SAMPLE NO. 19 AVE 110.26 S.D. 2.7 C.V. 2.46
SAMPLE NO. 20 AVE 108.81 S.D. 2.6 C.V. 2.39
LABS ELIMINATED 1097

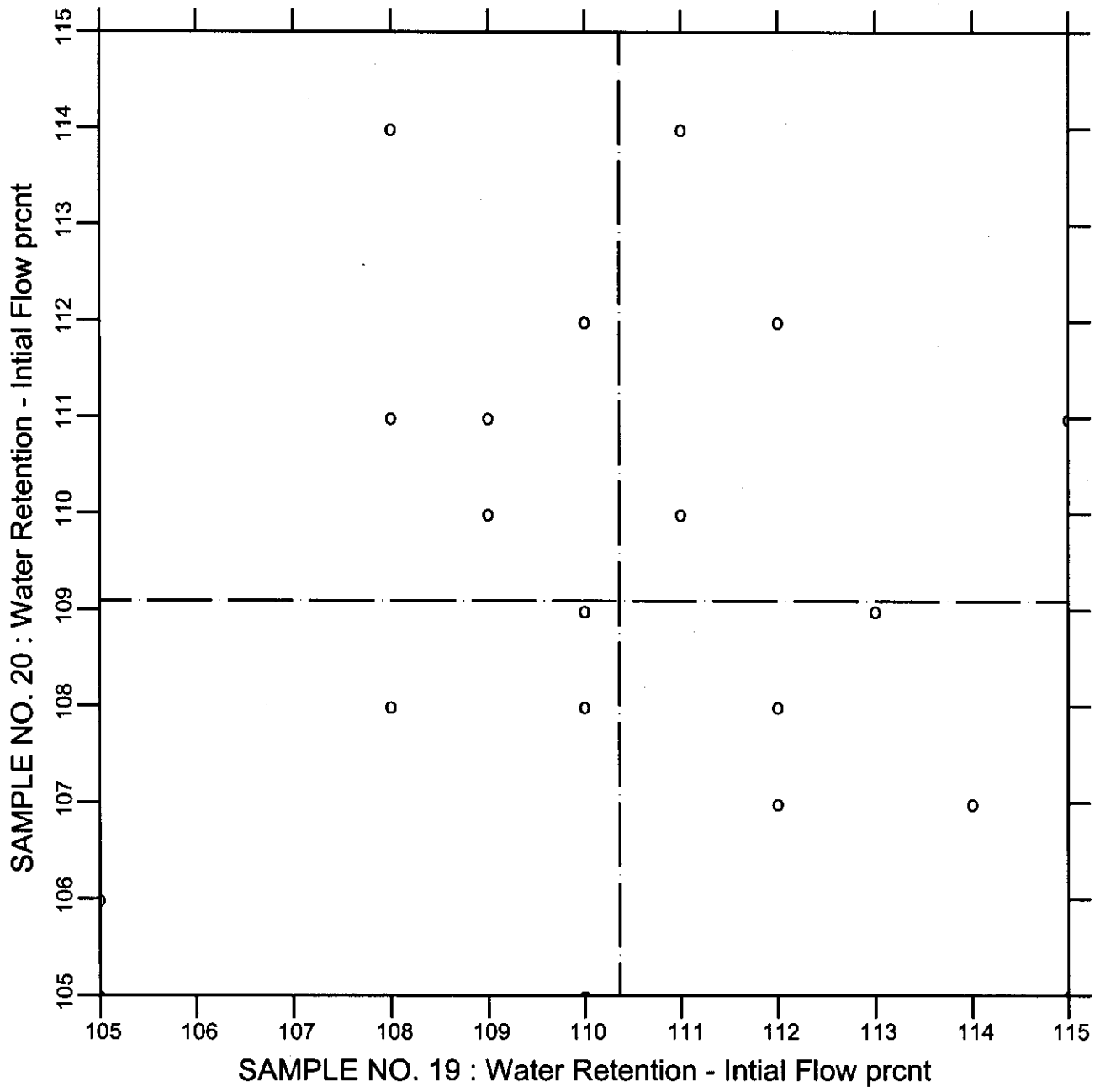
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Water
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.330 Water Retention - Mix Water 21 POINTS

SAMPLE NO. 19 AVE 62.08 S.D. 1.7 C.V. 2.71
SAMPLE NO. 20 AVE 64.44 S.D. 2.2 C.V. 3.34
LABS ELIMINATED 1151

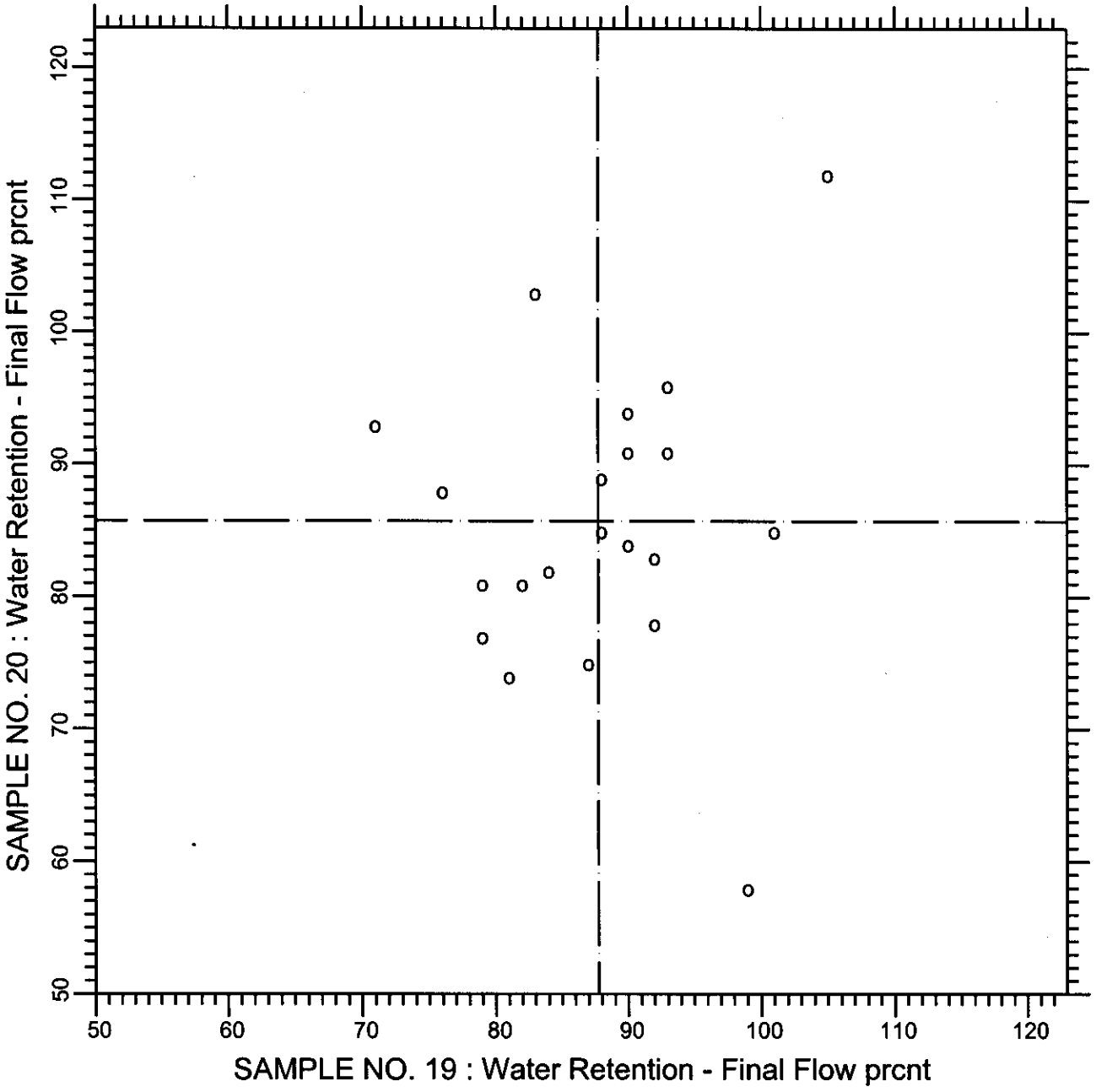
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Initial Flow
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.331 Water Retention - Intial Flow 22 POINTS

SAMPLE NO. 19	AVE	110.36	S.D.	2.7	C.V. 2.43
SAMPLE NO. 20	AVE	109.09	S.D.	2.7	C.V. 2.46

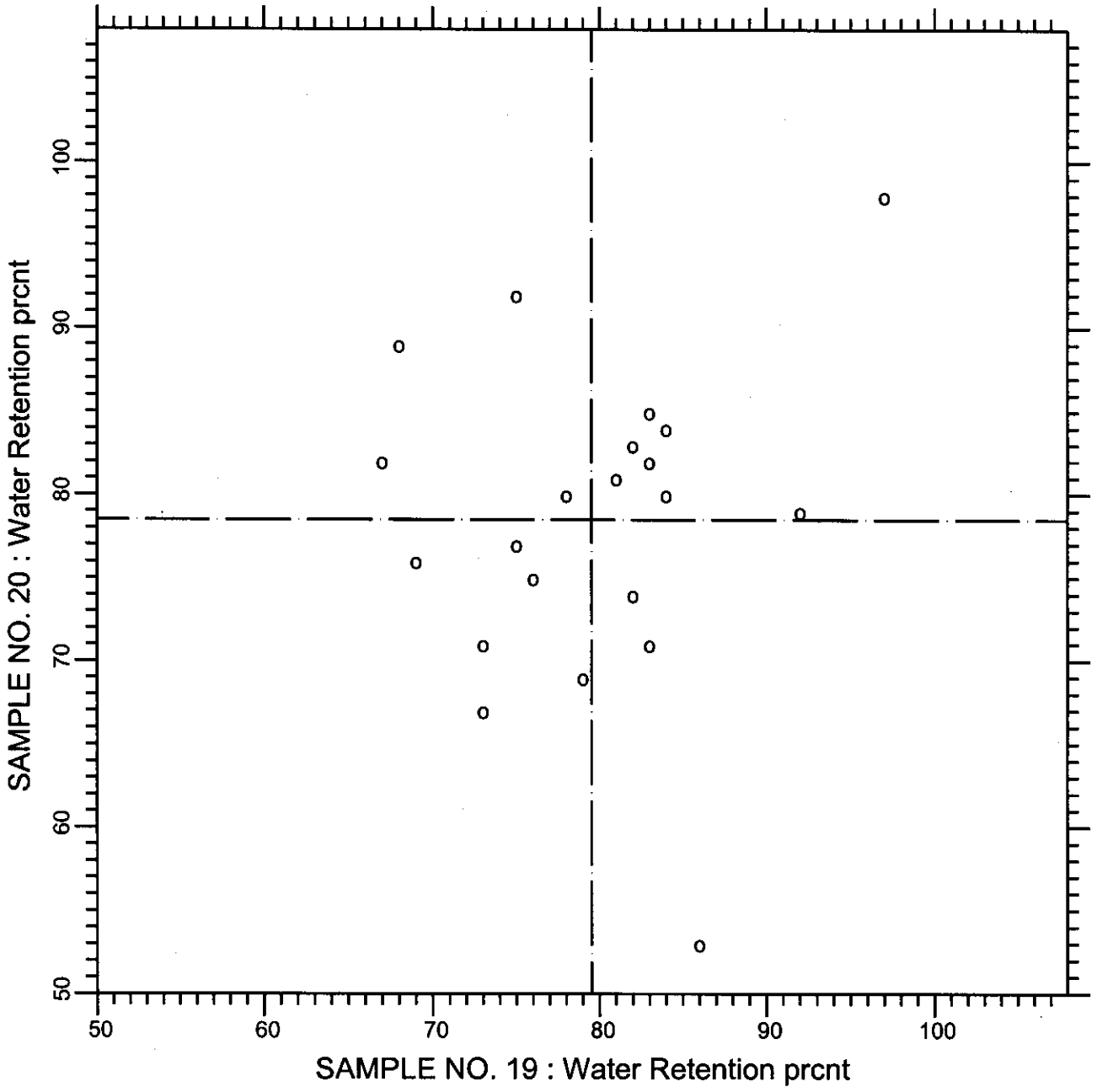
CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention - Final Flow
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.332 Water Retention - Final Flow 21 POINTS

SAMPLE NO. 19 AVE 87.8 S.D. 8.3 C.V. 9.51
SAMPLE NO. 20 AVE 85.7 S.D. 11.2 C.V. 13.08
LABS ELIMINATED 840

CCRL PROFICIENCY SAMPLE PROGRAM
Water Retention Value
C270 MASONRY MORTAR SAMPLES NO. 19 & NO. 20



TEST NO.333 Water Retention 21 POINTS

SAMPLE NO. 19 AVE 79.5 S.D. 7.5 C.V. 9.47
SAMPLE NO. 20 AVE 78.5 S.D. 9.6 C.V. 12.18
LABS ELIMINATED 840