2013
Asphalt Mix
OMRL Report

Sample Numbers
49 & 50

OKLAHOMA DEPARTMENT OF TRANSPORTATION

200 Northeast 21st Street

Oklahoma City, OK 73105-3204

May 10, 2013

TO: Participants in the OMRL Asphalt Mix Proficiency Sample Program

FROM: Materials Division

SUBJECT: Final Report for OMRL Asphalt Mix Proficiency Samples # 49 and # 50

This letter and the accompanying tables and graphical plots constitute the final report for OMRL Asphalt Mix Proficiency Samples # 49 and # 50.

The proficiency samples were prepared in the laboratory. The samples were distributed for testing on February 15, 2013. Results were received from 88 laboratories. Results received after the closing date and prior to this report date were included in the final report.

All data was processed as received. Averages, standard deviations, and coefficients of variations were computed from the data. A rating of "0" was assigned to any pair of test results in which either result was reported as missing or was found to be an outlier. Outliers were determined according to NCHRP Project 09-26. See Appendix A and B of that report for details of outlier determination. Appendix A of this report shows the actual criterion used for each test characteristic to identify outlier data. The outlier method used in NCHRP Project 09-26 was adopted in 2005 and used in previous reports for information only.

The analysis of the data included in this report consists of the following:

1.   Summary table of results for both samples.
2.   Table of results for individual laboratories.
3.   General scatter diagrams (Youden plots).
4.   Yearly performance charts (paired plots).
5.   Appendix A, outlier criterion tables for each characteristic.

A summary table of results was produced for the sample set. The summary table provides the statistics for each test property or characteristic analyzed both before and after the removal of outlier data.   Column 1 of the table gives the test description. Column 2 indicates the number of laboratories with no missing data for either sample and those excluded from the analysis by the outlier criterion in Appendix A. Column 3, 4 and 5 indicate the average or mean result, the standard deviation and the coefficient of variation for the first sample. Columns 6, 7, and 8 indicate the average or mean result, the standard deviation and the coefficient of variation for the second sample.

A table of results was produced for each laboratory. Column 1 of the table gives the test title. Column 2 and 3 show the test data submitted by the laboratory. "NA" in either one of these columns indicates that invalid or missing data was supplied by the laboratory. Columns 4 and 5 indicate the average values for each test. Columns 6 and 7 show the laboratory's ratings based on the following scale:

Rating 5 data within 1.0 standard deviation of the mean

Rating 4 data within 1.5 standard deviation of the mean

Rating 3 data within 2.0 standard deviation of the mean

Rating 2 data within 2.5 standard deviation of the mean

Rating 1 data within 3.0 standard deviation of the mean

Rating 0 data 3.0 or more standard deviations from the mean

A negative sign with rating 1 through 5 indicates a result below the mean; a positive number indicates a result above the mean. An absolute value for the rating that is less than 3 is considered a low rating. Significance need not necessarily be attached to a single low rating or pair of low ratings, however, a continuing tendency to get low ratings should lead a laboratory to reexamine its equipment and procedures for this test.

A set of general scatter diagrams or Youden plots was produced for this report. The points on the diagram are located by plotting the test value reported for sample # 50 from a given laboratory on the vertical axis, against the test value reported for sample # 49 by the same laboratory on the horizontal axis. The axes are labeled with the sample numbers. The horizontal and vertical scale limits used in plotting are generally three standard deviations on either side of the mean. The upper limit is set to 100 if the limit exceeds 100. The lower limit is set to 95 if it is equal to 100.

The horizontal red dashed line and the vertical red dashed line represent the mean or average values for the results of sample # 50 and sample # 49, respectively. The laboratories eliminated from the statistical calculations based on outlier criterion in Appendix A are shown on the last line. The values for the mean, standard deviation, and coefficient of variation for each sample is tabulated below the diagram.

Yearly performance charts were produced for each laboratory. These charts will enable a comparison to be made of all the test results reported by the laboratory. The points on the comparison chart are located by plotting the normal deviate of each test performed on the vertical axis, by the pair number of the test set on the horizontal axis.

The normal deviate is computed for each test result of each test performed up to 10 years or 10 pairs. It is computed by subtracting the test result of each sample number from the overall average of test results for that sample number and dividing by the standard deviation of that sample number. Pair number 1 shown on the graph indicates the first pair plotted. The last pair shown indicates the last pair of results. These are the results for sample #49 and sample #50. The title of the graph indicates which pair sets are being plotted. For each sample pair plotted, the symbol "x" represents the odd numbered sample of the pair and symbol "o" represents the even numbered sample.

A graphic representation of within-laboratory precision is given in the length of the vertical lines connecting each of the sample pairs. The closer a pair of symbols for a given sample pair, the better the laboratory's repeatability. Conversely, the farther apart the symbols the greater the laboratory's random error.

The lines connecting the midpoints between each pair of symbols show the trend in the laboratories performance over the period of time covered by the chart. Midpoints between consecutive pairs are connected with a solid line.

Ideally, a laboratory should have all symbols directly on the center line, thus demonstrating exceptional precision and accuracy of testing. Generally speaking, points within 2 normal deviates of the center line are probably acceptable, and a normal deviate of more than 2 may indicate a problem.

Laboratories listed as qualified for asphalt mixture testing on the Materials & Testing e-Guide Qualified Labs List are required to prepare nonconformity reports for each rating of 2, 1, 0, -1, and -2 for each test characteristic. Submit the nonconformity reports to the Materials Division for each sample and each rating of 1, 0, and -1 for each test characteristic.

Due to the statistical method used, both samples may receive a rating of "0" that requires a response for that test characteristic. Recompute both sample's rating in the response form to determine if both require a response. Nonconformity response forms are not required for the 3/4" sieve ratings as the standard deviations are very small.

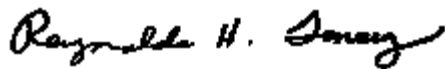The Qualified Labs List may be found at:
http://www.okladot.state.ok.us/materials/htm-smap/11069.htm

The nonconformity response form may be found at:
http://www.okladot.state.ok.us/materials/omrlinfo.htm

Nonconformity response forms should be submitted within 45 days of this report's date. Supporting documentation for any calibrations or equipment purchases to address low ratings should be included with the response forms.

If you have any questions concerning this report, please do not hesitate to contact me.

Reynolds H. Toney, P.E.
Materials Engineer

cc: Division Construction Engineers
  Director of Operations
  Construction Engineer
  Materials Engineer
  Assistant Materials Engineer
  Bituminous Engineer
 Asphalt Design Lab Supervisor
  FHWA

OMRL Asphalt Mix Proficiency Sample Program
Final Report - Summary Table

Asphalt Mix Proficiency Samples		Sample Number 49			Sample Number 50		
Test Description	**No. of Labs**	**AVG.**	**Standard Deviation**	**Coeff. of Variation**	**AVG.**	**Standard Deviation**	**Coeff. of Variation**
AASHTO T 30 - Analysis of Extracted Aggregate: (1) Total Percent Passing 3/4" Sieve (%)	88	99.7	0.5	0.5	99.7	0.6	0.6
	84	99.8	0.4	0.4	99.8	0.4	0.4
(2) Total Percent Passing 1/2" Sieve (%)	88	84.3	2.0	2.4	84.6	2.2	2.6
	88	84.3	2.0	2.4	84.6	2.2	2.6
(3) Total Percent Passing 3/8" (%)	88	71.3	2.2	3.1	71.3	2.3	3.3
	88	71.3	2.2	3.1	71.3	2.3	3.3
(4) Total Percent Passing No. 4 Sieve (%)	88	49.0	1.9	3.9	49.2	1.6	3.3
	87	49.0	1.9	3.8	49.3	1.5	3.0
(5) Total- Percent Passing No. 8 Sieve (%)	88	38.1	1.5	3.9	38.4	1.3	3.3
	87	38.2	1.5	3.9	38.4	1.1	3.0
(6) Total Percent Passing No. 16 Sieve (%)	88	31.1	1.1	3.4	31.2	0.9	3.0
	87	31.1	1.1	3.4	31.2	0.9	2.8
(7) Total Percent Passing No. 30 Sieve (%)	88	25.0	0.8	3.3	24.9	0.7	3.0
	88	25.0	0.8	3.3	24.9	0.7	3.0
(8) Total Percent Passing No. 50 Sieve (%)	88	13.9	0.7	4.9	14.0	0.8	5.6
	87	13.9	0.7	4.9	14.0	0.7	5.0
(9) Total Percent Passing No. 100 Sieve (%)	88	6.1	0.5	8.3	6.1	0.5	8.2
	86	6.1	0.3	4.7	6.1	0.3	5.7
(10) Total Percent Passing No. 200 Sieve (%)	88	3.67	0.24	6.54	3.73	0.34	9.10
	88	3.67	0.24	6.54	3.73	0.34	9.10
OHD L-26 - Asphalt Content (Method A): (11) Ignition Oven Loss (%AC)	88	4.66	0.18	3.83	4.64	0.20	4.31
	88	4.66	0.18	3.83	4.64	0.20	4.31
AASHTO T 209 - Theoretical Max. Specific Gravity: (12) Avg. Rices Gravity (G_{mm})	88	2.549	0.011	0.430	2.549	0.011	0.426
	87	2.550	0.010	0.390	2.549	0.010	0.409
OHD L-14 - Bulk Specific Gravity (Method B): (13) Avg. SGC Bulk Specific Gravity (G_{mb})	88	2.466	0.009	0.383	2.468	0.014	0.575
	87	2.466	0.010	0.385	2.467	0.012	0.475
OHD L-45 - CoreLok™ Bulk Specific Gravity: (14) Avg. SGC Bulk Specific Gravity (G_{mb})	85	2.426	0.193	7.949	2.428	0.188	7.747
	83	2.449	0.021	0.870	2.450	0.020	0.817
OHD L-14 - Percent Absorption: (15) Avg. SGC Absorption (%)	88	0.26	0.11	42.93	0.26	0.11	43.06
	87	0.26	0.11	42.85	0.25	0.11	41.96

NOTE: The shaded rows show results after removing outlying data.

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
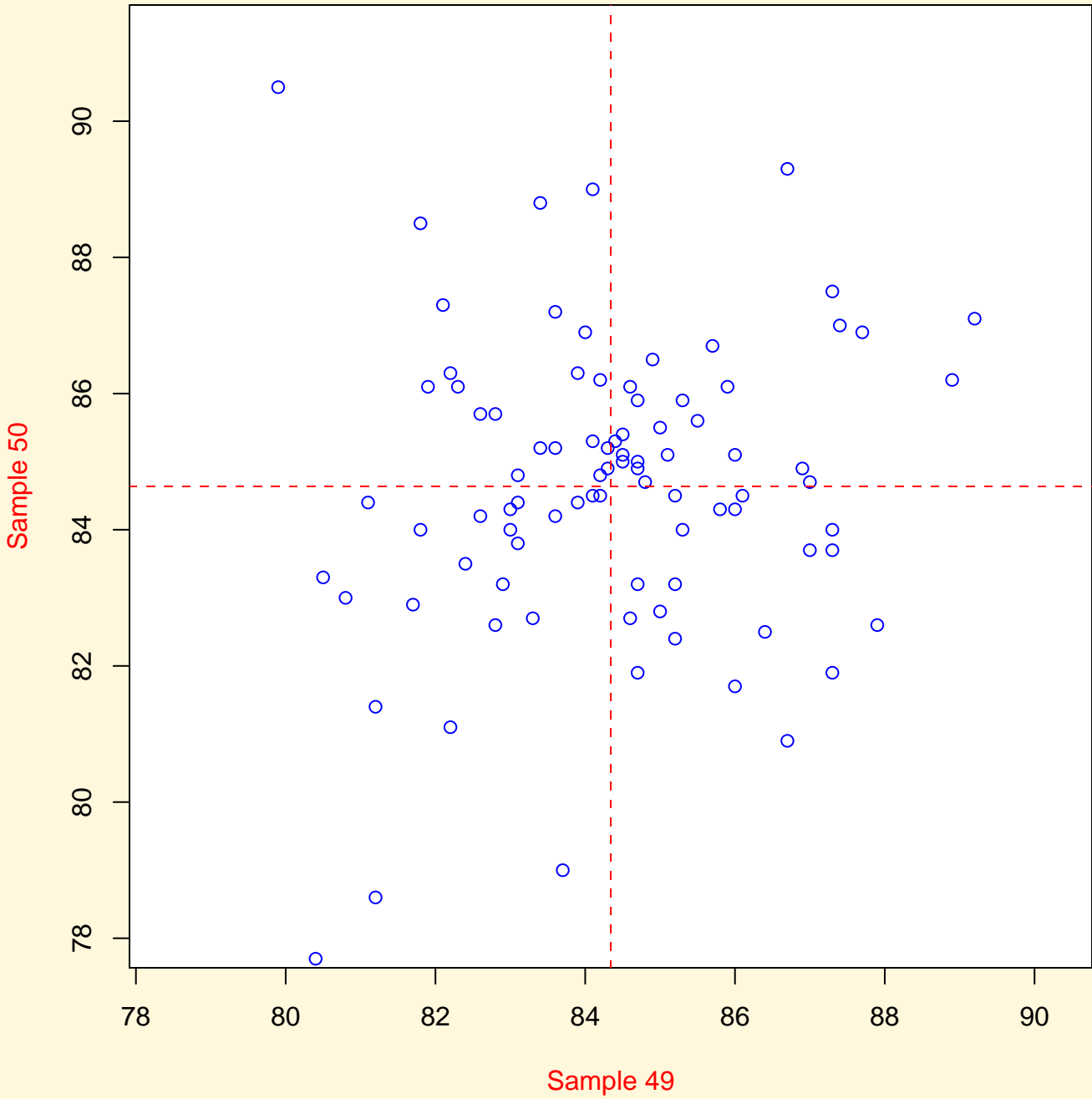## Sample Numbers 49 & 50

Percent Passing 3/4 inch Sieve
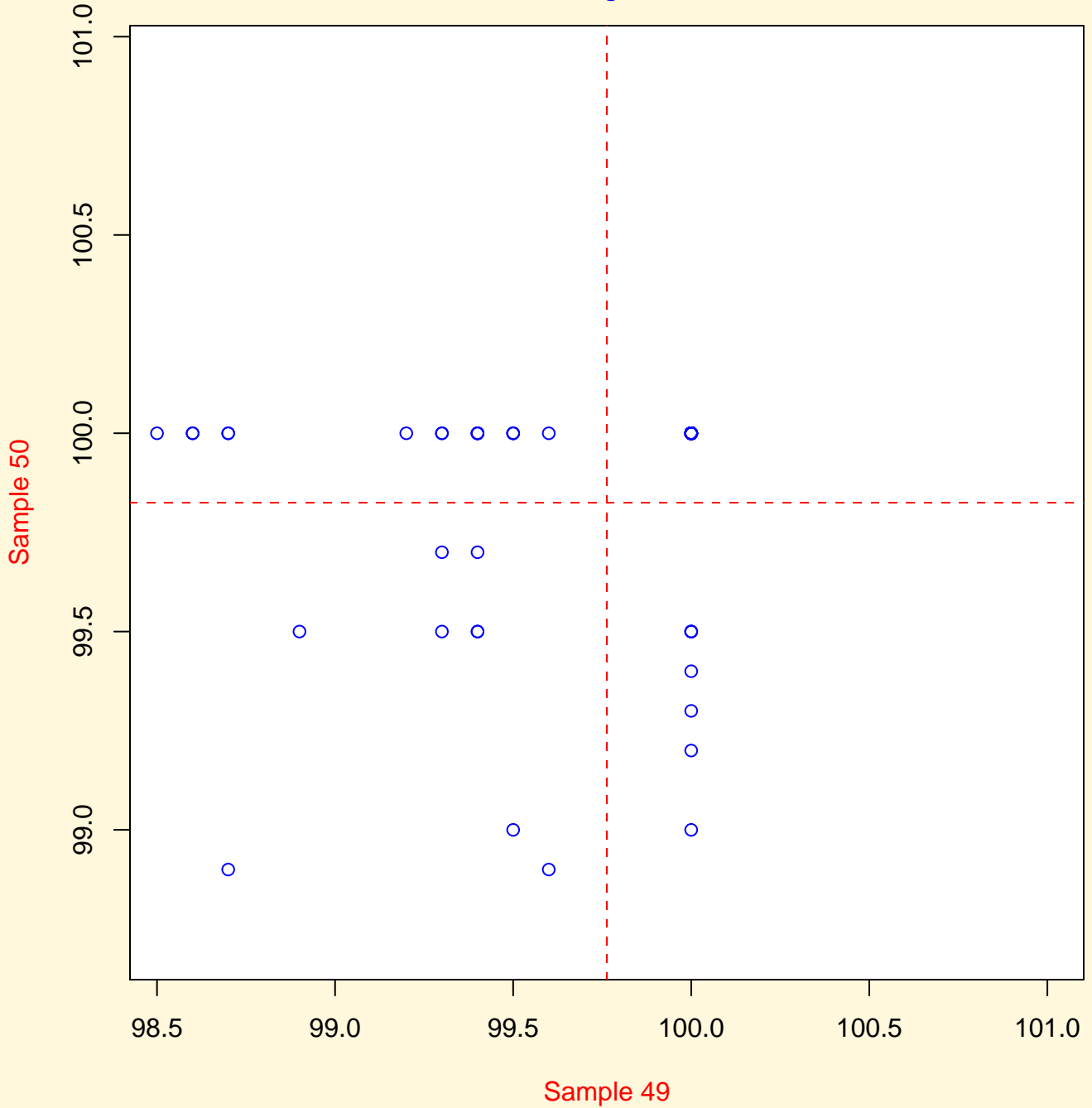
Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	99.8	0.4	0.4
50	99.8	0.4	0.4

Outlier Lab Nos. – 19, 72, 68, 73

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50
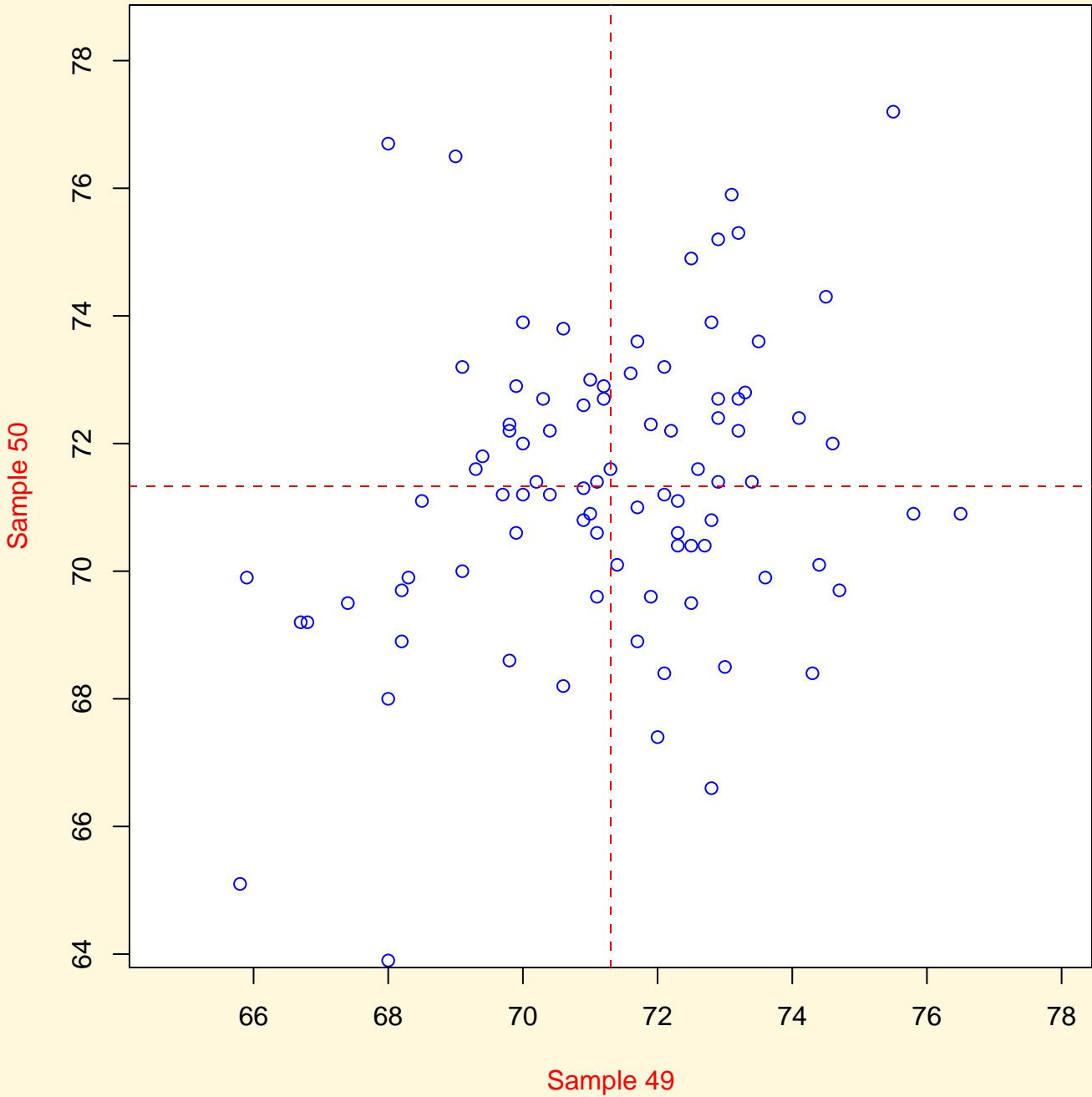
Percent Passing 1/2 inch Sieve

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	84.3	2.0	2.4
50	84.6	2.2	2.6

Outlier Lab Nos. –

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

Percent Passing 3/8 inch Sieve

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	71.3	2.2	3.1
50	71.3	2.3	3.3

Outlier Lab Nos. –

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
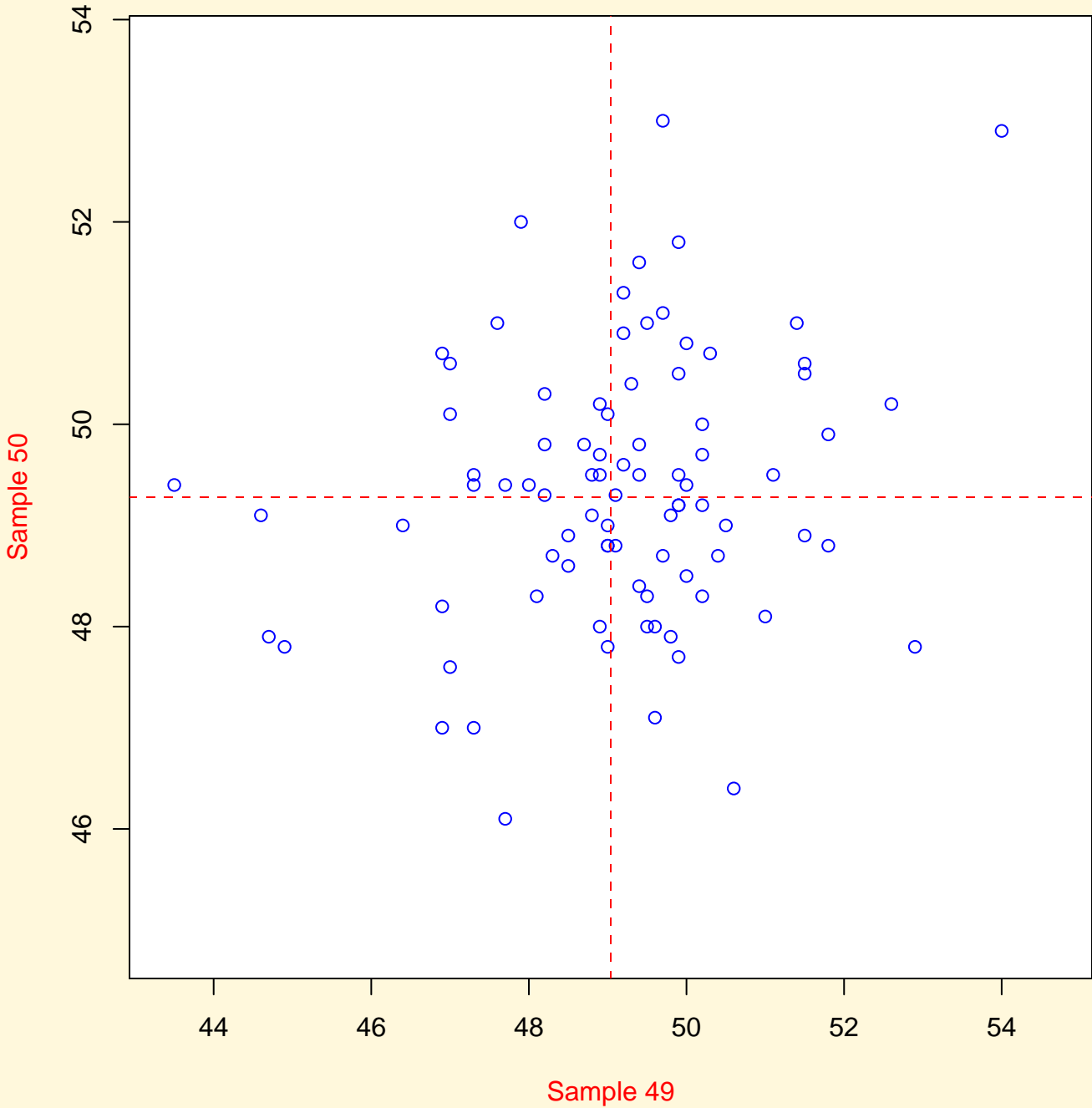## Sample Numbers 49 & 50

Percent Passing No. 4 Sieve

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	49.0	1.9	3.8
50	49.3	1.5	3.0

Outlier Lab Nos. – 108

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

Percent Passing No. 8 Sieve

Sample 50

Sample 49

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	38.2	1.5	3.9
50	38.4	1.1	3.0

Outlier Lab Nos. – 108

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
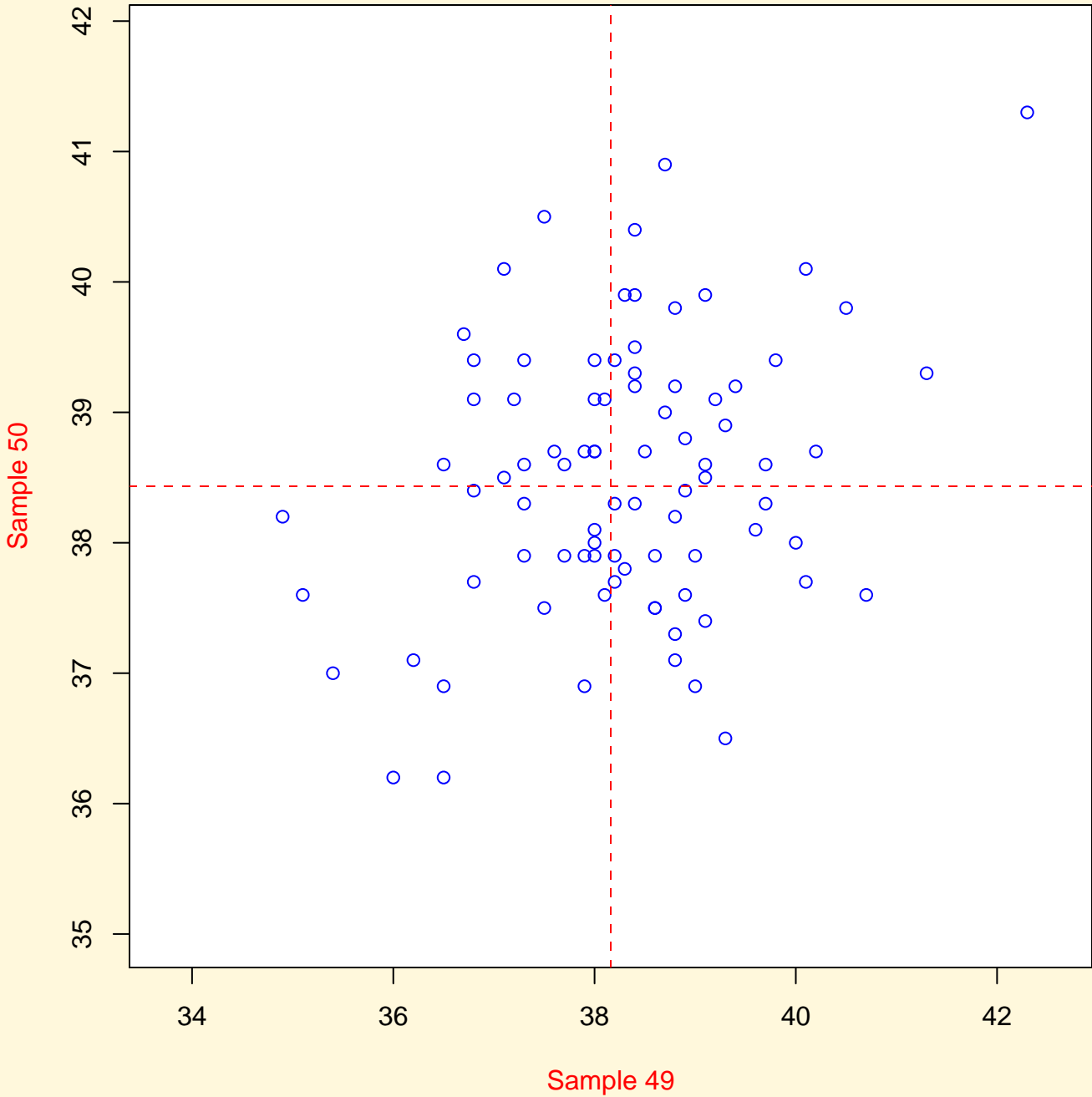## Sample Numbers 49 & 50

Percent Passing No. 16 Sieve

Sample 50 (y-axis) vs Sample 49 (x-axis)

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	31.1	1.1	3.4
50	31.2	0.9	2.8

Outlier Lab Nos. – 108

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
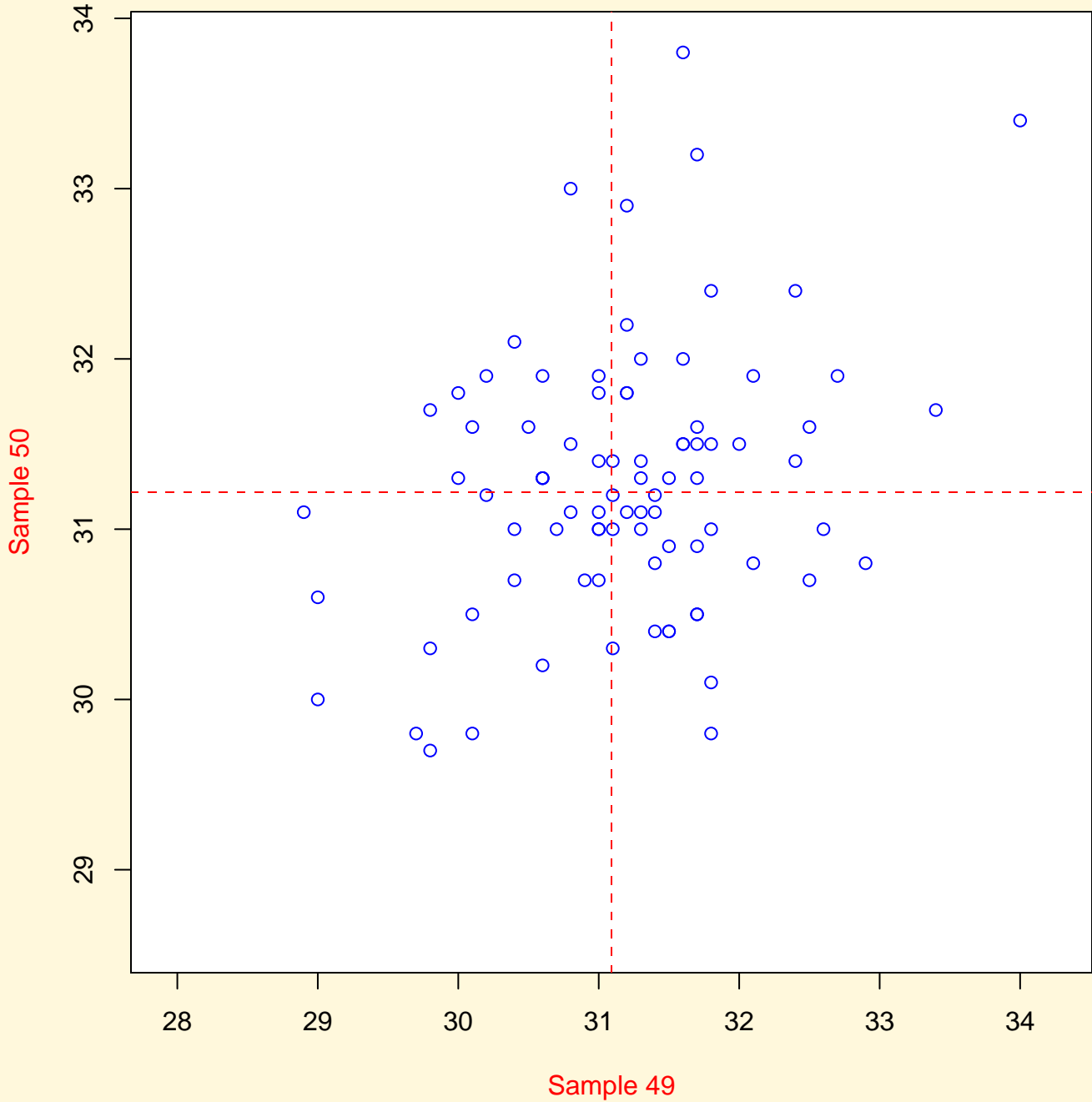## Sample Numbers 49 & 50

Percent Passing No. 30 Sieve

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	24.9	0.8	3.3
50	24.9	0.7	3.0

Outlier Lab Nos. –

Percent Passing No. 50 Sieve

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	13.9	0.7	4.9
50	14.0	0.7	5.0

Outlier Lab Nos. – 70

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
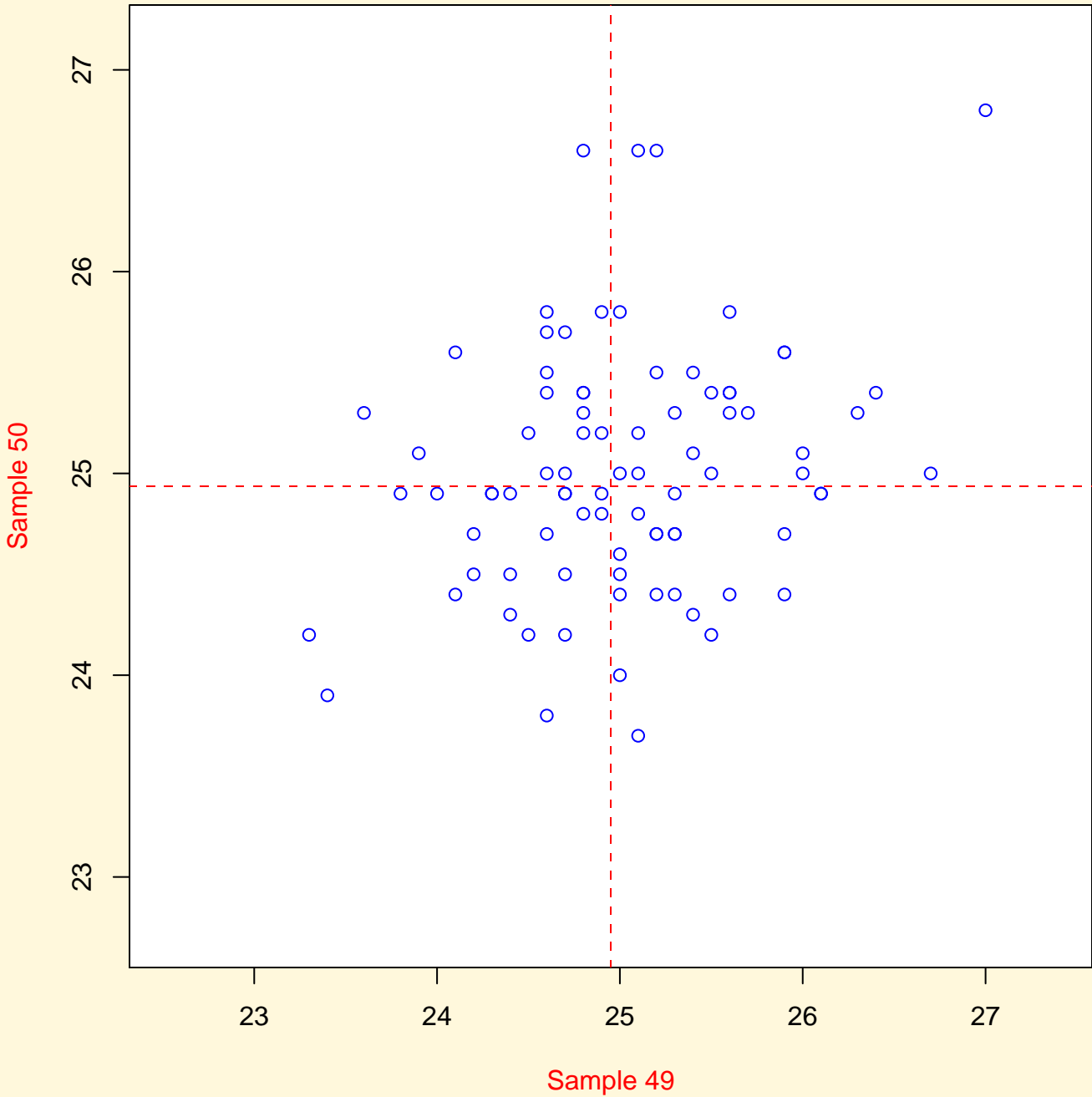## Sample Numbers 49 & 50

Percent Passing No. 100 Sieve

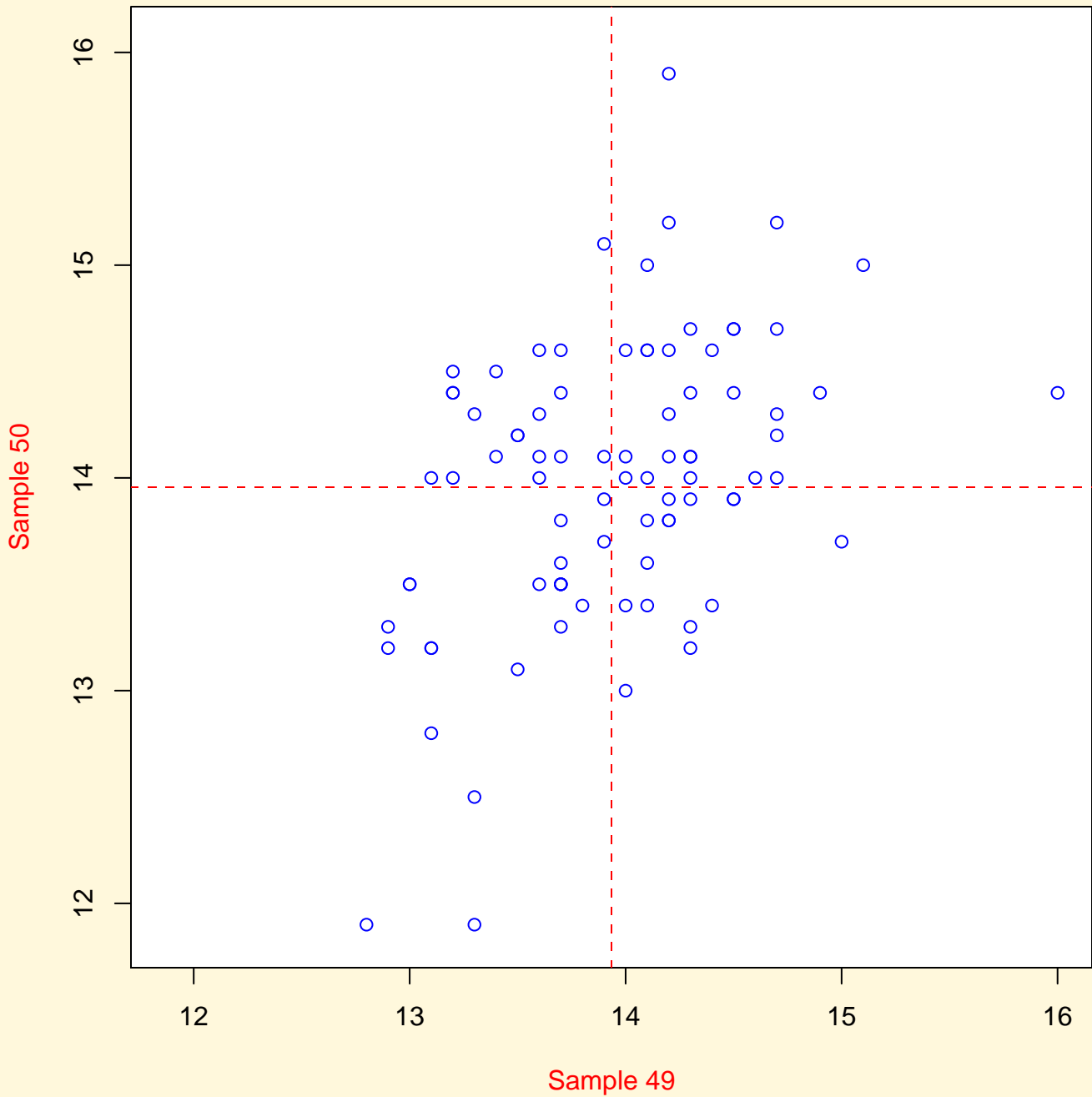| Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	6.1	0.3	4.7
50	6.1	0.3	5.7

Outlier Lab Nos. – 22, 25

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50
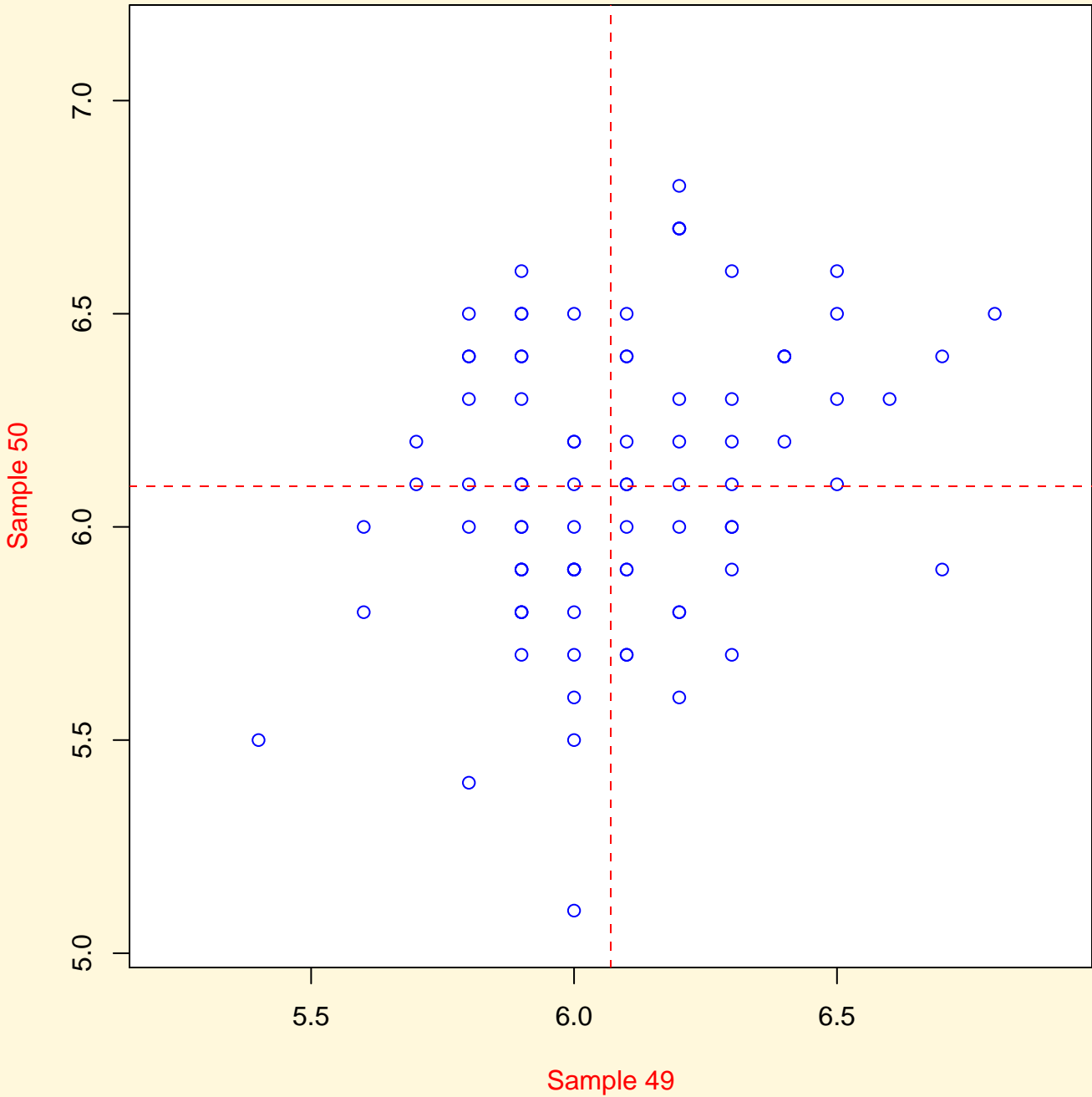
Percent Passing No. 200 Sieve
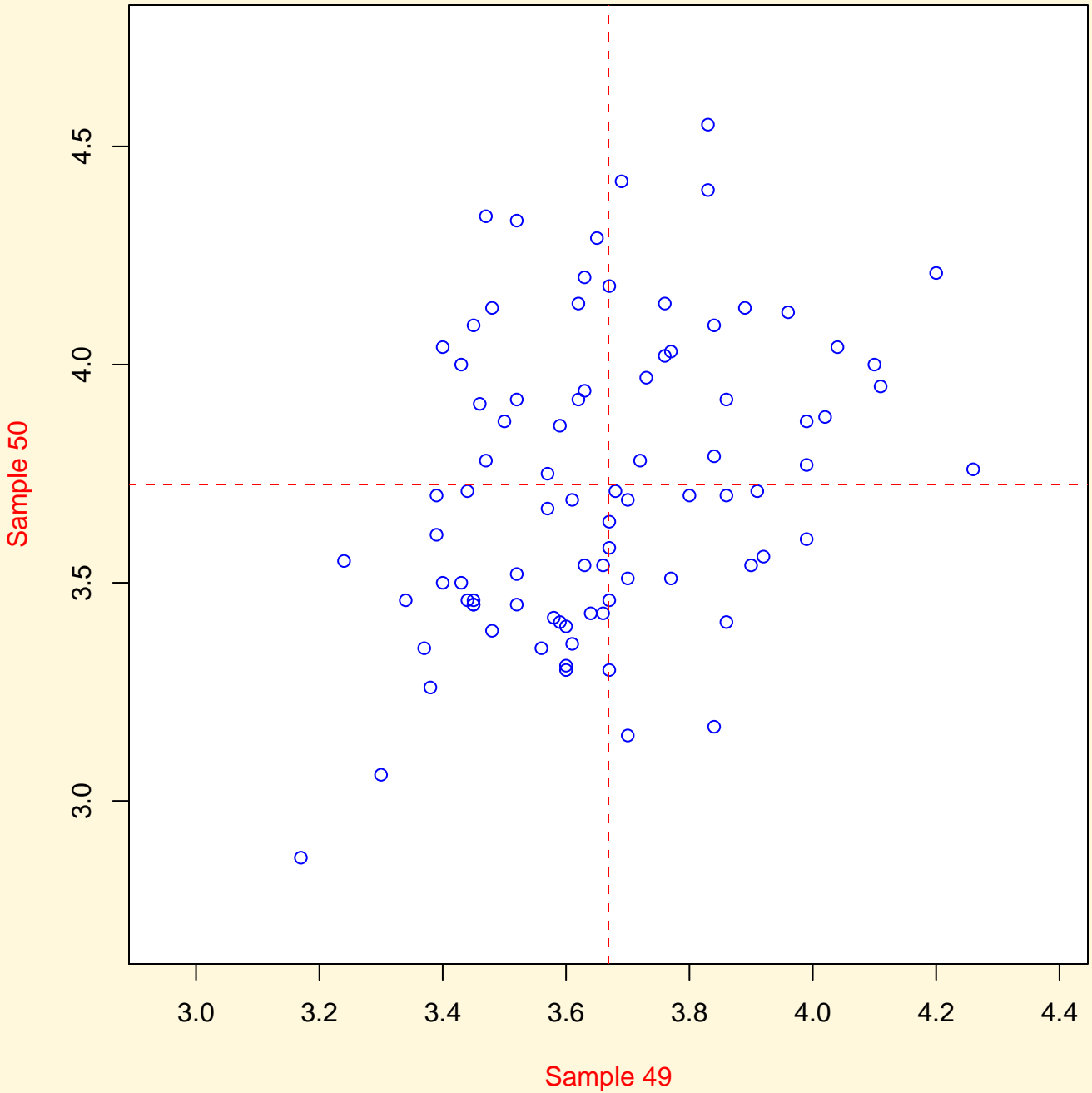
Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	3.67	0.24	6.54
50	3.73	0.34	9.10

Outlier Lab Nos. --

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

Percent Asphalt Content (Ignition Oven)

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	4.66	0.18	3.83
50	4.64	0.20	4.31

Outlier Lab Nos. –

Rices Specific Gravity
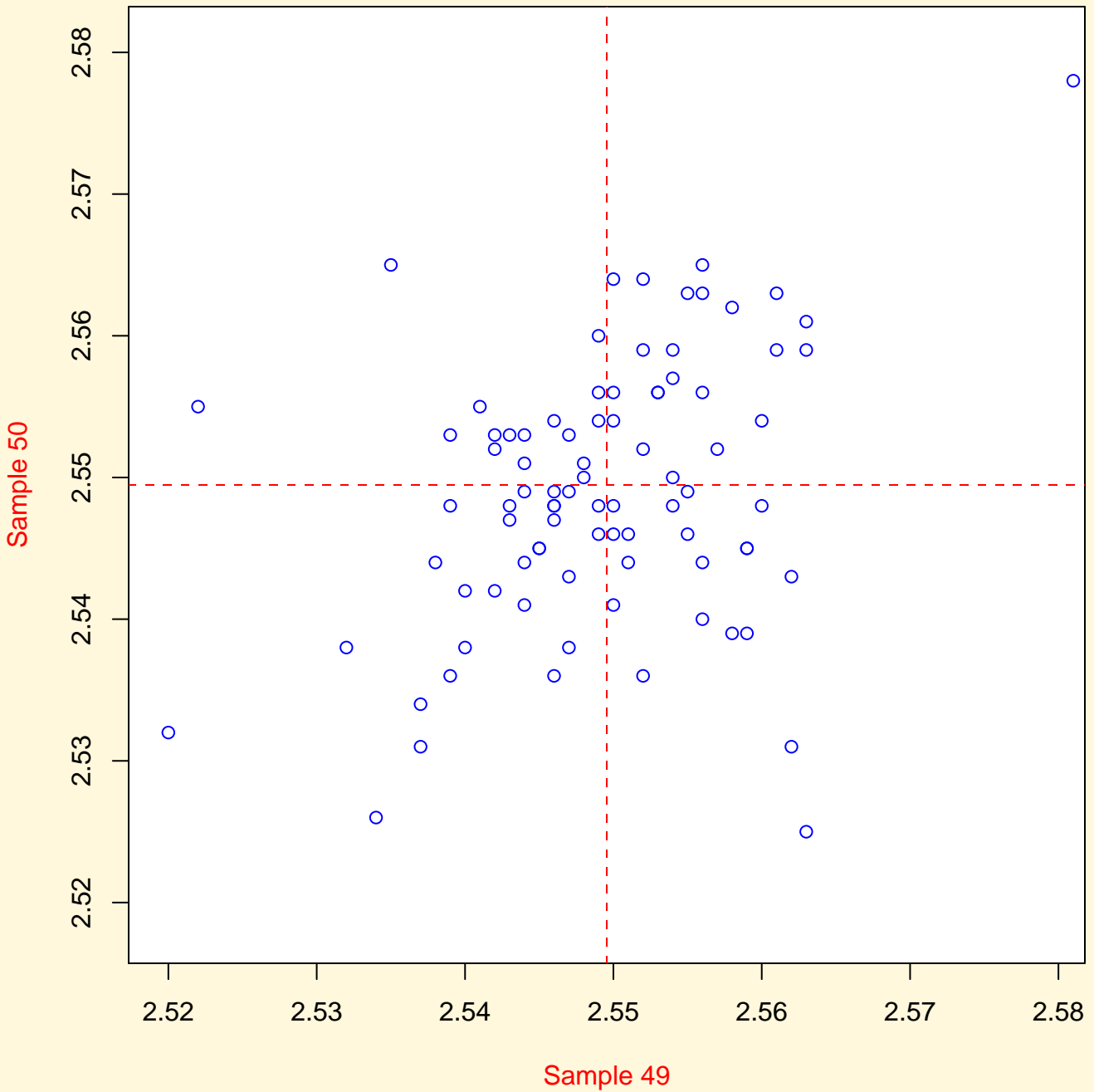
Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	2.550	0.010	0.390
50	2.549	0.010	0.409

Outlier Lab Nos. – 76

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

SGC Specific Gravity
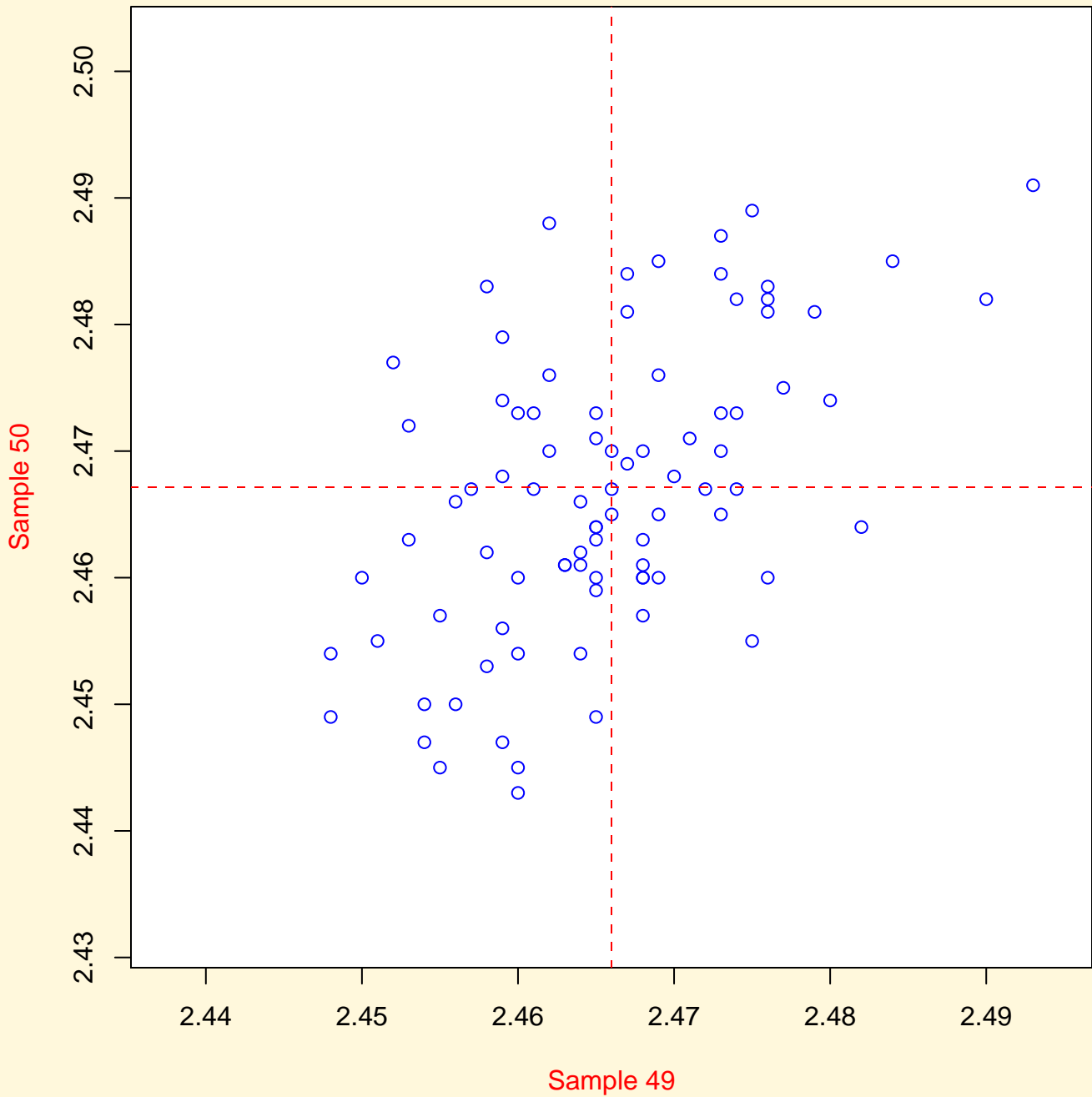
Sample 50

Sample 49

Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	2.466	0.010	0.385
50	2.467	0.012	0.475

Outlier Lab Nos. – 64

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

SGC Specific Gravity–OHD L–45
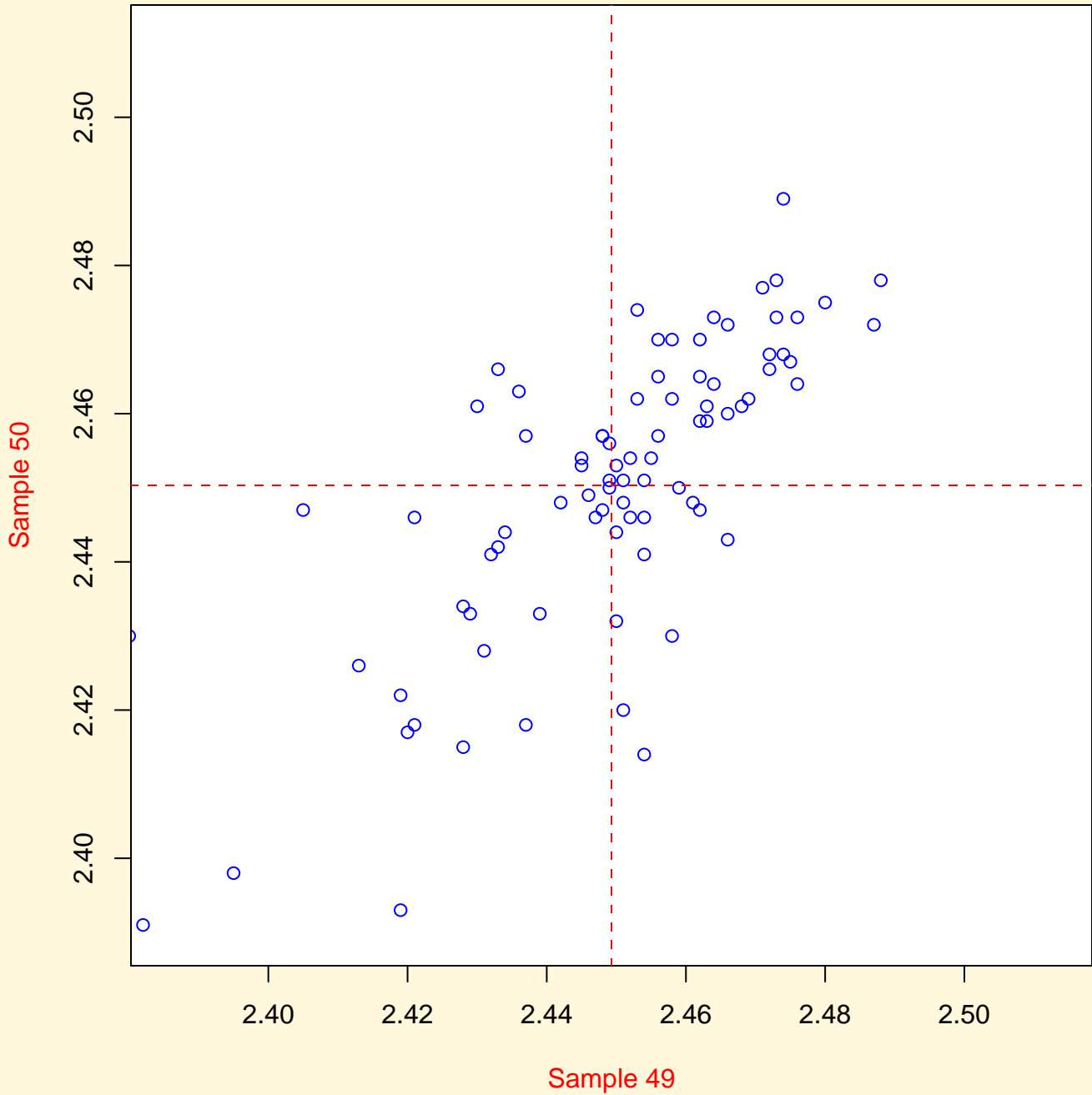
Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	2.449	0.021	0.870
50	2.450	0.020	0.817

Outlier Lab Nos. – 2, 123

OMRL Asphalt Mix Proficiency Sample Program
Asphalt Mix Analysis
Sample Numbers 49 & 50

Percent Water Absorption–OHD L–14
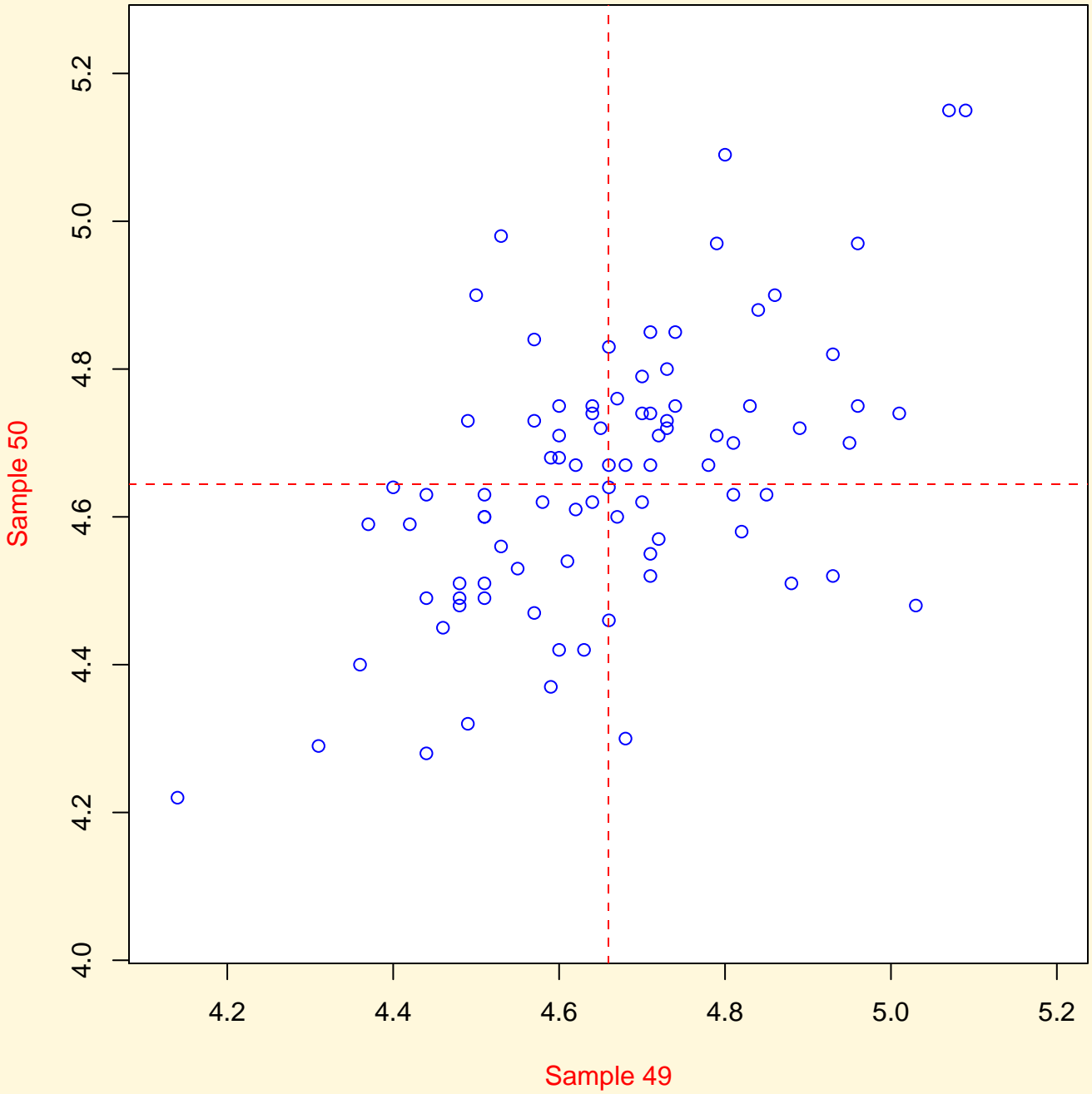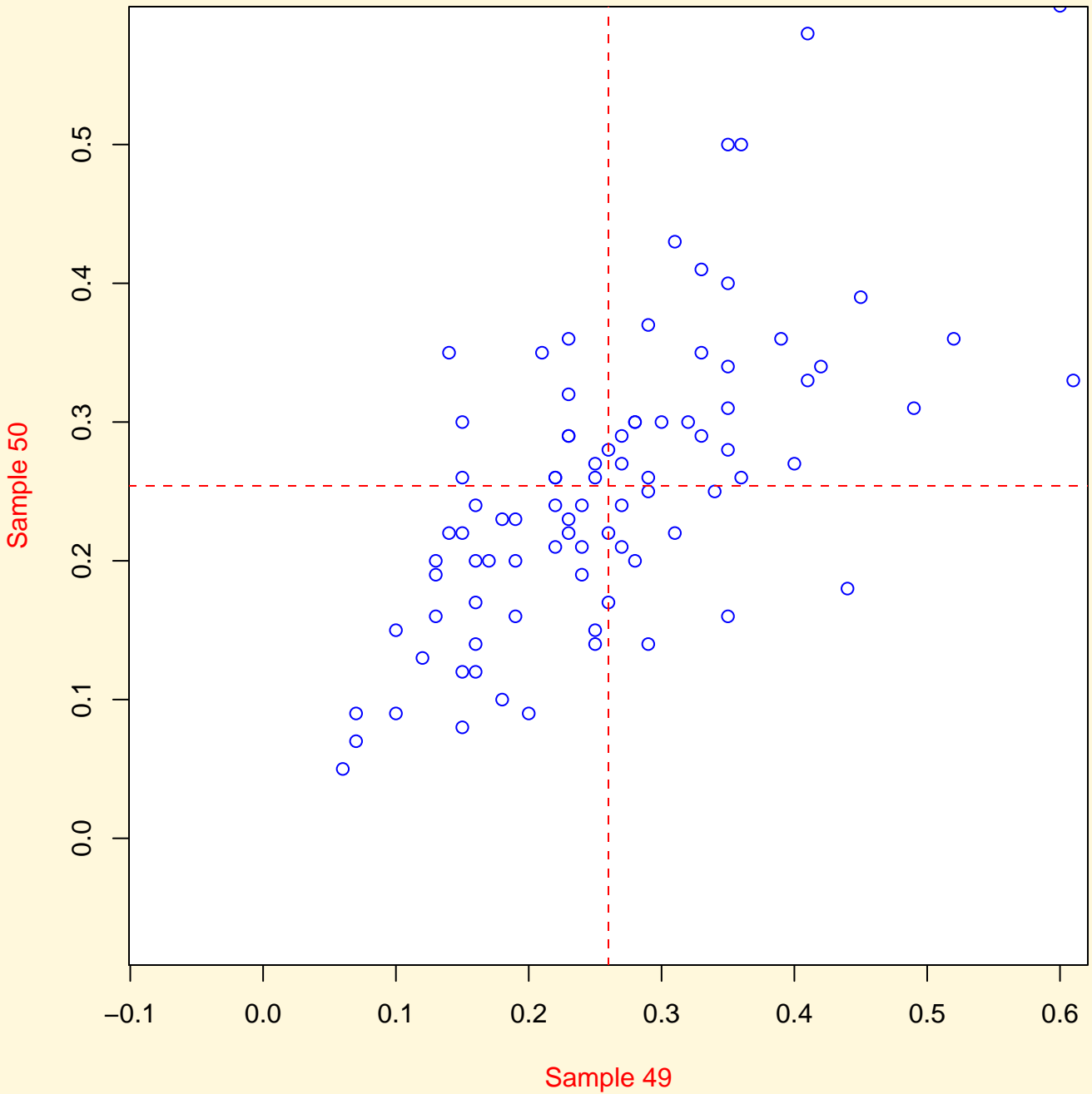
Sample No.	Mean	Std. Dev.	Coeff. of Var.
49	0.26	0.11	42.85
50	0.25	0.11	41.96

Outlier Lab Nos. – 12

Appendix A - Outlier Criterion
Percent Passing 3/4 inch Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	100.000	100.0000	0.000
0.875 Percentile	100.00000	100.0000	0.60000
0.125 Percentile	99.28750	99.2875	-0.50000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.712500	0.712500	1.10000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	1.107937	1.107937	1.710500
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	101.10794	101.1079	2.310500
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	98.17956	98.1796	-2.210500

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	84	84	84
Median	100.000	100.000	0.0000e+00
0.875 Percentile	100.0000	100.0000	0.60000
0.125 Percentile	99.3000	99.5000	-0.50000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.70000	0.50000	1.10000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.471800	0.337000	0.741400
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	100.47180	100.33700	1.341400
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	98.82820	99.16300	-1.241400

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing 1/2 inch Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	84.350	84.7500	0.100
0.875 Percentile	86.91250	86.9000	2.52500
0.125 Percentile	82.07500	82.5875	-3.11250
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	4.837500	4.312500	5.63750
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	7.522313	6.705938	8.766313
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	94.43481	93.6059	11.291313
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	74.55269	75.8816	-11.878813

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	84.350	84.750	1.0000e-01
0.875 Percentile	86.9125	86.9000	2.52500
0.125 Percentile	82.0750	82.5875	-3.11250
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	4.83750	4.31250	5.63750
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	3.260475	2.906625	3.799675
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	90.17298	89.80663	6.324675
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	78.81452	79.68087	-6.912175

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing 3/8 inch Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	71.500	71.2500	0.450
0.875 Percentile	73.41250	73.6250	2.66250
0.125 Percentile	68.47500	68.9000	-2.83750
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	4.937500	4.725000	5.50000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	7.677813	7.347375	8.552500
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	81.09031	80.9724	11.215000
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	60.79719	61.5526	-11.390000

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	71.500	71.250	4.5000e-01
0.875 Percentile	73.4125	73.6250	2.66250
0.125 Percentile	68.4750	68.9000	-2.83750
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	4.93750	4.72500	5.50000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	3.327875	3.184650	3.707000
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	76.74038	76.80965	6.369500
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	65.14712	65.71535	-6.544500

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 4 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	49.200	49.3000	0.050
0.875 Percentile	50.65000	50.8125	2.15000
0.125 Percentile	47.00000	47.8000	-2.00000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	3.650000	3.012500	4.15000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	5.675750	4.684437	6.453250
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	56.32575	55.4969	8.603250
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	41.32425	43.1156	-8.453250

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	49.200	49.300	1.0000e-01
0.875 Percentile	50.7000	50.8250	2.20000
0.125 Percentile	47.0000	47.8750	-1.85000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	3.70000	2.95000	4.05000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	2.493800	1.988300	2.729700
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	53.19380	52.81330	4.929700
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	44.50620	45.88670	-4.579700

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 8 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed- Xmed)
Count = Number of Laboratories	88	88	88
Median	38.250	38.4500	-0.050
0.875 Percentile	39.61250	39.6250	1.81250
0.125 Percentile	36.67500	37.1000	-1.70000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	2.937500	2.525000	3.51250
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	4.567812	3.926375	5.461938
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	44.18031	43.5514	7.274437
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	32.10719	33.1736	-7.161938

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed- Xmed)
Count = Number of Laboratories	87	87	87
Median	38.300	38.500	-7.1054e-15
0.875 Percentile	39.6250	39.6500	1.82500
0.125 Percentile	36.7750	37.2500	-1.62500
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	2.85000	2.40000	3.45000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	1.920900	1.617600	2.325300
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	41.54590	41.26760	4.150300
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	34.85410	35.63240	-3.950300

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 16 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	31.200	31.2000	0.000
0.875 Percentile	32.01250	31.9125	1.50000
0.125 Percentile	30.00000	30.3000	-1.10000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	2.012500	1.612500	2.60000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	3.129438	2.507437	4.043000
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	35.14194	34.4199	5.543000
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	26.87056	27.7926	-5.143000

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	31.200	31.200	0.0000e+00
0.875 Percentile	32.0250	31.9250	1.50000
0.125 Percentile	30.0750	30.3750	-1.02500
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	1.95000	1.55000	2.52500
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	1.314300	1.044700	1.701850
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	33.33930	32.96970	3.201850
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	28.76070	29.33030	-2.726850

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 30 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	25.000	24.9000	0.050
0.875 Percentile	25.90000	25.6000	1.01250
0.125 Percentile	24.20000	24.2875	-0.90000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	1.700000	1.312500	1.91250
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	2.643500	2.040938	2.973938
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	28.54350	27.6409	3.986438
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	21.55650	22.2466	-3.873938

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	25.000	24.900	5.0000e-02
0.875 Percentile	25.9000	25.6000	1.01250
0.125 Percentile	24.2000	24.2875	-0.90000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	1.70000	1.31250	1.91250
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	1.145800	0.884625	1.289025
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	27.04580	26.48463	2.301525
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	23.05420	23.40287	-2.189025

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 50 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	14.000	14.0000	0.000
0.875 Percentile	14.51250	14.6125	0.90000
0.125 Percentile	13.20000	13.2875	-0.70000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	1.312500	1.325000	1.60000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	2.040938	2.060375	2.488000
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	16.55344	16.6729	3.388000
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	11.15906	11.2271	-3.188000

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	14.000	14.000	0.0000e+00
0.875 Percentile	14.5250	14.6000	0.90000
0.125 Percentile	13.2000	13.2750	-0.70000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	1.32500	1.32500	1.60000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.893050	0.893050	1.078400
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	15.41805	15.49305	1.978400
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	12.30695	12.38195	-1.778400

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 100 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	6.000	6.1000	-0.100
0.875 Percentile	6.40000	6.5000	0.40000
0.125 Percentile	5.80000	5.7000	-0.50000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.600000	0.800000	0.90000
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.933000	1.244000	1.399500
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	7.33300	7.7440	1.799500
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	4.86700	4.4560	-1.899500

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	86	86	86
Median	6.000	6.100	-1.0000e-01
0.875 Percentile	6.4000	6.5000	0.40000
0.125 Percentile	5.8000	5.7000	-0.50000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.60000	0.80000	0.90000
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.404400	0.539200	0.606600
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	6.80440	7.03920	1.006600
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	5.39560	5.16080	-1.106600

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Passing No. 200 Sieve

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	3.635	3.7000	-0.065
0.875 Percentile	3.92500	4.1312	0.46125
0.125 Percentile	3.43000	3.3863	-0.35625
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.495000	0.745000	0.81750
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.769725	1.158475	1.271212
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	4.69472	5.2897	1.732462
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	2.66028	2.2278	-1.627462

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	3.635	3.700	-6.5000e-02
0.875 Percentile	3.9250	4.1312	0.46125
0.125 Percentile	3.4300	3.3863	-0.35625
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.49500	0.74500	0.81750
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.333630	0.502130	0.550995
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	4.25863	4.63338	1.012245
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	3.09637	2.88412	-0.907245

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Asphalt Content (Ignition Oven)

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed- Xmed)
Count = Number of Laboratories	88	88	88
Median	4.660	4.6550	0.010
0.875 Percentile	4.86250	4.8412	0.16625
0.125 Percentile	4.47875	4.4588	-0.20500
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.383750	0.382500	0.37125
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.596731	0.594787	0.577294
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	5.45923	5.4360	0.743544
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	3.88202	3.8640	-0.782294

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed- Xmed)
Count = Number of Laboratories	88	88	88
Median	4.660	4.655	1.0000e-02
0.875 Percentile	4.8625	4.8412	0.16625
0.125 Percentile	4.4788	4.4588	-0.20500
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.38375	0.38250	0.37125
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.258648	0.257805	0.250223
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	5.12115	5.09905	0.416473
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	4.22010	4.20095	-0.455222

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Rices Specific Gravity

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	2.549	2.5485	0.002
0.875 Percentile	2.55912	2.5601	0.01050
0.125 Percentile	2.53900	2.5380	-0.00975
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.020125	0.022125	0.02025
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.031294	0.034404	0.031489
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	2.59042	2.5945	0.041989
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	2.50771	2.5036	-0.041239

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	2.549	2.549	1.5000e-03
0.875 Percentile	2.5593	2.5602	0.00975
0.125 Percentile	2.5398	2.5380	-0.01000
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.01950	0.02225	0.01975
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.013143	0.014997	0.013311
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	2.57239	2.57525	0.023061
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	2.52661	2.52300	-0.023311

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
SGC Specific Gravity

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	2.465	2.4670	-0.002
0.875 Percentile	2.47600	2.4830	0.01200
0.125 Percentile	2.45587	2.4540	-0.01100
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.020125	0.029000	0.02300
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.031294	0.045095	0.035765
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	2.50729	2.5281	0.047765
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	2.42458	2.4089	-0.046765

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)- (Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	2.465	2.467	-2.0000e-03
0.875 Percentile	2.4760	2.4823	0.01200
0.125 Percentile	2.4558	2.4540	-0.01100
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.02025	0.02825	0.02300
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.013648	0.019040	0.015502
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	2.48965	2.50129	0.027502
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	2.44210	2.43496	-0.026502

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
SGC Specific Gravity-OHD L-45

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	85	85	85
Median	2.452	2.4530	0.000
0.875 Percentile	2.47200	2.4710	0.01350
0.125 Percentile	2.42100	2.4210	-0.01400
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.051000	0.050000	0.02750
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.079305	0.077750	0.042762
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	2.55131	2.5487	0.056262
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	2.34169	2.3433	-0.056762

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	83	83	83
Median	2.452	2.453	-1.0000e-03
0.875 Percentile	2.4720	2.4715	0.01175
0.125 Percentile	2.4280	2.4265	-0.01400
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.04400	0.04500	0.02575
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.029656	0.030330	0.017356
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	2.50166	2.50183	0.029106
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	2.39834	2.39617	-0.031355

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.

Appendix A - Outlier Criterion
Percent Water Absorption-OHD L-14

Table A - Extreme Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	88	88	88
Median	0.250	0.2500	0.000
0.875 Percentile	0.36375	0.3600	0.08125
0.125 Percentile	0.14875	0.1400	-0.09125
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.215000	0.220000	0.17250
(1.555) x (Range of Inner 75%) = Distance Beyond Inner 75% for 4.725 Std. Dev.	0.334325	0.342100	0.268238
Invalid Upper Limit = (87.5th Percentile) + (1.555) x (Range of Inner 75%)	0.69808	0.7021	0.349488
Invalid Lower Limit = (12.5th Percentile) - (1.555) x (Range of Inner 75%)	-0.18558	-0.2021	-0.359488

Table B - Outliers

Table of Statistics and Limits	Sample 49(X)	Sample 50(Y)	(Y-X)-(Ymed-Xmed)
Count = Number of Laboratories	87	87	87
Median	0.250	0.250	0.0000e+00
0.875 Percentile	0.3675	0.3600	0.08000
0.125 Percentile	0.1475	0.1400	-0.09250
Range of Inner 75% = (87.5th Percentile Value) - (12.5th Percentile Value)	0.22000	0.22000	0.17250
(0.674) x (Range of Inner 75%) = Distance Beyond Inner 75% for 2.7 Std. Dev.	0.148280	0.148280	0.116265
Outlier Upper Limit = (87.5th Percentile) + (0.674) x (Range of Inner 75%)	0.51578	0.50828	0.196265
Outlier Lower Limit = (12.5th Percentile) - (0.674) x (Range of Inner 75%)	-0.00078	-0.00828	-0.208765

NOTE: Limits are shown as shaded rows. If either pair of results are designated as "0" in ratings table, both results are removed prior to any analysis. Labs with outlier data exceeding these limits are listed in the paired plots.