Report No. 797

Paint - Round 18

Proficiency Testing Program

February 2013

ACKNOWLEDGMENTS

PTA wishes to gratefully acknowledge the technical assistance that was provided for this program by Mr J. Fletcher, Supalux Pty Ltd. This assistance included preparation, distribution and homogeneity testing of the sample, in addition to input into the design of the program, technical advice and discussion in the final report.

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CONTENTS

1. FOREWORD

This report summarises the results of the eighteenth round of a proficiency testing program covering a series of paint tests (to AS1580).

Proficiency Testing Australia (PTA) conducted the program in December 2012. The Program Coordinator was Dr M Li. The Technical Adviser was Mr J. Fletcher, Supalux Pty Ltd. This report was authorised by Dr M Bunt, Statistician, PTA. The aim of the program was to assess laboratories' ability to competently perform the prescribed analyses.

2. STATISTICAL DESIGN OF THE PROGRAM

For each statistically analysed test, robust statistical procedures were used to generate the z-scores and summary statistics for each test - number of results, median, normalised interquartile range, robust coefficient of variation, minimum, maximum and range.

3. FEATURES OF THE PROGRAM

(a) A total of 13 laboratories received samples, and all laboratories returned results.

(b) Each participant was supplied with two 500ml tins of water based paint labelled "Sample A" and "Sample B".

(c) Laboratories were asked to perform the following consistency analyses on both samples A and B:

(i) AS 1580.202.1 - density

(ii) AS 1580.214.1 - consistency – Stormer viscometer

(iii) AS 1580.101.5 - conditions of test-temperature and humidity control

(iv) AS 1580.301.1 - non-volatile content by mass

(v) AS 1580.401.8 - no-pick-up time of road marking paints

(vi) AS 1580.204.1 - fineness of grind

(d) Homogeneity was analysed for randomly selected samples. Based on this testing, it was concluded that the samples were sufficiently homogeneous. Therefore any results identified as outliers could not be attributed to sample variability (Appendix B).

(e) Participating laboratories were requested to perform their tests according to the "Instructions to Participants" and to record their results on the

accompanying "Results Sheets". They were distributed to participants with the samples (Appendix C).

(f) Each laboratory was randomly allocated a unique code number for the program to enable confidentiality of results. Reference to each laboratory in this report is made by its code number.

4. SUMMARY OF RESULTS

TABLE A: SUMMARY OF RESULTS

Analyses	Sample	Median	Robust CV	No. of Results
Density (kg/L)	A	1.632	0.5%	18
	B	1.656	0.4%	18
Viscosity Stormer Viscometer (KU)	A	79.4	0.9%	17
	B	95.0	3.0%	17
Conditions of Test-temperature Control	A	n/a	n/a	18
	B	n/a	n/a	18
Non-volatile Content by Mass	A	76.930	0.4%	17
	B	77.790	0.6%	17
No-Pick-Up Time (minutes)	A	n/a	n/a	4
	B	n/a	n/a	4
Fineness of Grind (µm)	A	80.0	19.5%	15
	B	80.0	25.5%	15

5 STATISTICAL OUTLIER RESULTS

In order to achieve the program's aim of assessing laboratories' testing performance, a robust statistical approach, which uses z-scores has been utilised. The z-score is a measure of how far the result(s) is from the consensus value - a normalised value which gives a "score" to each result relative to the other results in the group. Therefore a z-score close to zero means that the result agrees well with those from other laboratories. An outlier will be any result(s) which has an absolute z-score value greater than or equal to 3.0.

For further information on the calculation and interpretation of z-scores, please see the *Guide to Proficiency Testing Australia (2012)*[1].

TABLE B: OUTLIER RESULTS

Test	Z-Score Outlier Laboratory Codes
Density	11
Consistency-Stormer Viscometer	7C,11
Conditions of Test-temperature Control	n/a
Non-volatile Content by Mass	nil
No-Pick-Up Time	n/a
Fineness of Grind	6

6. PTA AND TECHNICAL ADVISER'S COMMENTS

Metrological Traceability and Measurement Uncertainty of Assigned Values

Consensus values (median) derived from the participants' results are used in this program. These values are not metrologically traceable to an external reference.

As the assigned value for this program is the median of the results submitted by the participants, the uncertainty of the median has been calculated and is presented in Appendix A

Analysis of Results by Method Groups

All participants were required to use AS1580 Paints and Related Materials – Test Methods, therefore, results were analysed without method groups.

Comments

There were three laboratories with outliers. The participants should investigate the cause of the outliers, such as interferences from the matrix, instrument conditions, transcription and calculation errors, sample preparation errors and human errors. On the whole, the study should provide valuable information to the participants on the performance of the methods and equipment used.

The results submitted by the participants for Density are satisfactory. Laboratory code 11 reported an outlier for Density.

Laboratory codes 7 and 11 reported outliers for Consistency – Stormer Viscometer

Statistical analysis was not performed for conditions of Test-temperature Control and No-Pick-Up Time due to their nature. The results of conditions of test-temperature control are satisfactory.

There was no reported z-score outlier for Non-volatile Content by Mass.

Considering that the samples are sufficiently homogeneous, all laboratories reporting outlier results should conduct an investigation.

7. REFERENCES

[1] *Guide to Proficiency Testing Australia, 2012.*
This document can be found on the PTA website at www.pta.asn.au

[2] AS1580 202.1 – *Paints and Related Materials – Test Methods: Density.*

[3] AS1580 214.1 – *Paints and Related Materials – Test Methods*- Consistency – Stormer viscometer

[4] AS1580 101.5 – *Paints and Related Materials – Test Methods: Conditions of Test-temperature and Humidity Control*

[5] AS1580 301.1 – *Paints and Related Materials – Test Methods: Non-volatile Content by Mass.*

[6] AS1580 401.8 – *Paints and Related Materials – Test Methods: No-pick-up time of road marking paints.*

[7] AS1580 409.1 – *Paints and Related Materials – Test Methods: Fineness of grind.*

APPENDIX A

Results and Data Analysis

Density - AS 1580 202.1

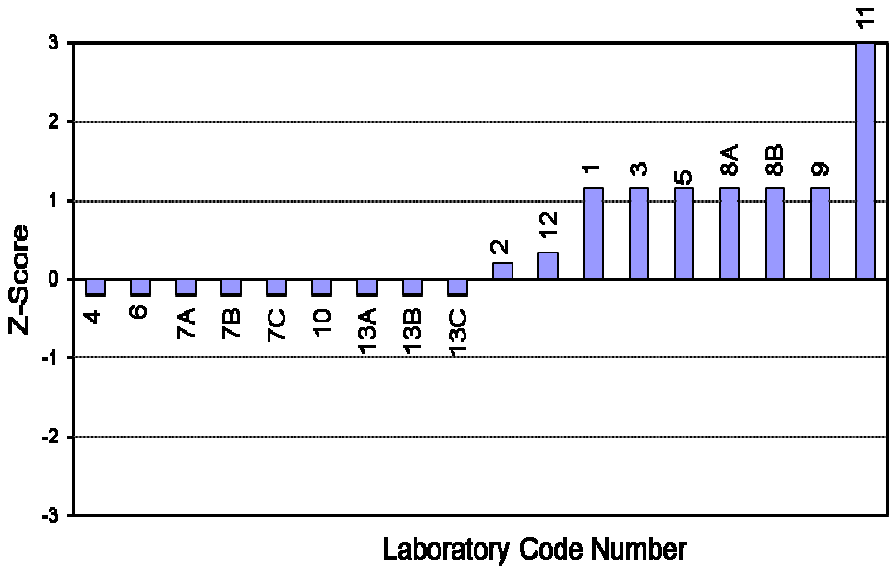
Results by Laboratory Code

Lab Code	Results (kg/L)		Sample A Robust Z-score		Sample B Robust Z-score
	Sample A	Sample B			
1	1.64	1.65	1.15		-0.74
2	1.633	1.654	0.20		-0.20
3	1.64	1.66	1.15		0.61
4	1.63	1.65	-0.20		-0.74
5	1.64	1.67	1.15		1.96
6	1.63	1.65	-0.20		-0.74
7A	1.63	1.65	-0.20		-0.74
7B	1.63	1.65	-0.20		-0.74
7C	1.63	1.65	-0.20		-0.74
8A	1.64	1.66	1.15		0.61
8B	1.64	1.66	1.15		0.61
9	1.64	1.66	1.15		0.61
10	1.63	1.65	-0.20		-0.74
11	1.663	1.656	4.25	§	0.07
12	1.634	1.655	0.34		-0.07
13A	1.63	1.66	-0.20		0.61
13B	1.63	1.66	-0.20		0.61
13C	1.63	1.66	-0.20		0.61
No of Results:	18	18			
Median:	1.632	1.656			
Normalised IQR:	0.007	0.007			
Robust CV:	0.5%	0.4%			
Minimum:	1.63	1.65			
Maximum:	1.663	1.670			
Range:	0.033	0.020			
Uncertainty (Median)	0.002	0.002			

[1] "**§**"s denote outliers (i.e. those results for which |*z-score*| ≥3.0).

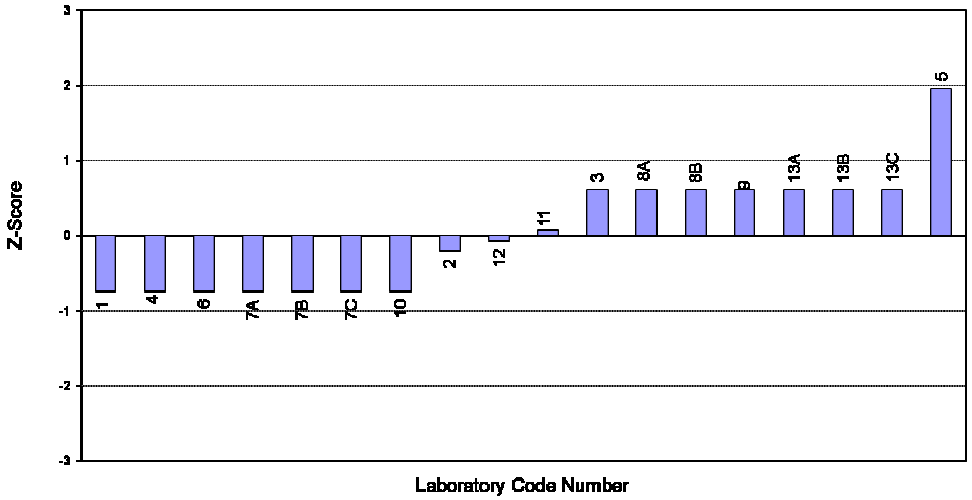
Density (kg/L)

Sample A Z-Score Charts



Density (kg/L)

Sample B Z-Score Charts



Consistency-Stormer Viscometer - AS 1580 214.1

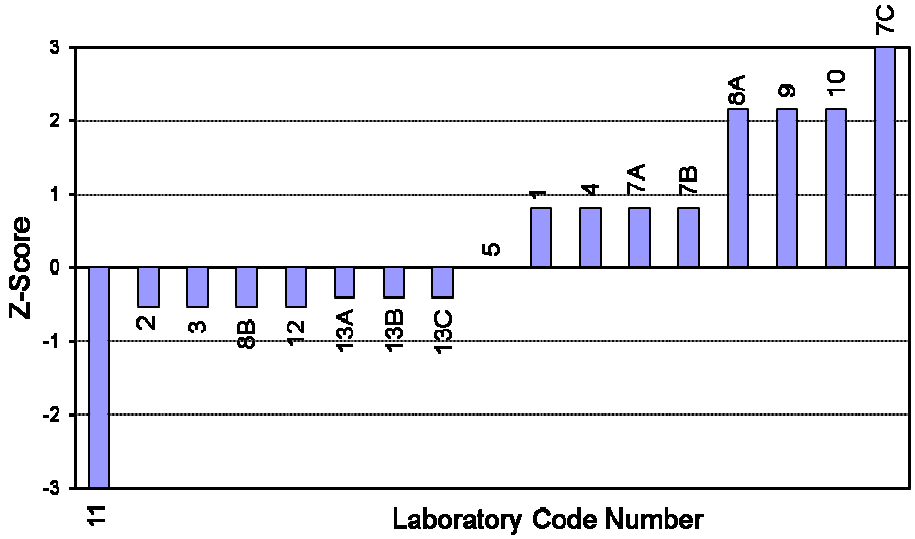
Results by Laboratory Code

Lab Code	Results (KU)		Sample A Robust Z-score[1]		Sample B Robust Z-score[1]	
	Sample A	Sample B				
1	80	99	0.81		1.42	
2	79	94	-0.54		-0.35	
3	79	93	-0.54		-0.71	
4	80	90	0.81		-1.77	
5	79.4	96.6	0.00		0.57	
7A	80	94	0.81		-0.35	
7B	80	93	0.81		-0.71	
7C	83	95	4.86	§	0.00	
8A	81	102	2.16		2.48	
8B	79	96	-0.54		0.35	
9	81	95	2.16		0.00	
10	81	94	2.16		-0.35	
11	73.55	83.99	-7.89	§	-3.91	§
12	79	92	-0.54		-1.06	
13A	79.1	96.8	-0.40		0.64	
13B	79.1	96.8	-0.40		0.64	
13C	79.1	96.8	-0.40		0.64	
No of Results:	17	17				
Median:	79.4	95.0				
Normalised IQR:	0.7	2.8				
Robust CV:	0.9%	3.0%				
Minimum:	73.55	83.99				
Maximum:	83	102				
Range:	9.45	18.01				
Uncertainty (Median)	0.225	0.856				

[1] "**§**"s denote outliers (i.e. those results for which |*z-score*| ≥3.0).

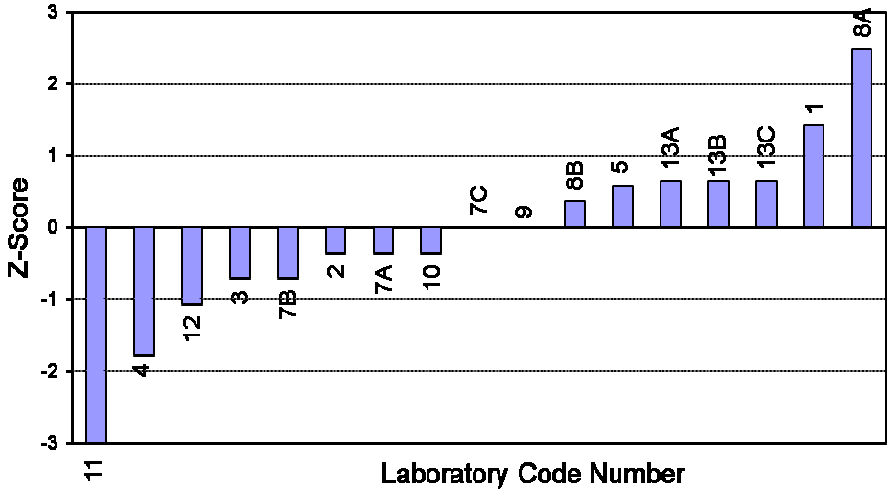
Consistency-Stormer Viscometer (KU)

Sample A Z-Score Charts



Consistency-Stormer Viscometer (KU)

Sample B Z-Score Charts



Conditions of Test-temperature Control - AS 1580 101.5

Results by Laboratory Code

Lab Code	Results	
	Sample A	Sample B
1	24.9 ℃ 73.1%RH	24.9 ℃ 73.1%RH
2	23.0 ℃ 60%RH	23 ℃ 60%RH
3	22.0 ℃ 47.0%RH	22.0 ℃ 47.0%RH
4	22 ℃ 55%RH	22℃ 55%RH
5	24.5 ℃ 61.0%RH	24.5 ℃ 61.0%RH
6	24.6 ℃ 43.2%RH	24.6 ℃ 43.2%RH
7A	24.2 ℃ 45%RH	24.2 ℃ 45%RH
7B	24.2 ℃ 45%RH	24.2 ℃ 45%RH
7C	24.2 ℃ 45%RH	24.2 ℃ 45%RH
8A	24.0 ℃ 46%RH	24.0 ℃ 46%RH
8B	24.0 ℃ 50.0%RH	24.0 ℃ 50.0%RH
9	22.5 ℃ 50.5%RH	22.5 ℃ 50.5%RH
10	25 ℃	25 ℃
11	23.00 ℃ 55%RH	23.00 ℃ 55%RH
12	25 ℃ 67 %RH	25 ℃ 67 %RH
13A	23.7 ℃ 71.4%RH	23.7 ℃ 71.4%RH
13B	23.7 ℃ 71.4%RH	23.7 ℃ 71.4%RH
13C	23.7 ℃ 71.4%RH	23.7 ℃ 71.4%RH
No of Results:	18	18

Note: Summary Statistics and Z-scores are not calculated.

Non-volatile Content by Mass - AS 1580 301.1

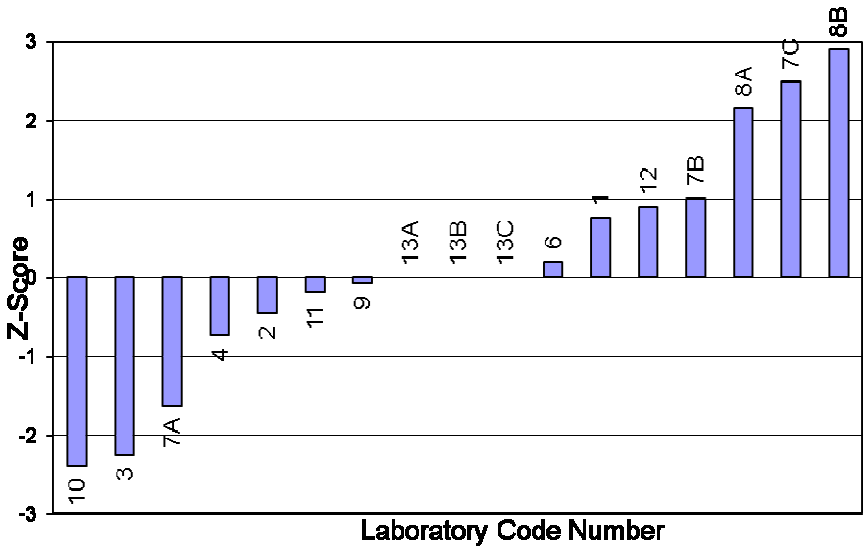
Results by Laboratory Code

Lab Code	Results		Sample A Robust Z-score[1]	Sample B Robust Z-score[1]
	Sample A	Sample B		
1	77.15	78.54	0.76	1.51
2	76.8	77.4	-0.45	-0.79
3	76.28	77.05	-2.25	-1.49
4	76.72	77.41	-0.73	-0.77
6	76.99	78.04	0.21	0.50
7A	76.46	77.22	-1.63	-1.15
7B	77.22	78.04	1.00	0.50
7C	77.65	78.12	2.49	0.66
8A	77.55	78.27	2.14	0.97
8B	77.77	78.24	2.91	0.91
9	76.91	77.45	-0.07	-0.68
10	76.24	77.96	-2.39	0.34
11	76.88	78.20	-0.17	0.82
12	77.19	77.79	0.90	0.00
13A	76.93	77.72	0.00	-0.14
13B	76.93	77.72	0.00	-0.14
13C	76.93	77.72	0.00	-0.14
No of Results:	17	17		
Median:	76.930	77.790		
Normalised IQR:	0.289	0.497		
Robust CV:	0.4%	0.6%		
Minimum:	76.24	77.05		
Maximum:	77.77	78.54		
Range:	1.53	1.49		
Uncertainty (Median)	0.088	0.151		

[1] "**§**"s denote outliers (i.e. those results for which |*z-score*| ≥3.0).

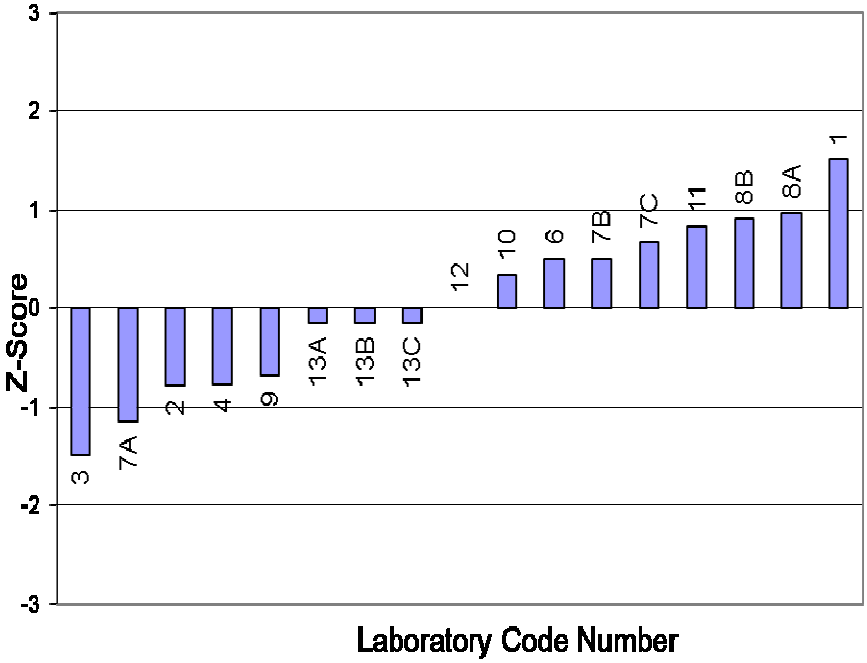
Non-volatile Content by Mass

Sample A Z-Score Charts



Non-volatile Content by Mass

Sample B Z-Score Charts



No-Pick-Up Time - AS 1580 401.8

Results by Laboratory Code

Lab Code	Results (minutes)	
	Sample A	Sample B
1	10	18
2	4	9
3	3	4
11	5	5
No of Results:	4	4

[1] N/A – statistical analysis was not applied

Fineness of Grind - AS 1580 204.1

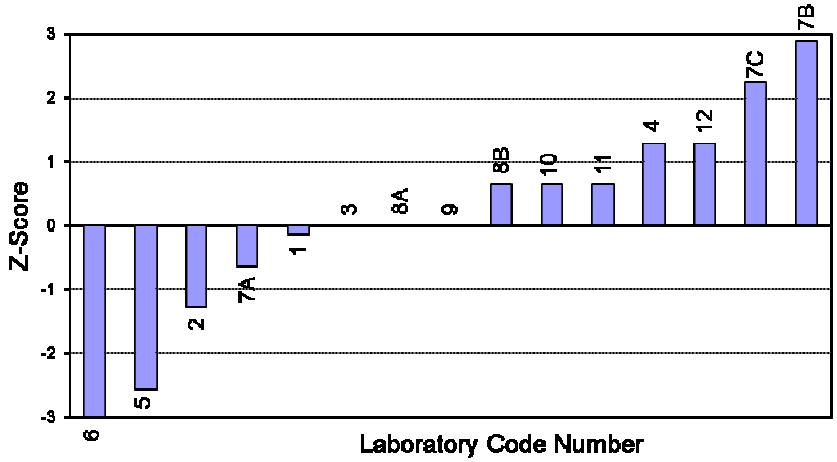
Results by Laboratory Code

Lab Code	Results (µm)		Sample A Robust Z-score[1]		Sample B Robust Z-score[1]
	Sample A	Sample B			
1	78	80	-0.13		0.00
2	60	60	-1.28		-0.98
3	80	80	0.00		0.00
4	100	100	1.28		0.98
5	40	40	-2.57		-1.96
6	20	20	-3.85	§	-2.94
7A	70	85	-0.64		0.25
7B	125	125	2.89		2.21
7C	115	115	2.25		1.72
8A	80	60	0.00		-0.98
8B	90	90	0.64		0.49
9	80	80	0.00		0.00
10	90	90	0.64		0.49
11	90	75	0.64		-0.25
12	100	100	1.28		0.98
No of Results:	15	15			
Median:	80.0	80.0			
Normalised IQR:	15.6	20.4			
Robust CV:	19.5%	25.5%			
Minimum:	20	20			
Maximum:	125	125			
Range:	105.0	105.0			
Uncertainty (Median)	5.0	6.6			

[1] "**§**"s denote outliers (i.e. those results for which |*z-score*| ≥3.0).

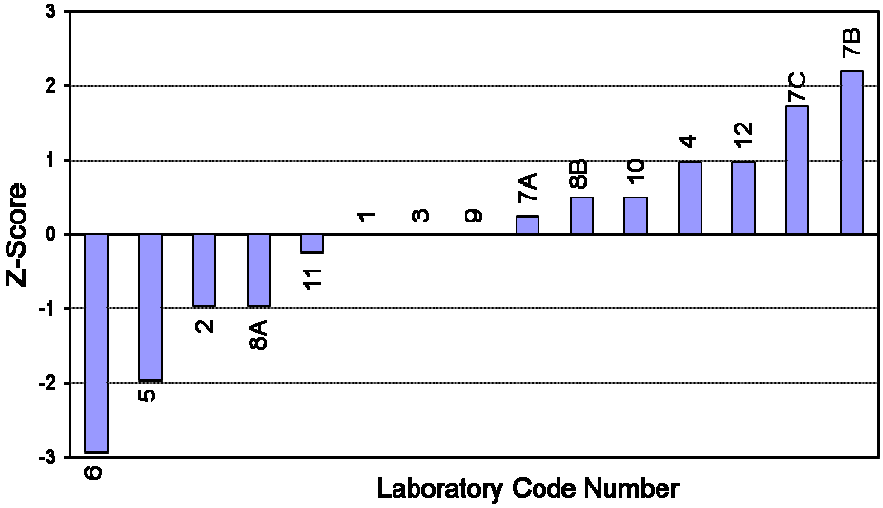
Fineness of Grind (µm)

Sample B Z-Score Charts



Fineness of Grind (µm)

Sample B Z-Score Charts



APPENDIX B

Sample Homogeneity

Prior to sample distribution, ten statistically random samples were selected from a batch of water based gloss white paint and analysed in duplicate for AS.1580.202.1 – Density. The following results were obtained for the purpose of homogeneity testing. The samples were tested by Supalux Pty Ltd.

From the statistical analysis of these results, it was considered that the samples were sufficiently homogenous for this round of the program. Therefore, any results later identified as outliers cannot be attributed to any significant sample variability.

APPENDIX C

Documentation

PROFICIENCY TESTING AUSTRALIA

Proficiency Testing Program: Paint Round 18

INSTRUCTIONS TO PARTICIPANTS

Please read the following carefully **BEFORE** commencing testing.

Each participant will be supplied with two 500ml tins of water based paint. These have been labelled “Sample A” and “Sample B”.

To ensure the appropriate analysis of results, participants are asked to adhere carefully to the following instructions:

1) The following tests are to be performed on samples A and B as per the Results Sheet:

   (i) *AS 1580.202.1 - density*

   (ii) *AS 1580.214.1 - consistency – Stormer viscometer*

   (iii) *AS 1580.101.5 - conditions of test-temperature and humidity control*

   (iv) *AS 1580.301.1 - non-volatile content by mass*

   (v) *AS 1580.401.8 - no-pick-up time of road marking paints*

   (vi) *AS 1580.204.1 - fineness of grind*

2) Determinations on each sample are to be conducted in accordance with the appropriate method (stated on the Results Sheet). All laboratories are also encouraged to attempt those tests not included as part of their routine methods.

3) The following specific instructions will apply:

a. Report the nominal volume of the pycnometer used for AS1580.202.1.

b. Report the make, model and range of the viscometer used for AS1580.214.1.

c. If AS 1580.101.5 routine conditions are not available the use AS1580.101.4 routine conditions.

d. For AS 1580.401.8 apply the test paint to a glass panel using a 375 micron drawdown applicator.

e. For AS 1580.204.1 a 0 – 100 micron gauge should be used.

4) For this program your laboratory has been allocated the following code number: **«Code» .** This is to allow for the confidential treatment of your results in the final report.

PROFICIENCY TESTING AUSTRALIA

Paint Round 18 - Proficiency Testing Program

Results Sheet

Lab «Code»

Test	AS 1580	Sample A	Sample B
Density (report in kg/L to 2 decimal places)	202.1		
Consistency-Stormer Viscometer (report to the nearest KU.)	214.1		
Conditions of Test-temperature Control (report routine conditions for both parameters to the nearest 1 decimal place)	101.5		
Non-volatile Content by Mass (report in % to 2 decimal places)	301.1		
No-Pick-Up Time (report the time that the film is dry in minutes)	401.8		
Fineness of Grind (report to the nearest µm)	204.1		

Signed: _____ **Date:** _____

Results are to be returned to PTA by 21 DECEMBER 2012.

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