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Soil Grading and Moisture Content – 2023 (113)

Proficiency Testing Program Report

WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17043

Report

This report is available on the LabSmart Services website. The issue of this proficiency report was authorised by Jeffrey Mulholland, General Manager, LabSmart Services, in October 2023.

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Please note that any technical questions regarding this program are to be directed to the program coordinator.

Z-scores Summary

A z-scores summary for this program was issued in May 2023. This technical report supersedes the z-scores summary.

Accredited Proficiency Testing Provider

LabSmart Services is accredited by NATA to **ISO/IEC 17043,** Conformity assessment – General requirements for proficiency testing. Accreditation number 20650. The accreditation provides additional assurance to participants of the quality and importance we place on our proficiency testing programs.

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Amendment History

Reports may be downloaded from the LabSmart Services website.
Version 1 – Issued 9 October 2023.

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1. Program Aim

The proficiency program was conducted in February 2023 with forty-seven (47) participants throughout Australia. The program involved the performance of AS 1289 3.6.1, Determination of the particle size distribution of a soil, and AS 1289 2.1.1, Determination of the moisture content of a soil – Oven drying method.

The program provides confidence to the construction materials testing industry regarding the competency of participants (and the industry) to perform these tests. Each participant's performance is statistically assessed and used as a measure of competency relative to all those who participated. Other measures of performance may also be used.

This report has been prepared using robust statistics. Information regarding the conduct and design of the program can be found in section 5.

A comprehensive technical comment (section 3) is provided to assist participants in improving the overall performance of these tests. In addition, test data has been reviewed for consistency, and additional feedback regarding aspects of the test is provided.

2. Performance

2.1. Identified Outliers

The results and statistical analysis of participants (Material less than 75 µm (washed), full PSD, and moisture content results) are detailed in section 4.

There were Twelve (12) participants with outliers(this includes **M5** result which was removed); many of these participants had multiple outliers. These outliers represented approximately 27% of the forty-one (41) participants [1,2] who returned results in the proficiency program (Table 1).

Participant's test results are tabulated in section 4, along with the robust statistics and z-score graphs. The z-score indicates how far away a participant is from the program's median value. A z-score of zero indicates a strong consensus with respect to all other participants and represents a very good outcome. Additionally, the z-score graph supplied in section 4 gives a quick visual indication of how a result compares to others in the program.

Outliers are where a z-score value is equal to or greater than 3 or less than or equal to -3. It is strongly recommended that participants with outliers **investigate** their performance of the test. Participants with outliers are detailed in Table 1.

Those participants with z-scores greater than 2 or less than -2 should **review** their testing methodology. Only those approaching a z-score of 3 (i.e. outside ± 2.75) have been specifically identified in Table 1 as feedback.

More detail on the robust statistics used can be found in section 5.

Technical comment(s) and feedback in section 3 are provided to assist participants in investigating or reviewing their results and those seeking to improve their testing performance.

Table 1: Participant codes where remedial action is recommended based on z-scores*

Sample	Test	Investigate	Review
A	Less than 75 µm (by washing)	**D4, J3, B3, Z4, M5**	**-**
	Particle size distribution (% Passing)		
	2.36 mm	**C2, F3**	**B3, K8, F5**
	1.18 mm	**C2, T2**	**-**
	600 µm	**C2, T2, K6**	**-**
	425 µm	**C2, T2, K6**	**P6**
	300 µm	**D4, C2, T2, P6, K6**	**B3**
	150 µm	**D4, C2, J3, B3, P6, K6**	**-**
	75 µm	**D4, C2, J3, K6**	**B3, Q7**
B	Moisture content	**K5, D5**	**-**

** Those with a z-score that was close to 2.75 should review their results; see section 3 for further comments*

Important Note: There were three (3) participants (**D3**, **G5** & **V8**) that supplied masses for their PSD results, but they didn't supply a '% passing' results. All 3 participants were assessed and treated equally. As LabSmart was unable to internally recalculate all three of these participants '% passing' results with the information supplied, all three participants were not recalculated. LabSmart will be more than happy to rectify the matter with these three participants, they will just need to contact us to organize Supplementary Reports.

2.2. Program Summary

Overall a satisfactory level of performance[(1)] was achieved by the majority (~73%) of participants, with approximately 27% having one or more outliers[(2)]. The performance by participants is very good overall and compares favourably with previous proficiency programs.

It is noted that different soil samples will yield different variations for each fraction according to material quantity and type. For this program, the variation in test results in this program is similar to those of previous years. This is a good outcome.

The competency of washing was assessed through the calculation of a 'washed material finer than 75 µm' result. Although not a reportable result under the test method, the mass of the washed material is still accountable within the test and competency of washing and is an important aspect of the test. Most participants completed the washing component well, with a good spread of results for 'washed - material finer than 75 µm'.

There is always an opportunity for laboratories to improve and the data supplied on the ‘Result Log’ sheets indicates that there is considerable room for improvement in the use of 'check sums' and the checking process employed by technicians and supervisors.

There was a significant number of inconsistencies/errors made by participants (based on data provided and assumed to be correct). In many cases, this often caused a poorer outcome. In other instances, it threw doubt on some outcomes, which may have resulted in outliers when recalculated. It is something laboratories should continue to work towards improving.

Section 3 provides technical comment(s) that may be useful in identifying possible areas for improvement and investigating outliers.

The proficiency program allows many of the laboratories to have greater confidence in their results while for others providing an opportunity to improve their competency with respect to the test in this program.

The following is a summary of some of the statistics for this program.

Table 2: Summary of test result statistics

Sample	Test	Units	Participants	Median	Normalized IQR
A	Less than 75 µm (by washing)	%	41	1.67	0.40
	Particle size distribution (% Passing)	%			
	2.36 mm		42	85.64	0.94
	1.18 mm		42	58.95	2.03
	600 µm		42	34.00	1.50
	425 µm		41	24.10	1.26
	300 µm		42	16.00	0.83
	150 µm		42	5.00	0.60
	75 µm		42	1.87	0.58
B	Moisture content	%	46	13.82	0.23

(1) Overall performance outcomes can vary from one program to another and should not be taken as either an improvement or deterioration in industry performance. Variation in program outcomes may be attributed to the difficulty of the material under test or where participants overall in one program may have more experience or greater skill levels than those in another program. Evaluation of industry performance endeavours to balance these issues. Industry outcomes and individual performance outcomes are detailed in sections 3 through 6.

(2) Statistics relating to the number of outliers or participation rates are intended as an overview only for the program. They are calculated based on the total number of participants. However, not all participants perform each test or return all results.

3. Technical Comment

Please note that the feedback in this section is aimed at providing information that can assist participants and laboratories in improving laboratory operations.

All participants identified below are considered to have successfully completed the program unless otherwise identified in section 2.

Each submission was assessed to provide additional feedback to participants. Results submitted by participants (Appendix C) were checked and, in many cases, recalculated. The data submitted on the program 'Results Log' sheet should agree with the results provided. In other words, the 'mass retained' value should match the reported '% passing' value. Much of the technical comment deals with inconsistencies around the submitted data.

It is apparent that some participants did not perform sufficient checks such as 'Check Sums'. There is sufficient material provided for 'Sample A' to perform the test more than once. In many instances, checks, had they been performed, would have indicated that retesting may have been warranted.

In checking the participant's data, it is often difficult to determine exactly what may be incorrect. The following comments should be taken as a guide towards reviewing submitted results. Incorrect results do not necessarily mean they will be an outlier. Many participants identified below may not have shown up as outliers, but the results may still be incorrect.

In some cases, participants did not submit all the data requested, so the results for these participants could not be fully checked.

Those with outliers or those that are mentioned on more than one occasion below would benefit from reviewing their results.

Note: In the following sections, I 2 I is used as a shorthand way of indicating a positive and negative z-score, e.g. -2 and 2, and similarly, I 1 I indicates a z-score of -1 and 1.

3.1 Material less than 75 µm (Washed)

Washing is important as it can have a large impact on the accuracy of the results obtained. The more material washed through the 75 µm, the greater the influence.

The 'material less than 75 µm -washed', '% Passing the 75 µm', and the pan data are all linked. Reviewing them together indicates how well the sieving-wash process has been performed.

Washing

Laboratories must be able to wash a sample thoroughly and not lose material. The particle size distribution test method incorporates both washed and unwashed samples. The test method does not specifically calculate the amount of material 'washed out' of the sample. However, it is relevant to include the mass of the material obtained from the washing process in the 'check sum' determination.

Loss of material, incomplete washing or inaccurate drying will significantly affect the results obtained. For this proficiency program, the calculation of a 'washed - less than 75 µm' result has been used to measure competency for the 'washing' process.

It is expected that if the material was washed correctly, the mass retained in the pan after sieving over the 75 µm should be small. It would also be expected that in most situations, the '% passing the 75 µm sieve' would be equal to or only slightly greater than the '% washed'. Such a comparison should be incorporated into the 'check sum' process. Some participants had differences between '% Passing the 75µm' and 'Material finer than 75µm – washed' that were greater than 1%. This should be investigated.

Recalculation

For this section (where possible), all participant data was recalculated based on the data supplied. There were several inconsistencies between the raw data recalculated by LabSmart Services and the results provided by the participant. It should be noted that some participants rounded their results; therefore, it is difficult to comment on all the inconsistencies. However, Table 3 shows a list of participants where rounding can't account for the discrepancy (greater than 0.5% difference).

Table 3: Recalculated – Material finer than 75 µm (Washed)

Code	Submitted (%)	Recalculated (%)	Difference (%)
C2	0.7	1.69	0.99
S4	1.63	0.92	-0.71
J3	4.2	1.65	-2.55

Three participants (**P9**, **D3**, **V8**) did not supply a result for 'Material less than 75 µm (Washed)', even though they did record the relevant data, three participants (**D4, F3, W5**) did not supply enough information to recalculate 'Material less than 75 µm (Washed)' and two participants (**B3**, **Z4**) appear to have not washed their samples (however these two participants will be discussed when discussing outliers for 'Material less than 75 µm (Washed)').

Participants listed in Table 3 appear to have had issues with calculations, or they may have supplied the wrong supporting data on the 'Results Log' Sheet. These participants along with the participants listed in the previous paragraph, should take the time to **review** their submitted data.

Final Comment

Those with z-scores above 2, may have lost material in the washing process or have a damaged/worn sieve. Those with a z-score less than -2 may not have washed sufficiently or had a calculation error.

The following notes relate to the five outliers associated with 'Material less than 75 µm (Washed)'. These outliers were **D4, J3, B3, Z4 & M5.**

D4

Participant **D4** didn't supply enough data for LabSmart to recalculate their result; additionally, they were identified as an outlier on 3 of the PSD sieves (300µm, 150µm, & 75µm). As LabSmart was unable to recalculate a result due to missing data, little more can be said here. But, should participant **D4** require assistance in assessing this outlier, don't hesitate to get in touch with LabSmart services.

J3

Participant **J3** was identified in Table 3, to have incorrectly calculated their ‘Material less than 75 µm (Washed)’ result (based on the sample masses supplied). Had they arrived at the same result as LabSmart's calculations, they would not have been identified as an outlier.

B3

Participant **B3** supplied a result of zero, this is supported by their starting and dry-washed masses. Additionally, it should be noted that this is not their only outlier and was identified as an outlier on the 150µm sieve. Most likely, participant **B3** supplied the wrong information on the ‘Result Log’ sheets, as it would be unlikely for them to get 6 out of the 8 z-scores to fall in with the data they supplied (therefore, the supporting data is deemed incorrect). As LabSmart was unable to recalculate a result anywhere near that of the supplied result with the supporting data, little more can be said here. But, should participant **B3** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services.

Z4

Participant **Z4** supplied a result of zero, this is supported by their starting and dry-washed masses. Most likely, participant **Z4** supplied the wrong information on the ‘Result Log’ sheets, as it would be unlikely for them to get 7 out of the 8 z-scores to fall in with the data they supplied (therefore, the supporting data is deemed incorrect). As LabSmart was unable to recalculate a result anywhere near that of the supplied result with the supporting data, little more can be said here. But, should participant **Z4** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services. don't hesitate to get in touch with LabSmart services.

M5

Participant **M5** supplied a result of 98% for their ‘Material less than 75 µm (Washed)’ result (this was deemed to be unacceptable compared to other results and removed). During LabSmart's recalculation for this result (using the supplied masses) it was identified that this participant may have calculated their percentages around the wrong way as LabSmart calculated a result of 1.96% (an approximate reverse of 98%). Had participant M5 supplied the result of 1.96%, they would not have been identified as an outlier.

3.2 Particle size distribution

When combining the washing and PSD components of this report, there were 30 outliers identified involving 10 participants. The outliers are summarised in Table 4. This section will not deal with participants **Z4** & **M5** for 'Material less than 75 µm (Washed)' as they were discussed in section 3.1.

Table 4: Summary of outliers (Shaded) for PSD

Code	Washing	2.36	1.18	600	425	300	150	75
D4								
C2								
T2								
J3								
B3								
Z4								
P6								
F3								
M5								
K6								

Individual comments about the outliers can be found at the end of this section; the following relates to a general discussion of the results obtained.

Start Weight

In past programs, The sample size was restricted to a set starting mass to reduce the variability associated with variable sample size. Unaccounted material losses or gains (lost material, binding, material breakdown, etc.) have a greater effect on smaller sample sizes. This was not undertaken in this program, and participants were allowed to use any starting mass they chose. For this program, there were starting masses ranging between 172.64g to 1529.26g.

Pan

The amount of material left in the pan after sieving can indicate how well the washing process has been performed. It is also an indication as to how much of the material breaks down during sieving.

If a high pan weight is obtained, then how much of the material broke down needs to be considered and why. Did it break down easily because that was the type of material it was? Feeling the hardness of individual particles in larger fractions can help with this. Observing what sort of particles pass through when hand sieving also helps. It could also be due to a rough washing process. If it was felt that the material did not break down sufficiently to account for the pan weight obtained, then incomplete washing may need to be considered.

There was a registerable and consistent amount of fine material in this sample, requiring careful washing. All homogeneity pan weights were below 0.1% retained (or between 0 to 0.4g). This is in line with the average pan mass seen by most participants.

Based on the homogeneity data, the material appeared not to break down (or if so, only slightly) during sieving, as little to no material made it as far as the pan. This may have been different for participants. However, analysis of the data (as a whole) indicates that it had a negligible effect on the program, as the spread of results are within expected (and acceptable) ranges.

Sieving a 'split' sub-sample

Out of the participants that returned results, 20 reported using 200mm sieves, 15 reported using 300mm sieves, and 9 reported using a combination of 200/300mm sieves.

The sieving method refers to AS1289.1.1 for the appropriate sample size. However, as previously explained above, participants used a wide range of starting masses (172.64g to 1529.26g). In some cases, these starting masses would have overloaded some sieves, and the material needed to be sieved in two passes or split into a sub-sample. It is often better to sieve in two passes for materials that have quantities close to the nominated overload weights.

The test method does not indicate when it is appropriate to split a sample. Many laboratories used 200mm sieves and most likely split the sample into two or more parts as this is the most efficient sieving approach (based on the time taken). Even though some participants indicated that a 200mm diameter sieve was used, they did not supply information indicating the sample was split or sieved over more than one pass. This should be reviewed.

Additionally, it appears that some participants may have split their samples down into smaller fractions (sub-samples) during the sieving process. This type of splitting could, in some situations, decrease the overall accuracy if there has been a significant loss of material (or gain), and therefore it may not necessarily be the most accurate approach. So just remember, when quartering a sample down to a sub-sample, it needs to be done carefully to obtain a representative sample. In situations where participants split their samples down into smaller fractions, it was hard for LabSmart to identify where this split had happened, and as a result, in many cases, LabSmart was not able to complete recalculations of these participant results.

Calculation of '% Passing'

As requested, most participants returned results for 'mass retained' and '% Passing'. The 'mass retained' is primary data (i.e. not calculated), so participants should be able to transfer this data accurately to the proficiency testing 'Results Log' sheet. Participants need to understand the calculation process from primary data to the 'final' result.

The calculation of percent passing was checked by recalculating the submitted 'mass retained' data for each fraction. There were more than 50% of participants whose results did not match the recalculated value. It is believed a lot of this was a result of participants splitting their samples down to produce sub-samples and not supplying the required data. Additionally, some participants didn't supply enough information, and their results could not be recalculated.

This puts LabSmart in a difficult position, as it would be unfair to target participants who supplied enough data to correctly check their results when it was not possible to recalculate over half the group. All participants would benefit from reviewing the supplied data and their methodologies and making sure they supply the correct data to proficiency providers.

Normally, this section of the report would show recalculations of participants where the supplied masses don't equal their final result. However, as there were so many participants in this category, and most of it relates to participants not supplying enough data, that will not be done for this report.

Check Sums

AS 1289 3.6.1, Clause 5.4(b) (i) Note 3 indicates that the sieved fractions plus washed material and pan should equal the starting mass to within ±1%. The 'mass retained' results were used to check how well the participants met this requirement. Normally, this section of the report would show participants where their Check Sums showed a significant amount of missing materials. However, as with Calculation of '% Passing' there were so many participants in this category, and most of it relates to participants not supplying enough data; this section will not be done for this report.

It is important to note that 'Check Sums' can be (and should be) applied to other aspects of the calculation process.

Incomplete sieving, lost material or excessive sieving

If the sieving for a fraction is incomplete, there would be more retained on a sieve and hence a larger 'mass retained' value. In this case, less passes a sieve, so a lower value for '% Passing' is likely to be obtained compared to the median value shown for that fraction. This corresponds to a negative z-score.

A positive z-score indicates that less was retained on the sieve (due to more complete sieving, too vigorous sieving or material was lost etc.), giving a higher' % Passing' value compared to the median.

Lost material shows up in the 'check sum' process. For this program, the material had a notable amount of angular particles that tended to bind in the sieves. Careful cleaning of the sieves was needed to obtain an accurate result. Not cleaning sieves is like losing material and should, in most cases, show up in the 'check sum' calculation (assuming the sieves were clean to start with).

The above is only an indication as a natural variation of each fraction within the proficiency sample occurs. Very high or low z-scores are less affected by sample variation. This can provide a reasonable indication for '% Retained' results but is less effective for '% Passing' as gains and loss can accumulate.

Mechanical Sieving

Of the forty-two (42) participants who performed the particle size distribution, 28 (68%) reported using a mechanical shaker. Additionally, the times reported varied from 5 to 20 minutes.

Limit of Performance and Decimal places used

The number of decimal places a participant uses broadly indicates their accuracy and is related to the LOP (Limit of Performance). Understanding what is required and correctly reporting on the 'Results Log' sheet indicates a reasonable understanding of the test method. Most participants performed well in this aspect.

A small number of participants had difficulty with the concept of LOP, as indicated by the following:

- Did not put anything on the 'Results Log' sheet
- LOP does not match the decimal places used
- Entering 'balance resolution' instead of LOP

The LOP of the balance indicates how many decimal places can reasonably be reported. The test method indicates the minimum requirements. Laboratories, of course, can use more accurate balances than this. See Table 5 for examples relating to LOP.

For this program, the LOP was requested. Either the maximum LOP as per the standard or the actual balance calibration LOP was acceptable.

Several participants would benefit from reviewing this aspect of the test.

Table 5: Examples relating to LOP

	Test method Max LOP	Implied Resolution	Typical balance calibration LOP
Course/Intermediate	±5g	1g	±2.4g
Fine	±0.5g	0.1g	±0.37g
More accurate	±0.05g	0.01g	±0.046g

The proficiency program requested results to be reported to 0.01 (where possible), as it helps improve the quality of the feedback that can be given.

Even though the proficiency program requested results be recorded to two decimal places (nearest 0.01) where possible, If you have a balance that reads only to 0.1g, then the nearest 0.1g is reasonable.

There was a random change in the number of decimal places reported within some of the participant's set of results. The most common were:

- Start mass to 1 decimal place, the rest of the weights to 2 decimal places
- Weights to 1 decimal place while '% passing' was to 2 decimal places
- Dropped numbers, most likely zeros at the end of a number

None of these are likely to impact the results significantly, but participants should show consistent use of decimal places.

Discussion of PSD Outliers

The following notes relate to the 8 participants with outliers associated with all '% passing' results.

D4

Participant **D4** didn't supply enough data for LabSmart to recalculate their result; they were identified as an outlier on the 300µm, 150µm, & 75µm sieves (along with the 'Material less than 75 µm (Washed)'). As LabSmart was unable to recalculate a result due to missing data, little more can be said here. But, should participant **D4** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services.

C2

Participant **C2** had outliers on all sieves. Recalculation from the mass retained across all sieves supports the starting mass, and LabSmart's recalculation of the data shows a more favourable outcome. Therefore, it can only be assumed that there was an error in the calculation of % passing (either incorrectly calculating the result or transcription error). Participant **C2** would benefit from reviewing the calculation process.

T2

Participant **T2** was identified as having outliers across the '% passing 1.18µm' down to '% passing 300µm'. Recalculation from the mass retained across all sieves supports the starting mass. The '% passing 1.18µm' starts with a Z-score of -3.03 and this number grows to -5.81 by the '% passing 300µm' only to come back in at '% passing 150µm'. The nature of an ever-increasing value indicates a systemic issue and Participant **T2** would most likely benefit from reviewing the Incomplete sieving, lost material or excessive sieving section of this report.

J3

Participant **J3** was identified as an outlier on the 150µm, & 75µm sieves (along with the 'Material less than 75 µm (Washed)'). Recalculation from the mass retained across all sieves supports the starting mass, however, there are differences between LabSmart's recalculation and participant **J3** when it comes to '% passing', starting at the '% passing 1.18µm' and increasing down to the '% passing 75µm'. Participant **J3** would benefit from reviewing the calculation process.

B3

Participant **B3** was identified as an outlier on the 150µm sieve (along with the 'Material less than 75 µm (Washed)'). Participant **B3** supplied a result of zero for 'Material less than 75 µm (Washed)', this is supported by their starting and dry-washed masses. Most likely participant **B3** supplied the wrong information on the 'Result Log' sheets, as it would be unlikely for them to get 6 out of the 8 z-scores to fall in with the supporting data they supplied (therefore the supporting data is deemed incorrect). As LabSmart was unable to recalculate a result anywhere near that of the supplied result with the supporting data little more can be said here. But, should participant **B3** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services..

P6

Participant **P6** didn't supply enough data for LabSmart to recalculate their result (they appear to have split their sample down to a sub-sample at some point) and were identified as an outlier on the 300µm, & 150µm sieves. As LabSmart was unable to recalculate a result due to missing data, little more can be said here. But, should participant **P6** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services..

F3

Participant **F3** didn't supply enough data for LabSmart to recalculate their result (they appear to have split their sample down to a sub-sample at some point) and were identified as an outlier on the 2.36mm sieve. As LabSmart was unable to recalculate a result due to missing data, little more can be said here. But, should participant **F3** require assistance in assessing this outlier, please don't hesitate to get in touch with LabSmart services.

K6

Participant **K6** was identified as having outliers across the '% passing 600µm' down to '% passing 75µm'. Recalculation from the mass retained across all sieves supports the starting mass; however, there are differences between LabSmart's recalculation and participant **J3** when it comes to '% passing', starting at the '% passing 1.18µm' and increasing down to the '% passing 75µm'. Even though LabSmarts recalculation doesn't bring them within acceptable limits participant **J3** would benefit from reviewing the calculation process.

3.3 Moisture content

Sample B was double bagged, and each bag heat sealed. Where noted, all participants indicated that the bag was satisfactorily sealed when received. Any loss of moisture during transit was therefore very unlikely.

It was suggested participants elect to test the whole sample; However, five participants (**D4, L3, T2, G5 & M5**) elected to test a subsample. Utilizing a subsample introduces potential errors that could affect the final outcome.

Participants were requested to report the 'wet mass' of the sample. Participants **V3 & D5** reported a starting weight more than the weight of the sample sent, indicating that the wet mass reported probably contained the weight of the "tray" used as well. These participants should review the process used.

Depending on the weight of the sample used, the test method allows a range of balance LOPs to be used. Many opted for a balance with a smaller LOP than required by the test method. It is recognized that most laboratories have an assigned balance and associated LOP allocated to this test.

Sample A had a low MC and would show up if a participant accidentally tested sample A instead of sample B.

Two outliers were identified (**K5 & D5**) for moisture content (4% of all participants). Outliers need to be investigated, and those above a z-score of |2| should also review the result obtained.

Participants with low moisture content results (i.e. z-score less than -2.00) should review results for transcription and calculation errors. Incomplete drying to constant mass may also contribute to a low result. Additionally, a lengthy delay between opening the sample bag and recording the weight could also lead to loss of moisture and a low moisture content result. Similarly, if wet material was left in the sample bag, this could also affect the outcome achieved.

Most participants had z-scores between ± 2 standard deviations. Overall, participants outcomes were very good and similar to previous programs.

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4. Statistics: Z-Score & Graph

Sample A - Material finer than 75 µm (Washed): Z - Scores

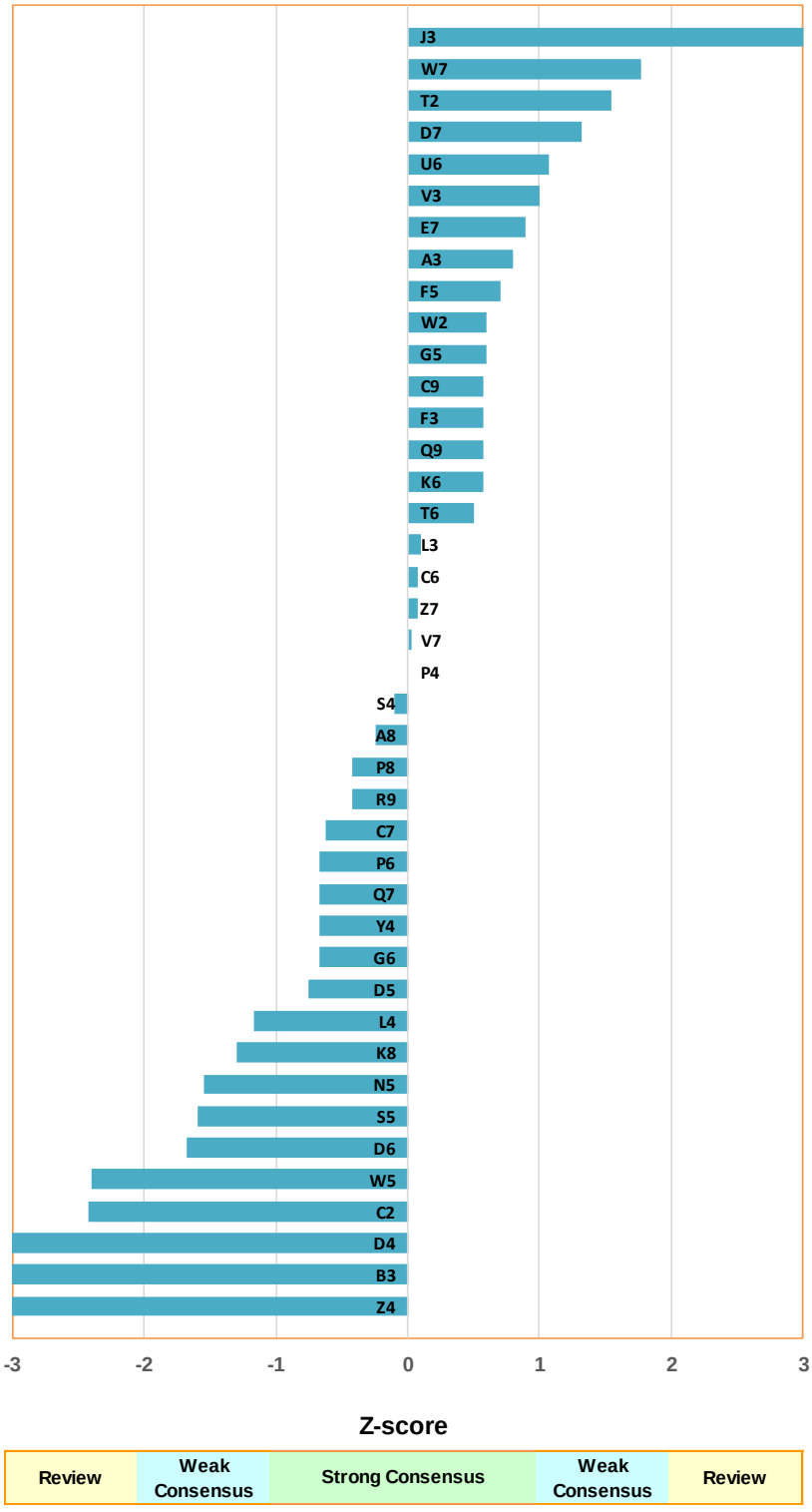
Code	Test Result %	Z Score
D4	.45	**-3.05** #
L3	1.71	0.10
C2	0.70	-2.42
S4	1.63	-0.10
T2	2.29	1.55
P8	1.5	-0.42
J3	4.2	**6.32** #
E7	2.03	0.90
C7	1.42	-0.62
D6	1.0	-1.67
B3	0.0	**-4.17** #
Z4	000	**-4.17** #
V7	1.68	0.02
K5	NR	
P6	1.4	-0.67
Q7	1.4	-0.67
A8	1.57	-0.25
A3	1.99	0.80
T6	1.87	0.50
C9	1.9	0.57
P9	NR	
V3	2.07	1.00
F2		
D5	1.37	-0.75
F3	1.9	0.57
S5	1.03	-1.60
K8	1.15	-1.30
P4	1.67	0.00

Code	Test Result %	Z Score
Q9	1.9	0.57
F5	1.95	0.70
W2	1.91	0.60
W5	0.71	-2.40
U6	2.10	1.07
R9	1.5	-0.42
D3	NR	
G5	1.91	0.60
L4	1.2	-1.17
N5	1.05	-1.55
M5	98	**R**
D7	2.2	1.32
V8	NR	
C6	1.7	0.07
K6	1.9	0.57
W7	2.38	1.77
Z7	1.7	0.07
Y4	1.4	-0.67
G6	1.4	-0.67

Statistic	*Value*	
Number of results	**41**	
Median	**1.67**	
Median MU	**0.08**	
First Quartile	**1.37**	
Third Quartile	**1.91**	
IQR	**0.54**	
Normalised IQR	**0.40**	
CV (%)	**24.0**	
Minimum	**0.45**	(0.00)
Maximum	**2.38**	(4.20)
Range	**1.93**	(4.20)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - Material finer than 75 µm (Washed): Z - Score Graph



Sample A - % Passing 2.36mm : Z - Scores

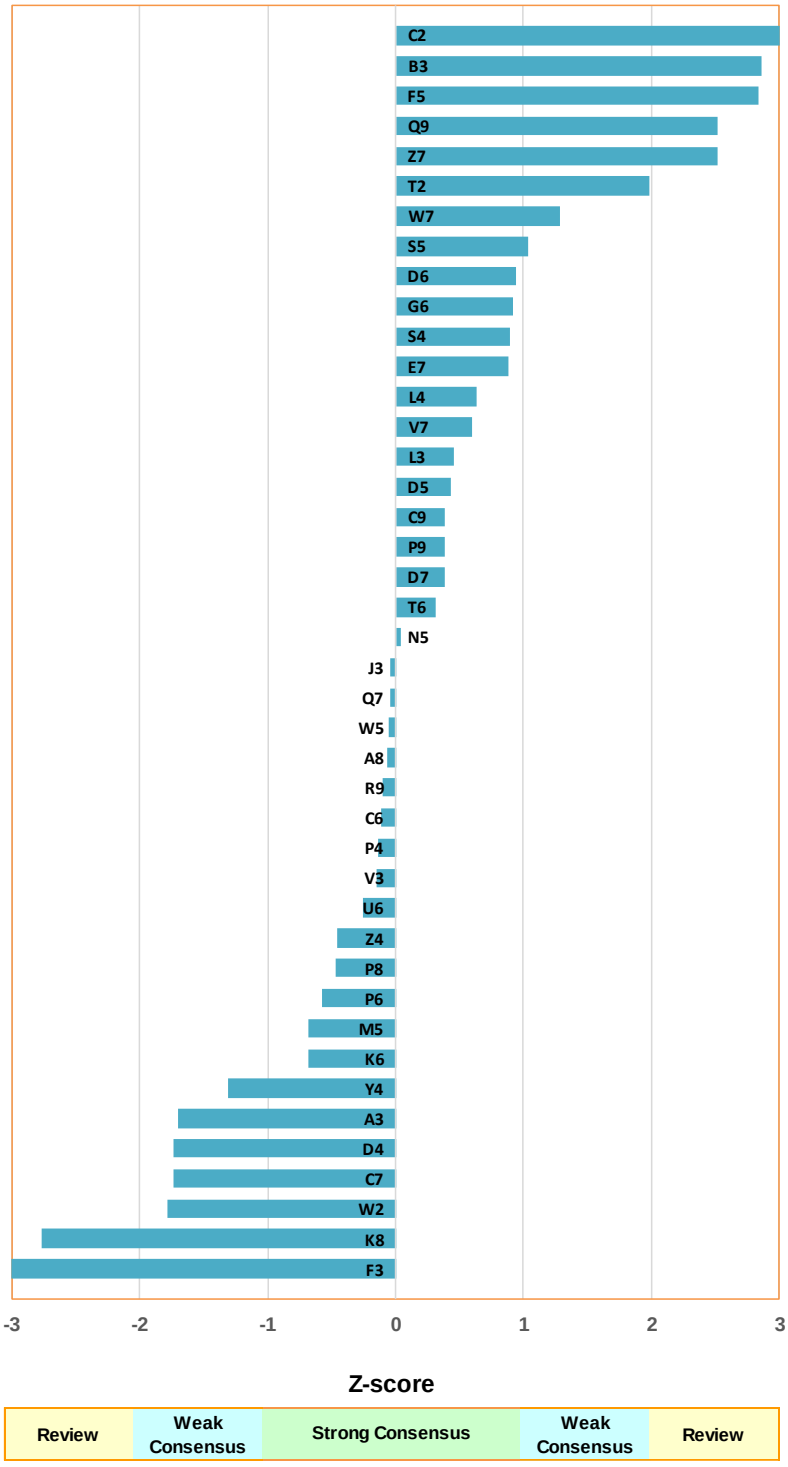
Code	Test Result %	Z Score
D4	84	-1.74
L3	86.06	0.45
C2	92.52	**7.34** #
S4	86.47	0.89
T2	87.5	1.99
P8	85.2	-0.46
J3	85.6	-0.04
E7	86.46	0.88
C7	84	-1.74
D6	86.52	0.94
B3	88.32	**2.86**
Z4	85.21	-0.45
V7	86.20	0.60
K5	NR	
P6	85.1	-0.57
Q7	85.6	-0.04
A8	85.57	-0.07
A3	84.04	-1.70
T6	85.93	0.31
C9	86	0.39
P9	86	0.39
V3	85.49	-0.15
F2		
D5	86.04	0.43
F3	82.51	**-3.33** #
S5	86.61	1.04
K8	83.04	**-2.77**
P4	85.51	-0.13

Code	Test Result %	Z Score
Q9	88	2.52
F5	88.30	**2.84**
W2	83.96	-1.79
W5	85.58	-0.06
U6	85.4	-0.25
R9	85.54	-0.10
D3	NR	
G5	NR	
L4	86.23	0.63
N5	85.67	0.04
M5	85	-0.68
D7	86	0.39
V8	NR	
C6	85.53	-0.11
K6	85	-0.68
W7	86.84	1.28
Z7	88	2.52
Y4	84.40	-1.32
G6	86.50	0.92

Statistic	*Value*	
Number of results	**42**	
Median	**85.64**	
Median MU	**0.18**	
First Quartile	**85.20**	
Third Quartile	**86.47**	
IQR	**1.27**	
Normalised IQR	**0.94**	
CV (%)	**1.1**	
Minimum	**83.04**	(82.51)
Maximum	**88.32**	(92.52)
Range	**5.28**	(10.01)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 2.36mm : Z - Score Graph



Sample A - % Passing 1.18mm: Z - Scores

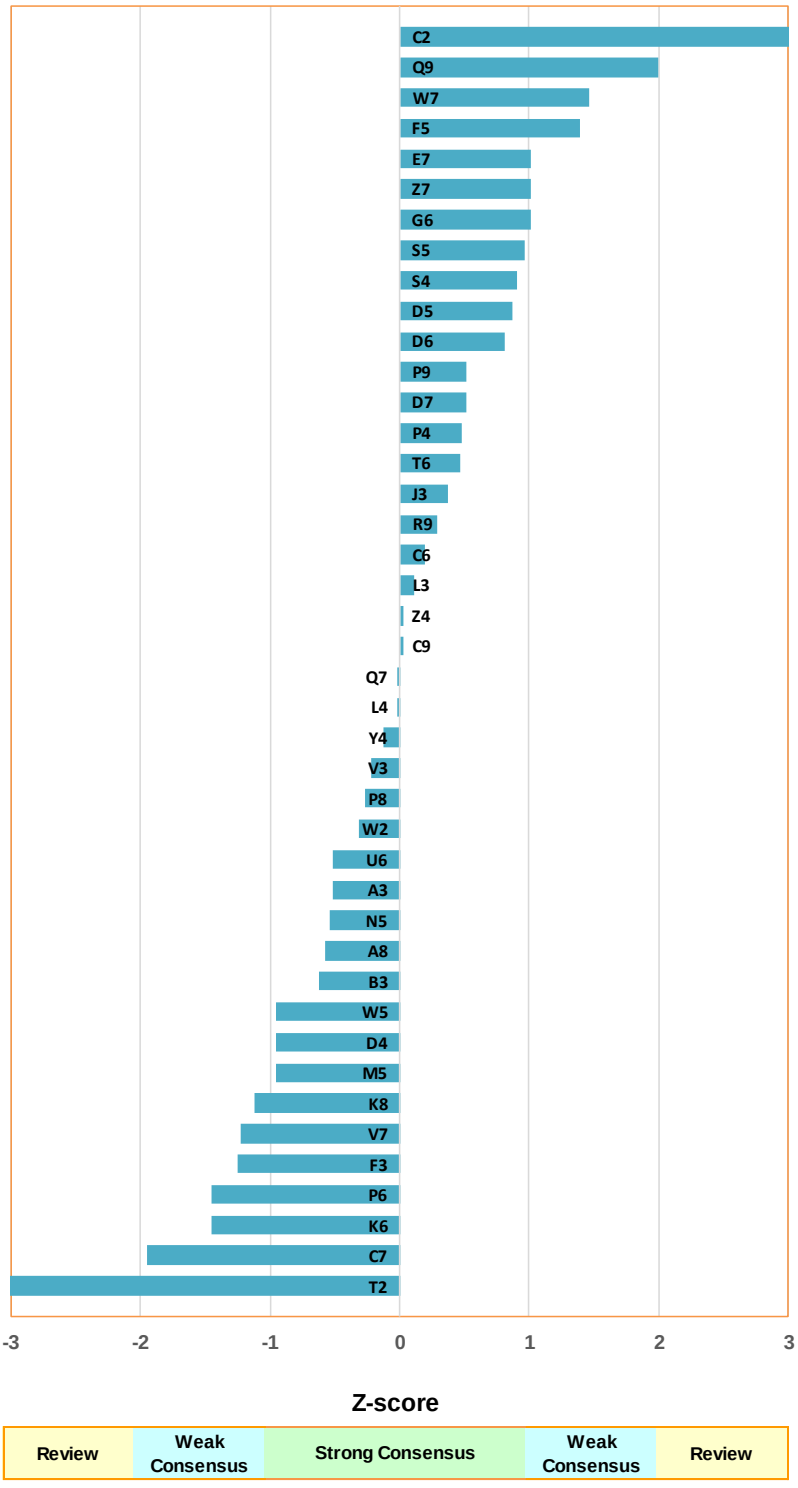
Code	Test Result %	Z Score
D4	57	-0.96
L3	59.18	0.11
C2	80.58	**10.66** #
S4	60.79	0.91
T2	52.8	**-3.03** #
P8	58.4	-0.27
J3	59.7	0.37
E7	61.00	1.01
C7	55	-1.95
D6	60.60	0.81
B3	57.69	-0.62
Z4	59.01	0.03
V7	56.45	-1.23
K5	NR	
P6	56.0	-1.45
Q7	58.9	-0.02
A8	57.78	-0.58
A3	57.89	-0.52
T6	59.90	0.47
C9	59	0.02
P9	60	0.52
V3	58.51	-0.22
F2		
D5	60.72	0.87
F3	56.40	-1.26
S5	60.91	0.97
K8	56.67	-1.12
P4	59.91	0.47

Code	Test Result %	Z Score
Q9	63	2.00
F5	61.77	1.39
W2	58.30	-0.32
W5	57.02	-0.95
U6	57.9	-0.52
R9	59.53	0.29
D3	NR	
G5	NR	
L4	58.90	-0.02
N5	57.85	-0.54
M5	57	-0.96
D7	60	0.52
V8	NR	
C6	59.35	0.20
K6	56	-1.45
W7	61.92	1.46
Z7	61	1.01
Y4	58.70	-0.12
G6	61.00	1.01

Statistic	*Value*	
Number of results	**42**	
Median	**58.95**	
Median MU	**0.39**	
First Quartile	**57.71**	
Third Quartile	**60.45**	
IQR	**2.74**	
Normalised IQR	**2.03**	
CV (%)	**3.4**	
Minimum	**55.00**	(52.80)
Maximum	**63.00**	(80.58)
Range	**8.00**	(27.78)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 1.18mm: Z - Score Graph



Sample A - % Passing 600µm: Z - Scores

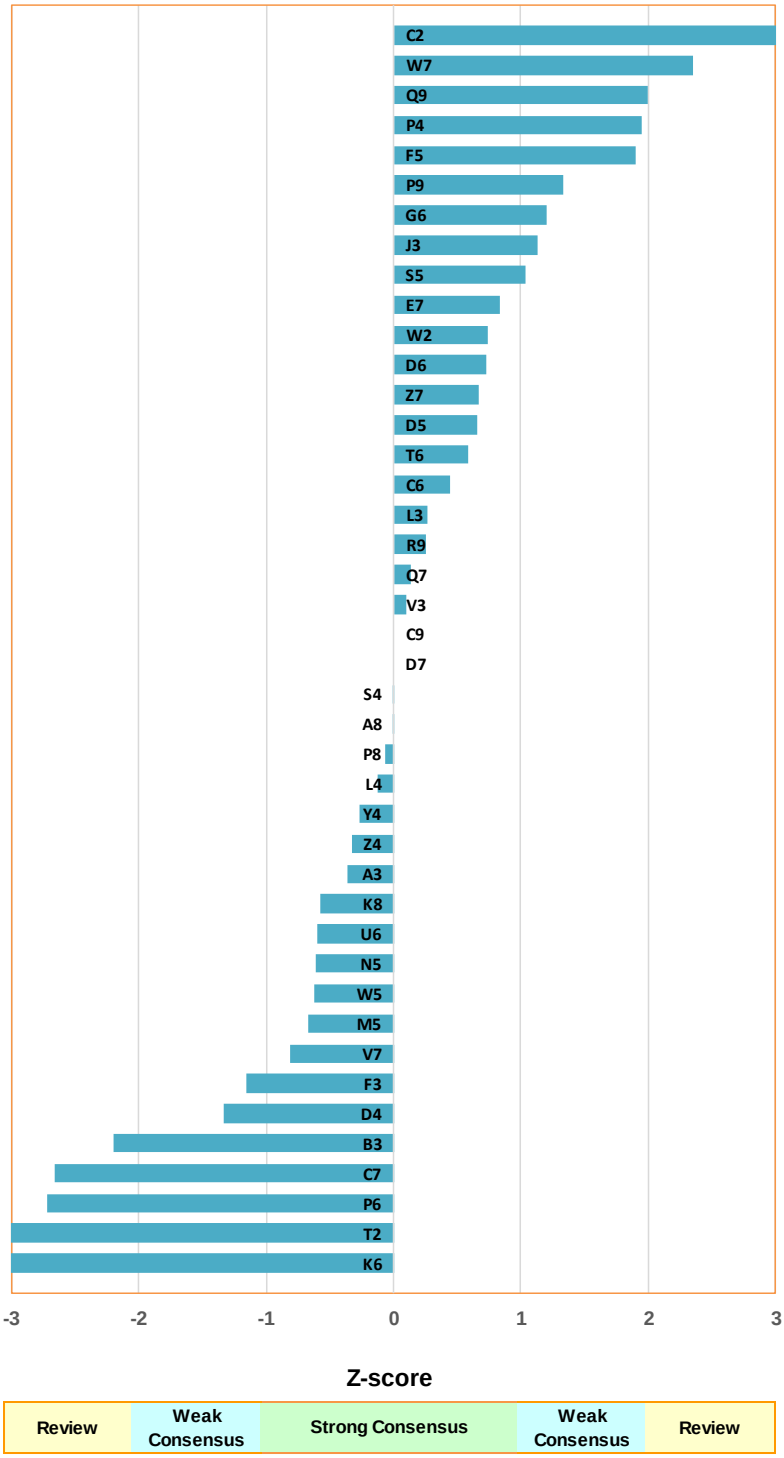
Code	Test Result %	Z Score
D4	32	-1.33
L3	34.40	0.27
C2	71.24	**24.78** #
S4	33.99	-0.01
T2	25.9	**-5.39** #
P8	33.9	-0.07
J3	35.7	1.13
E7	35.25	0.83
C7	30	-2.66
D6	35.09	0.73
B3	30.70	-2.20
Z4	33.51	-0.33
V7	32.78	-0.81
K5	NR	
P6	29.9	-2.73
Q7	34.2	0.13
A8	33.99	-0.01
A3	33.45	-0.37
T6	34.88	0.59
C9	34	0.00
P9	36	1.33
V3	34.15	0.10
F2		
D5	34.99	0.66
F3	32.26	-1.16
S5	35.56	1.04
K8	33.14	-0.57
P4	36.93	1.95

Code	Test Result %	Z Score
Q9	37	2.00
F5	36.86	1.90
W2	35.12	0.75
W5	33.06	-0.63
U6	33.1	-0.60
R9	34.38	0.25
D3	NR	
G5	NR	
L4	33.81	-0.13
N5	33.08	-0.61
M5	33	-0.67
D7	34	0.00
V8	NR	
C6	34.66	0.44
K6	14	**-13.31** #
W7	37.53	2.35
Z7	35	0.67
Y4	33.60	-0.27
G6	35.80	1.20

Statistic	*Value*	
Number of results	**42**	
Median	**34.00**	
Median MU	**0.29**	
First Quartile	**33.09**	
Third Quartile	**35.11**	
IQR	**2.03**	
Normalised IQR	**1.50**	
CV (%)	**4.4**	
Minimum	**29.90**	(14.00)
Maximum	**37.53**	(71.24)
Range	**7.63**	(57.24)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 600µm: Z - Score Graph



Sample A - % Passing 425µm: Z - Scores

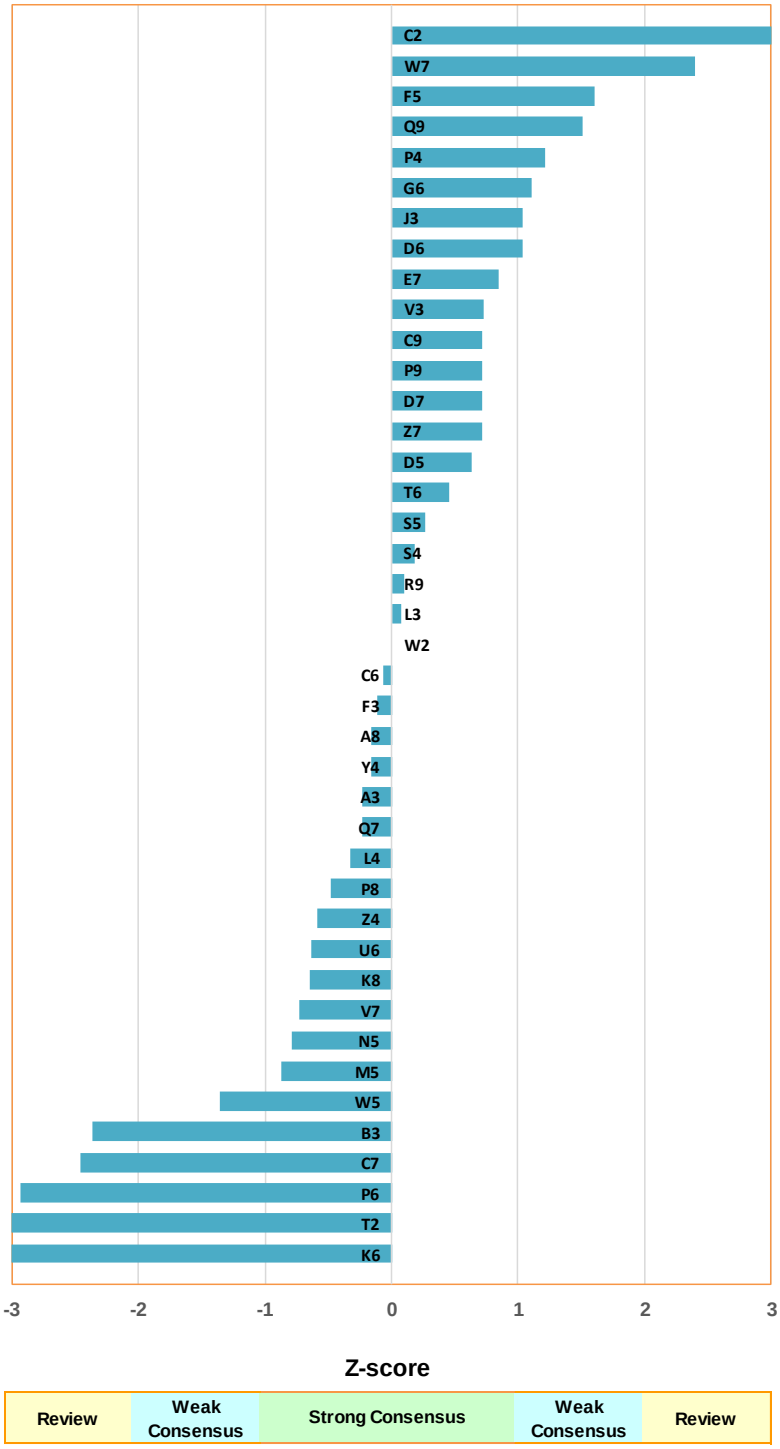
Code	Test Result %	Z Score
D4	NR	
L3	24.20	0.08
C2	67.44	**34.39** #
S4	24.33	0.18
T2	17.3	**-5.40** #
P8	23.5	-0.48
J3	25.4	1.03
E7	25.16	0.84
C7	21	-2.46
D6	25.40	1.03
B3	21.11	-2.37
Z4	23.36	-0.59
V7	23.18	-0.73
K5	NR	
P6	20.4	**-2.94**
Q7	23.8	-0.24
A8	23.90	-0.16
A3	23.81	-0.23
T6	24.67	0.45
C9	25	0.71
P9	25	0.71
V3	25.01	0.72
F2		
D5	24.90	0.63
F3	23.95	-0.12
S5	24.43	0.26
K8	23.29	-0.64
P4	25.63	1.21

Code	Test Result %	Z Score
Q9	26	1.51
F5	26.12	1.60
W2	24.10	0.00
W5	22.39	-1.36
U6	23.3	-0.63
R9	24.23	0.10
D3	NR	
G5	NR	
L4	23.68	-0.33
N5	23.11	-0.79
M5	23	-0.87
D7	25	0.71
V8	NR	
C6	24.02	-0.06
K6	10	**-11.19** #
W7	27.13	2.40
Z7	25	0.71
Y4	23.90	-0.16
G6	25.50	1.11

Statistic	*Value*	
Number of results	**41**	
Median	**24.10**	
Median MU	**0.25**	
First Quartile	**23.30**	
Third Quartile	**25.00**	
IQR	**1.70**	
Normalised IQR	**1.26**	
CV (%)	**5.2**	
Minimum	**20.40**	(10.00)
Maximum	**27.13**	(67.44)
Range	**6.73**	(57.44)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 425µm: Z - Score Graph



Sample A - % Passing 300µm: Z - Scores

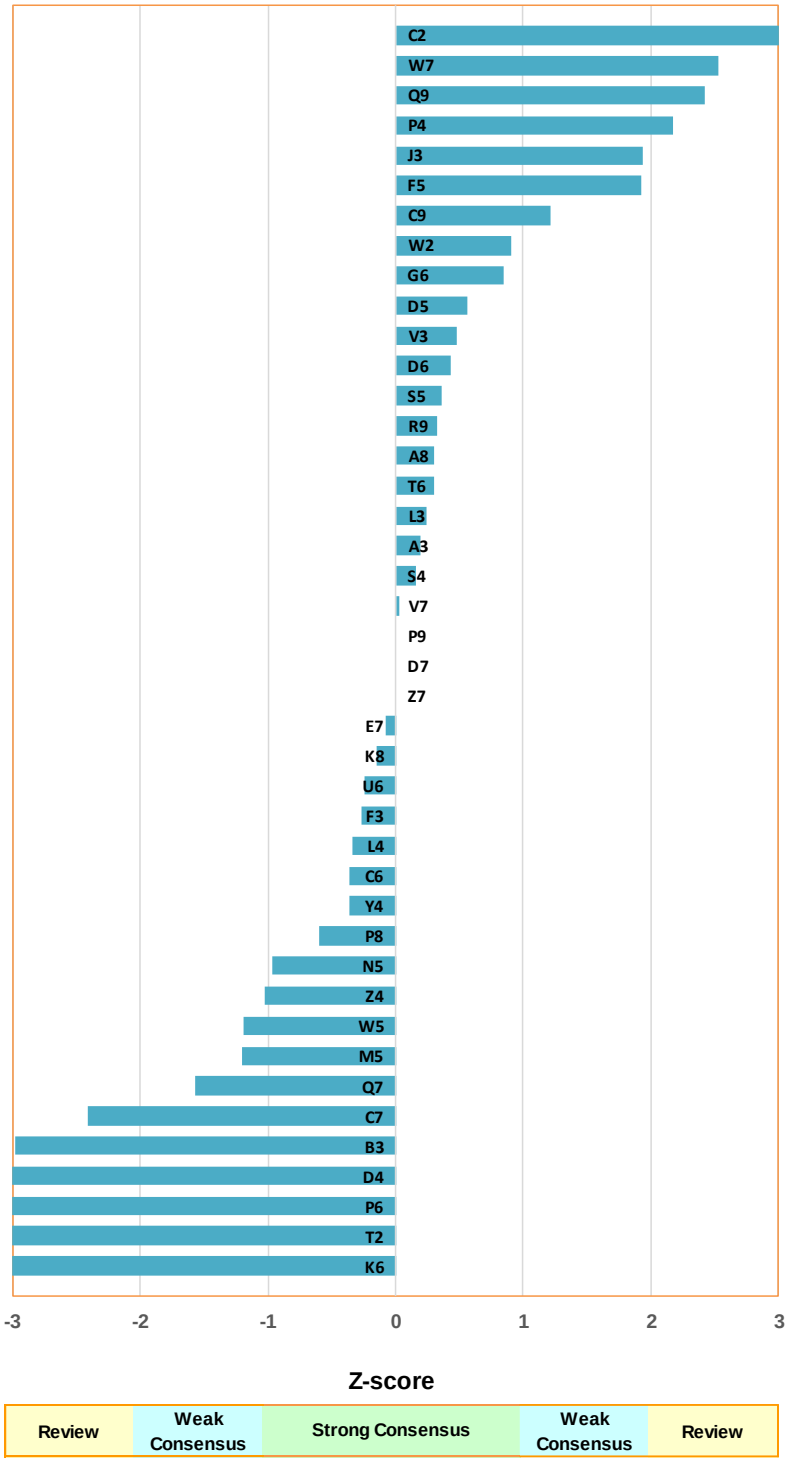
Code	Test Result %	Z Score
D4	13	**-3.63** #
L3	16.20	0.24
C2	64.64	**58.85** #
S4	16.13	0.16
T2	11.2	**-5.81** #
P8	15.5	-0.60
J3	17.6	1.94
E7	15.94	-0.07
C7	14	-2.42
D6	16.36	0.44
B3	13.53	**-2.99**
Z4	15.15	-1.03
V7	16.02	0.02
K5	NR	
P6	12.6	**-4.11** #
Q7	14.7	-1.57
A8	16.25	0.30
A3	16.16	0.19
T6	16.25	0.30
C9	17	1.21
P9	16	0.00
V3	16.40	0.48
F2		
D5	16.46	0.56
F3	15.78	-0.27
S5	16.30	0.36
K8	15.88	-0.15
P4	17.80	2.18

Code	Test Result %	Z Score
Q9	18	2.42
F5	17.59	1.92
W2	16.75	0.91
W5	15.01	-1.20
U6	15.8	-0.24
R9	16.27	0.33
D3	NR	
G5	NR	
L4	15.72	-0.34
N5	15.20	-0.97
M5	15	-1.21
D7	16	0.00
V8	NR	
C6	15.70	-0.36
K6	7	**-10.89** #
W7	18.09	2.53
Z7	16	0.00
Y4	15.70	-0.36
G6	16.70	0.85

Statistic	*Value*	
Number of results	**42**	
Median	**16.00**	
Median MU	**0.16**	
First Quartile	**15.28**	
Third Quartile	**16.39**	
IQR	**1.12**	
Normalised IQR	**0.83**	
CV (%)	**5.2**	
Minimum	**13.53**	(7.00)
Maximum	**18.09**	(64.64)
Range	**4.56**	(57.64)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 300µm: Z - Score Graph



Sample A - % Passing 150µm: Z - Scores

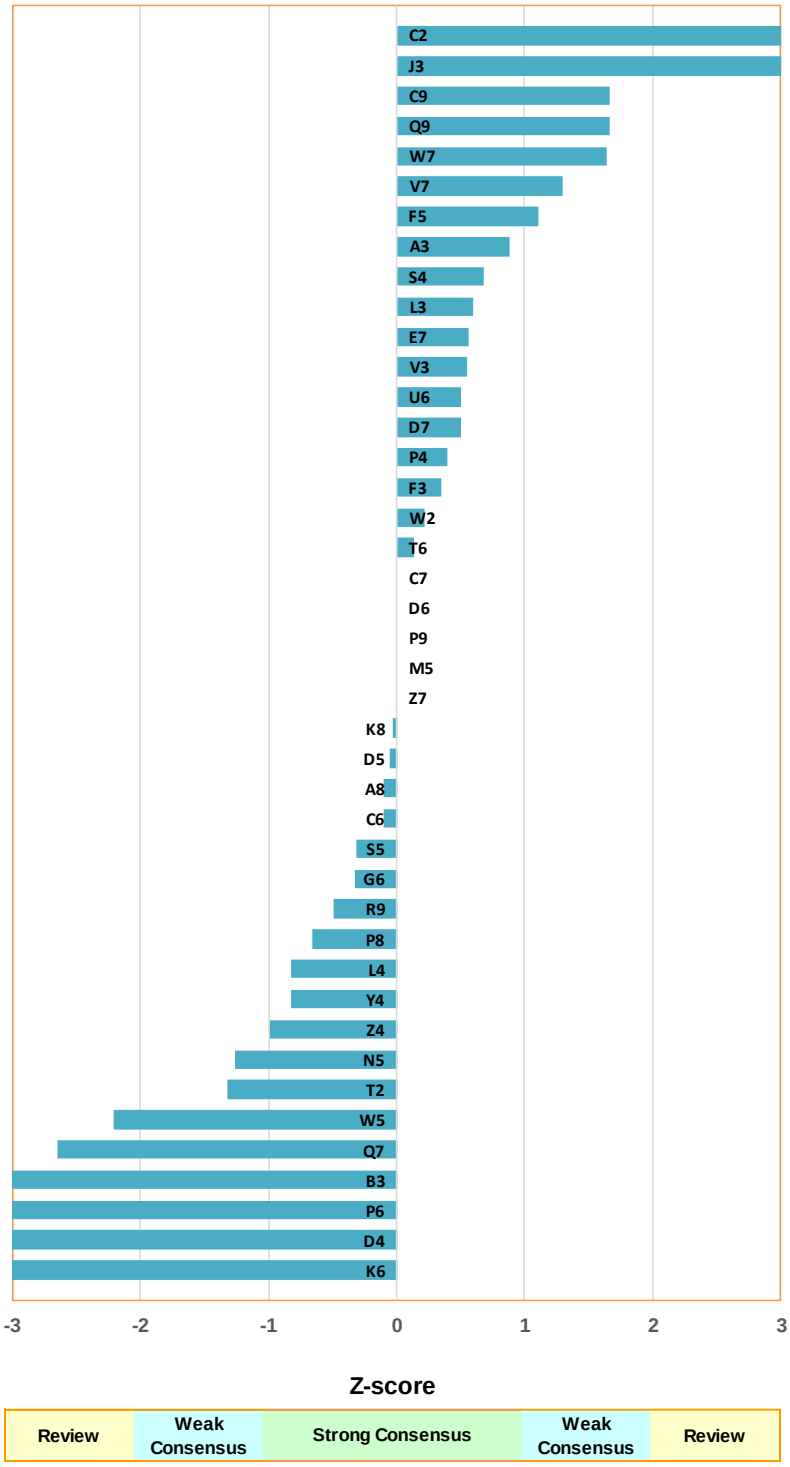
Code	Test Result %	Z Score
D4	3	**-3.32** #
L3	5.36	0.60
C2	60.34	**91.88** #
S4	5.41	0.68
T2	4.2	-1.33
P8	4.6	-0.66
J3	7.2	**3.65** #
E7	5.34	0.56
C7	5	0.00
D6	5.00	0.00
B3	3.14	**-3.09** #
Z4	4.40	-1.00
V7	5.78	1.30
K5	NR	
P6	3.1	**-3.15** #
Q7	3.4	-2.66
A8	4.94	-0.10
A3	5.53	0.88
T6	5.08	0.13
C9	6	1.66
P9	5	0.00
V3	5.33	0.55
F2		
D5	4.97	-0.05
F3	5.21	0.35
S5	4.81	-0.32
K8	4.98	-0.03
P4	5.24	0.40

Code	Test Result %	Z Score
Q9	6	1.66
F5	5.67	1.11
W2	5.13	0.22
W5	3.67	-2.21
U6	5.3	0.50
R9	4.70	-0.50
D3	NR	
G5	NR	
L4	4.50	-0.83
N5	4.24	-1.26
M5	5	0.00
D7	5.3	0.50
V8	NR	
C6	4.94	-0.10
K6	2	**-4.98** #
W7	5.99	1.64
Z7	5	0.00
Y4	4.50	-0.83
G6	4.80	-0.33

Statistic	*Value*	
Number of results	**42**	
Median	**5.00**	
Median MU	**0.12**	
First Quartile	**4.53**	
Third Quartile	**5.34**	
IQR	**0.81**	
Normalised IQR	**0.60**	
CV (%)	**12.0**	
Minimum	**3.40**	(2.00)
Maximum	**6.00**	(60.34)
Range	**2.60**	(58.34)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 150µm: Z - Score Graph



Sample A - % Passing 75µm: Z - Scores

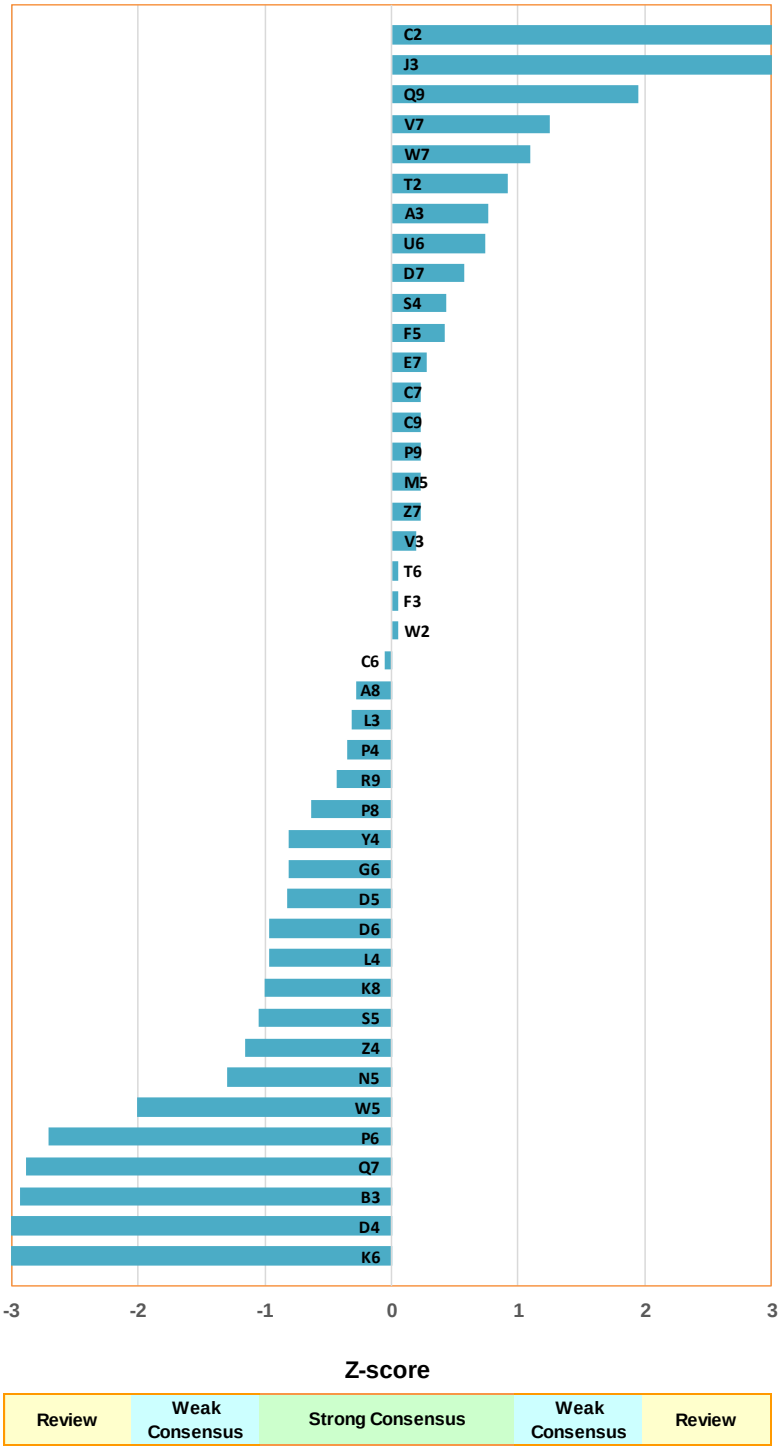
Code	Test Result %	Z Score
D4	0	**-3.23** #
L3	1.69	-0.31
C2	59.07	**98.93** #
S4	2.12	0.43
T2	2.4	0.92
P8	1.5	-0.64
J3	4.2	**4.03** #
E7	2.03	0.28
C7	2	0.22
D6	1.31	-0.97
B3	0.17	**-2.94**
Z4	1.20	-1.16
V7	2.59	1.25
K5	NR	
P6	0.3	-2.72
Q7	0.2	**-2.89**
A8	1.71	-0.28
A3	2.31	0.76
T6	1.90	0.05
C9	2	0.22
P9	2	0.22
V3	1.98	0.19
F2		
D5	1.39	-0.83
F3	1.90	0.05
S5	1.26	-1.05
K8	1.29	-1.00
P4	1.67	-0.35

Code	Test Result %	Z Score
Q9	3	1.95
F5	2.11	0.42
W2	1.90	0.05
W5	0.71	-2.01
U6	2.3	0.74
R9	1.62	-0.43
D3	NR	
G5	NR	
L4	1.31	-0.97
N5	1.12	-1.30
M5	2	0.22
D7	2.2	0.57
V8	NR	
C6	1.84	-0.05
K6	0	**-3.23** #
W7	2.50	1.09
Z7	2	0.22
Y4	1.40	-0.81
G6	1.40	-0.81

Statistic	*Value*	
Number of results	**42**	
Median	**1.87**	
Median MU	**0.11**	
First Quartile	**1.31**	
Third Quartile	**2.09**	
IQR	**0.78**	
Normalised IQR	**0.58**	
CV (%)	**30.9**	
Minimum	**0.30**	(0.00)
Maximum	**3.00**	(59.07)
Range	**2.70**	(59.07)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample A - % Passing 75µm: Z - Score Graph



Sample B - Moisture Content: Z - Scores

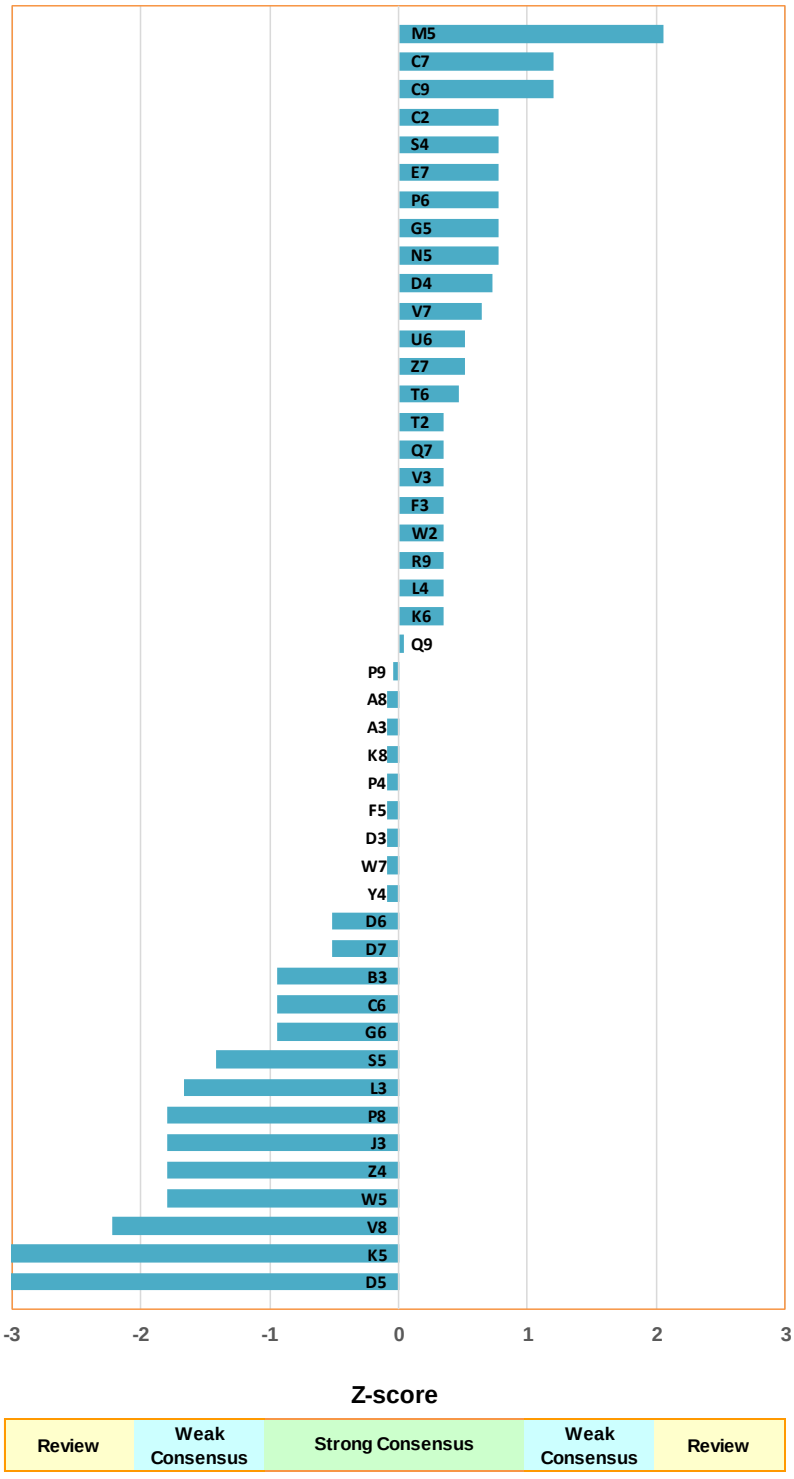
Code	Test Result %	Z Score
D4	13.99	0.73
L3	13.43	-1.67
C2	14.0	0.77
S4	14.0	0.77
T2	13.90	0.34
P8	13.4	-1.80
J3	13.4	-1.80
E7	14.0	0.77
C7	14.10	1.20
D6	13.7	-0.51
B3	13.6	-0.94
Z4	13.4	-1.80
V7	13.97	0.64
K5	12.32	**-6.42** #
P6	14.0	0.77
Q7	13.9	0.34
A8	13.8	-0.09
A3	13.8	-0.09
T6	13.93	0.47
C9	14.1	1.20
P9	13.81	-0.04
V3	13.9	0.34
F2		
D5	10.6	**-13.79** #
F3	13.90	0.34
S5	13.49	-1.41
K8	13.80	-0.09
P4	13.8	-0.09

Code	Test Result %	Z Score
Q9	13.83	0.04
F5	13.8	-0.09
W2	13.9	0.34
W5	13.4	-1.80
U6	13.94	0.51
R9	13.9	0.34
D3	13.8	-0.09
G5	14.00	0.77
L4	13.9	0.34
N5	14.0	0.77
M5	14.3	2.06
D7	13.7	-0.51
V8	13.3	-2.23
C6	13.6	-0.94
K6	13.9	0.34
W7	13.8	-0.09
Z7	13.94	0.51
Y4	13.80	-0.09
G6	13.6	-0.94

Statistic	*Value*	
Number of results	**46**	
Median	**13.82**	
Median MU	**0.04**	
First Quartile	**13.63**	
Third Quartile	**13.94**	
IQR	**0.32**	
Normalised IQR	**0.23**	
CV (%)	**1.7**	
Minimum	**13.30**	(10.60)
Maximum	**14.30**	(14.30)
Range	**1.00**	(3.70)

Note: A # indicates an outlier where the z-score obtained is either greater then 3 or less than -3. Codes for all participates are shown. The results column shows a blank entry or 'NR' for those participants that did not submit a result for this test. Results in **green** have been calculated by the program coordinator. An **R** indicates an abnormal result rejected by the program coordinator. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers.

Sample B - Moisture Content: Z - Score Graph



5. Program Information

5.1 Z-score Summary

The proficiency program was conducted over February/March 2023. A 'Z-score Summary' was issued on the 1st of May 2023 and posted on the LabSmart Services website. The summary was also e-mailed to participants. The summary is intended as an early indicator of participant performance. This proficiency testing program report supersedes the z-score summary. Further information can be found in section 5.9, 'Statistics'.

5.2 Program Design

5.2.1 Design

The program has been designed so that the level of experience/skill needed to perform these tests will present a reasonable assessment of the overall competency of the tester and industry performance.

Sample A - PSD

Part of the design of each program involves determining what information needs to be requested to allow for the correct analysis of the data collected. This allows the best possible feedback to be offered to enable participants to improve their performance on this test. The 'retained mass' for PSD is used for this purpose.

In designing a proficiency program, it is sometimes necessary to minimize the effect of some inherent test method variability. A sufficient sample was provided to allow participants to undertake testing on a larger sample size than required by the test method (if desired). This larger sample would mean that unaccounted material losses or gains (lost material, binding, material breakdown etc.) have less of an effect the larger the sample size. Additionally, this also allows retesting should the participant need to do so. Laboratory performance is based on the '% Passing' results.

Sample B – Moisture Content

Calculations were undertaken to ensure that an accurate moisture content was achieved across all samples prepared. The accuracy needed to be sufficiently small as to have only an insignificant influence on the testing performed by participants, i.e. Less than 0.02%.

The program was designed to provide technical feedback regarding performance and possible performance improvements. Further considerations involving the design of the program are detailed below.

5.2.2 Selection of material used in the program.

Sample A - PSD

A sample was selected for the PSD test to allow accurate comparisons between laboratories to be made. The sample used contains sufficient material across a range of size fractions, along with a notable amount of material passing the 0.75 µm sieve, to produce a result suitable for comparative purposes. Additionally, the number of significant figures that results are required to be submitted has been increased to facilitate comparison.

The test method allows for a moisture correction to be performed. For this program, it was desirable to focus as much as possible on the sieving outcome. Consequently, it was recommended that each participant dried their material prior to commencement to eliminate any variability due to moisture.

The sieving standard does not cover material passing the 75µm sieve as it is normally covered under hydrometer testing. It is, however, desirable to record this information as it allows "check sums" to be performed on the sieving analysis and as a measure of how well the washing operation may have been performed.

In past programs, The sample size was restricted to a set starting mass to reduce the variability associated with variable sample size. Unaccounted material losses or gains (lost material, binding, material breakdown, etc.) have a greater effect on the smaller sample size. This was not undertaken in this program, and participants were allowed to use any starting mass they chose.

The sample selected for Sample A in this program had a small amount of material retained on the 4.75mm sieve. The data will be recorded for recalculation purposes, but a z-score analysis will not be undertaken as the amount is too small to analyse rigorously.

Sample B – Moisture Content

Moisture content is a common test performed by soil laboratories. Samples of accurately known moisture were provided to ensure that homogeneity would be satisfactory for the program. During the design phase, the moisture content was set to 13.80%.

Homogeneity samples were tested to ensure the integrity of the samples sent and validate the integrity of the preparation process. The Homogeneity testing was found to be acceptable.

5.2.3 Role of Proficiency Testing

The determination of outliers is an important task of this proficiency program. A secondary function is to provide feedback that can help those with outliers identify possible areas to investigate and assist all participants in improving.

In addition to the statistics, proficiency programs often obtain other information that is not normally available to a laboratory. It allows for a better understanding of the testing and can provide information that can lead to improvements in the testing process or test method.

Proficiency testing enables participants to measure competency against others. It is also a measure of staff performance and the equipment used. Apart from 'measurement uncertainty', it is the most useful tool a laboratory has in better understanding the performance of a test.

5.2.4 Participant assessment

The assessment of each participant is based on a z-score that is related to the program consensus value (median). This is used to determine any statistical outliers. Compliance with proficiency program requirements, including the correct calculation of results and adherence to program and test method requirements, may also be used as part of the assessment process. Participants may also be asked to investigate any discrepancies detected with the paperwork submitted. See section 5.10 for more details.

5.2.5 Reporting of results - Significant figures

The number of decimal places (significant figures) reported for a test has a bearing on the statistical analysis and, therefore, the interpretation of the results. There is a need to strike a balance between what is desirable from a statistical viewpoint while recognizing how the results are used in practice.

Too few decimal places (e.g. due to rounding) can cause an increase in the observed spread of results. Increasing the number of decimal places (with respect to normal reporting) can distort the observed spread of results compared to that encountered in actual practice. Large numbers of similar, rounded results can also cause a distortion in the analysis.

For example, rounding to 0.5 % means that any number between 10.75 and 11.25 will be 11.0%. If the largest value is 10.75 in a set of results, it is pushed out to 11.0 through rounding. Rounded results are useful from "an end-user" perspective but are not as useful when considering laboratory performance.

For this program, it was decided that the benefits of using additional decimal places would complement the aim of the proficiency program.

Participants results were analysed as received regardless of whether there were 'more or less' significant figures than the number requested by the program.

5.2.6 Additional information requested.

As detailed in Appendix C, this program requested additional information not usually reported. The additional information is, however, consistent with the performance of the test and the records the test method requires laboratories to maintain. The additional information is used to interpret participant's performance and assist with providing technical comment, including feedback on outliers and possible participant improvement.

5.2.7 PSD data checks

A secondary function of proficiency testing programs is to provide feedback that can help those with outliers identify possible areas to investigate, as well as assist all participants to improve. This information also helps with identifying any random or systematic errors associated with the test methodology.

As observed in other proficiency programs, 'operator errors' can often creep into the result calculation process. Assessment of participant's data was incorporated into this program to ensure data was comparable.

Where possible, all participant's PSD results are recalculated. Any inconsistencies identified during this process do not need to be investigated (as do outliers) but are identified as possible feedback for participant improvement.

5.2.8 Role of % Retained.

The sieving component of this proficiency program is based on '% Passing' results as normally reported by laboratories. The '% Passing' involves a cumulative calculation which can at times give rise to misleading outliers, particularly on smaller aperture sieves. In such cases, an outlier may not necessarily be attributed to the sieve size on which the outlier occurred. Participants need to be aware of this should they need to undertake any investigation.

To provide feedback, 'Mass Retained' is requested for each participant (Appendix C). Increasing the number of significant numbers that results are reported also aids analysis and feedback.

The calculated '% Retained" results may be provided as an appendix to the report where relevant.

It should be noted that if the mass retained results submitted are themselves incorrect, then this will most likely show as z-scores greater than 3 or less than -3. This might be the case even if no outlier was obtained for the '% Passing' results. To perform a comparison, there needs to be a 'one for one' test result, i.e. a 'Mass Retained / % Passing' correspondence, for the analysis to be statistically valid. That is, the analysis's accuracy depends on all of the participants supplying accurate mass-retained results.

5.2.9 Confidentiality

All information, including test results, are treated confidentially. The proficiency testing report does not identify either companies or individuals. Each participant is issued a unique identifying code during enrolment that is used in the report to ensure confidentiality of performance.

5.3 Sample Preparation

Sample A - PSD

Sample A consisted of approximately 1.5 kg of sandy material. Samples for the program were drawn and packaged from a single, well-mixed lot. Each sample was numbered consecutively, placed in a plastic bag, and sealed.

Ten samples were drawn evenly spaced throughout the lot for homogeneity testing. Each participant received a randomly drawn sample from the remainder. A unique participation code was assigned to each participant sample.

Sample B – Moisture Content

Sample B consisted of approximately 1 kg of soil. A single lot (bulk sample) was oven-dried and well-mixed. A known weight of soil was added to a sample bag. Then, a known amount of water was added to each sample. Bags were immediately heat-sealed, placed into a second bag and heat-sealed again. Bags were consecutively numbered.

Ten samples were drawn evenly spaced throughout the lot for homogeneity testing. Each participant received a randomly drawn sample from the remainder. A unique participation code was assigned to each participant sample.

5.4 Packaging and Instructions

Samples A and B were packed into a sturdy box. A set of instructions and a 'Results Log' sheet were placed in the box before sealing and dispatch. Participants were instructed to test according to the nominated test method and report to the accuracy indicated on the 'Results Log' sheet. See Appendix A for a copy of the instructions issued to participants and Appendix B for a copy of the 'Results Log' sheet used.

5.5 Quarantine

Some states require LabSmart to undertake steps to meet their quarantine requirements before sending to that state. This normally requires heat treatment, and for this program, both samples were handled differently.

For sample A, only selected samples going to quarantine states were heat treated. To make sure there was no effect from the heat treatment, LabSmart also submitted 5 additional samples that were heat treated to the same company undertaking the homogeneity testing and then comparing the results. The outcome was found to be satisfactory.

For sample B, as it was part of our procedure to dry all of the material back to a constant mass, all of the material was treated to heat treatment requirements during that stage.

5.6 Sample Dispatch

Samples were dispatched to participants in February 2023 using Pack and Send. Dispatched samples are tracked from dispatch to delivery by Pack and Send and LabSmart Services.

5.7 Homogeneity Testing

Samples for homogeneity testing were packed the same way as those for participants. Ten samples were selected throughout the set of samples produced, and the same instructions were given to the laboratory performing the homogeneity testing.

Analysis of the homogeneity testing results indicated that the variability associated with the proficiency samples was satisfactory (Table 6). In most cases, the average value for each homogeneity test lies close to 1 s.d of the participant's median value. The homogeneity assessment provides confidence that any outliers identified in the program represent statistically valid outliers.

Table 6: Homogeneity results for samples A & B

Sample	Test		Units	% Passing										Average	s.d	Coefficient of Variation (%)
				H1	H2	H3	H4	H5	H6	H7	H8	H9	H10			
A	Less than 75 µm by washing		%	2.21	2.18	2.17	2.34	2.16	2.18	2.17	2.25	2.16	2.11	2.19	0.06	2.9
	PSD	2.36 mm	%	86.62	87.73	86.36	86.55	87.88	86.80	86.33	86.87	86.97	87.40	86.95	0.55	0.6
		1.18 mm	%	60.27	60.52	61.02	60.50	61.08	59.56	59.93	60.50	60.18	60.58	60.41	0.46	0.8
		600 µm	%	34.87	35.02	35.74	35.34	35.40	34.22	34.45	34.77	34.76	34.58	34.92	0.47	1.3
		425 µm	%	25.84	25.27	26.31	26.00	25.93	25.34	25.31	25.56	25.57	25.35	25.65	0.35	1.4
		300 µm	%	17.65	17.06	18.05	17.68	17.38	17.19	17.12	17.19	17.33	16.94	17.36	0.34	2.0
		150 µm	%	6.07	5.69	6.17	6.03	5.60	5.92	5.71	5.72	5.81	5.57	5.83	0.21	3.6
		75 µm	%	2.56	2.37	2.69	2.64	2.16	2.51	2.38	2.25	2.35	2.20	2.41	0.18	7.6
B	Moisture Content		%	13.76	13.84	13.80	13.81	13.84	13.81	13.80	13.78	13.81	13.80	13.81	0.02	0.2

5.8 Participation

Forty-seven participants entered the program. The nominated date for participants to return their results was the 17th of March, 2023. Only one participant was not able to return their results in time for inclusion in the final report.

5.9 Statistics

Z-scores were calculated for each test and used to assess the variability of each participant relative to the consensus median. A corresponding z-score graph was produced for each test.

Using median and quartiles reduces the effect that outliers have on the statistics and other influences. Consequently, z-scores provide a more realistic or robust method of assessment.

Some results were reported by participants to more decimal places than requested as part of the proficiency program and by others to fewer decimal places. In all instances, test results have been used as submitted by participants.

Assessment of participant data is undertaken to ensure results are statistically comparable. Checks are undertaken to ensure the calculated results match what the participant reported and that the appropriate corrections, etc., have been applied if required. The level of checking required varies from program to program. If significant inconsistencies are identified, the results may be removed (Rejected) or amended with the discrepancy highlighted.

A z-score is one way of measuring the degree of consensus with respect to the grouped test results. The z-scores in this report approximate standard deviations. For each test, a z-score graph is shown. Use the graph to visually check statistically how you compare to other participants.

The following bar (Figure 1) is shown at the bottom of each graph. This helps to quickly visualize where each participant's result falls.

Figure 1: Z-score interpretation bar

For example:

- A **strong consensus** (i.e. agreement) means that your test result is close, i.e. within 1 standard deviation of the median.
- A **weak consensus** means that your test result is satisfactory and is within 2 standard deviations of the median.

If you have obtained a test result outside 2 standard deviations, then it may be worth **reviewing** your testing processes to ensure that all aspects are satisfactory. Only those obtaining a z-score approaching 3 (I.e. outside the 2.75 range) have been highlighted in the report for review.

If you have obtained a test result outside 3 standard deviations, you will need to investigate your testing processes to ensure that all aspects are satisfactory.

Further details on the statistics used in this proficiency program can be obtained from the 'Participant Guide' on the LabSmart Services website or from LabSmart Services directly.

5.9.1 Z-score summary.

A "Z-Scores Summary" is issued soon after most results are received. It gives participants early feedback as to any program outliers. The summary is usually available on the LabSmart Services website until the final report is issued. The final report supersedes the z-score summary.

The final report contains detailed technical feedback regarding the performance of tests and revised z-scores. The inclusion of late results or corrections is at the discretion of the program coordinator. In some instances, this may change some of the z-scores slightly, but generally, the performance outcome remains the same. If there is any impact, it will be discussed in section 5.1 of the report.

5.9.2 Comparing statistics from one program to another.

The statistics generated from one proficiency program are not usually comparable to those from another proficiency testing program. Only very general comparisons may be possible. The reason statistics from one program may not be compared to another is due to the range of variables that differ from one proficiency program to another.

These variables include:

- Type of material selected.
- Variability of the sample.
- The number of participants.
- Experience of participants.
- Test methodology variations.
- The number of organizations represented.
- Equipment used.
- Range of test methods used.
- Experience of supervisors.
- Range of organizations involved.
- Program design.
- Type of statistics employed.

The program outcome represents a 'snapshot' of the competency within the industry and hence provides an overview of the industry. The more participants involved in the program, the more representative the overview.

5.9.3 Measurement uncertainty

The statistics detailed in this program do not replace the need for laboratories to separately calculate measurement uncertainties associated with each test when required by the client or NATA. The proficiency program does give information useful for calculating the MU and benchmarking the MU calculated.

5.9.4 Metrological traceability

The assigned median value used in this proficiency testing program is derived from participant performance and is not metrologically traceable.

5.10 Non-statistical Matters

One of the issues faced by proficiency testing providers is what to do with an incorrect result even if its z-score is satisfactory. In many cases, they cannot be detected but still can significantly impact the statistics calculated. This can cause biased (or unfair) outcomes for other participants.

To limit the effect that erroneous results may have on a program, additional information is requested to allow the main results to be recalculated. In some cases, results shown to be erroneous may be rejected for inclusion in the program. If the result does not add any significant statistical bias, it is left in the program.

The result, however, is incorrect even though it may have a satisfactory z-score. To highlight that the participant needs to investigate erroneous results, it is considered a 'non-statistical' matter and will be highlighted in the report.

This may also be applied to non-compliance to program requirements, e.g. incorrect reporting of results etc. or incorrect partial calculations/data.

Non-statistical matters were not used as part of the assessment process for this program.

6. Summary of Participants Results

Summary of Participant Results

CODE	Particle Size Distribution																			
	Start Mass (Dry)	Dry Washed Mass	Washed % Passing 75 um	2.36 mm		1.18 mm		600 um		425 um		300 um		150 um		75 mm		Pan	Sieve Diameter	Shaker Time (min)
				Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Retained (g)		
D4				47.3	84	126.3	57	198.2	32			251.8	13	281.6	3	289.4	0	290.7	200 mm	7
L3	756.2	743.3	1.71	104.5	86.06	203.3	59.18	187.4	34.40	77.1	24.20	60.5	16.20	82.0	5.36	27.7	1.69	0.1	300 mm	8
C2	172.64	169.73	0.70	30.53	92.52	49.54	80.58	38.73	71.24	15.74	67.44	11.62	64.64	17.80	60.34	5.30	59.07	0.0	200 mm	
S4	1323.3	1311.1	1.63	90.0	86.47	89.6	60.79	93.5	33.99	33.7	24.33	28.6	16.13	37.2	5.41	11.7	2.12			5
T2	651.19	636.3	2.29	81.6	87.5	226.1	52.8	174.6	25.9	56.4	17.3	39.5	11.2	45.7	4.2	11.5	2.4	0.4	200 mm	10
P8	654.9	644.26	1.5	95.59	85.2	88.96	58.4	81.53	33.9	34.42	23.5	26.64	15.5	36.22	4.6	10.35	1.5	0.33	200 mm	10
J3	368.8	362.7	4.2	52.42	85.6	98.43	59.7	91.22	35.7	38.04	25.4	29.56	17.6	39.51	7.2	11.39	4.2	0.18	200 mm	5
E7	348.70	342.2	2.03	46.7	86.46	44.7	61.00	45.2	35.25	17.7	25.16	16.2	15.94	18.6	5.34	5.8	2.03	0.1	200 mm	8
C7	344.20	339.30	1.42	53.80	84	101.70	55	85.70	30	31.00	21	24.20	14	31.30	5	9.80	2	1.70	200 mm	7
D6	312.1	309.0	1.0	41.9	86.52	80.8	60.60	79.5	35.09	30.2	25.40	28.2	16.36	35.4	5.00	11.5	1.31	1.4	300 mm	10
B3	715.1	715.2	0.0	82.6	88.32	57.8	57.69	50.9	30.70	18.1	21.11	14.3	13.53	19.6	3.14	5.6	0.17	0.2	300 mm	10
Z4	1298.5	1298.5	000	190.4	85.21	82.6	59.01	80.4	33.51	32.0	23.36	25.9	15.15	33.9	4.40	10.1	1.20	0.6	300 mm	15
V7	1216.90	1196.50	1.68	166.90	86.20	42.28	56.45	33.63	32.78	13.65	23.18	10.18	16.02	14.55	5.78	4.53	2.59	0.53	00/300 m	
K5																				
P6	683.8	674.1	1.4	100.4	85.1	41.9	56.0	37.6	29.9	13.7	20.4	11.3	12.6	13.7	3.1	4.1	0.3	0.1	200 mm	10
Q7	1197.7	1180.5	1.4	169.1	85.6	315.8	58.9	290.8	34.2	123.8	23.8	107.1	14.7	132.9	3.4	38.6	0.2	1.4	300 mm	8
A8	765.10	753.06	1.57	109.53	85.57	212.66	57.78	181.99	33.99	77.23	23.90	58.50	16.25	86.59	4.94	24.69	1.71	1.00	00/300 m	
A3	1203.6	1182.7	1.99	28.6	84.04	47.2	57.89	44.1	33.45	17.4	23.81	13.8	16.16	19.2	5.53	5.8	2.31	0.4	200 mm	20
T6	368.1	361.2	1.87	51.4	85.93	95.8	59.90	92.1	34.88	37.6	24.67	31.0	16.25	41.1	5.08	11.7	1.90	0.2	200 mm	15
C9	610.8	599.0	1.9	83.019	86	185.128	59	168.352	34	84.365	25	67.742	17	86.642	6	21.868	2	0.460	00/300 m	
P9	1529.26	1500.47		214.62	86	35.94	60	33.96	36	15.34	25	11.86	16	15.08	5	4.96	2	0.02	00/300 m	
V3	728.60	713.50	2.07	105.4	85.49	196.6	58.51	177.5	34.15	66.6	25.01	62.7	16.40	80.7	5.33	24.4	1.98	1.0	200 mm	15
F2																				
D5	501.37	494.50	1.37	69.5	86.04	63.0	60.72	64.0	34.99	25.1	24.90	21.0	16.46	28.6	4.97	8.9	1.39	0.0	00/300 m	
F3	607.4	238.3	1.9	41.42	82.51	62.31	56.40	57.60	32.26	19.81	23.95	19.50	15.78	25.22	5.21	7.91	1.90		200 mm	
S5	530.1	524.1	1.03	70.0	86.61	136.2	60.91	134.4	35.56	59.0	24.43	43.1	16.30	60.9	4.81	18.8	1.26	0.7	300 mm	10
K8	427.6	422.7	1.15	69.0	83.04	112.8	56.67	100.6	33.14	42.1	23.29	31.7	15.88	46.6	4.98	15.8	1.29	0.6	300 mm	8

Note 1 : Blank entries indicate no result was supplied. Particpants that used a mechanical shaker have the time used shown.

Note 2: Cells shaded in **Green** indicate that the participant supplied more than one mass for the mass retained and that LabSmart Services has totalled the individual values to display in this table

Summary of Participant Results Continued

CODE	Particle Size Distribution																				
	Start Mass (Dry)	Dry Washed Mass	Washed % Passing 75 um	2.36 mm		1.18 mm		600 um		425 um		300 um		150 um		75 mm		Pan	Sieve Diameter	Shaker Time (min)
				Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Mass retained (g)	% Passing	Retained (g)		
P4	371.9	365.4	1.67	53.6	85.51	95.2	59.91	87.3	36.93	40.2	25.63	29.1	17.80	46.7	5.24	13.3	1.67	0.5	300 mm	8
Q9	351.37	344.71	1.9	42.72	88	88.37	63	89.27	37	38.15	26	30.26	18	41.14	6	12.43	3	0.87	200 mm	10
F5	379.56	372.17	1.95	44.39	88.30	100.71	61.77	94.55	36.86	40.78	26.12	32.37	17.59	45.23	5.67	13.52	2.11	0.04	00/300 m	
W2	684.52	671.46	1.91	109.14	83.96	43.85	58.30	39.60	35.12	18.83	24.10	12.56	16.75	19.85	5.13	5.53	1.90	0.08	200 mm	
W5	1479.34	NA	0.71	211.84	85.58	84.79	57.02	71.15	33.06	31.66	22.39	21.92	15.01	33.66	3.67	8.80	0.71	2.10	00/300 m	
U6	653.2	639.5	2.10	94.5	85.4	180.0	57.9	162.0	33.1	63.9	23.3	48.9	15.8	68.2	5.3	20.1	2.3	0.2	00/300 m	7
R9	767.3	756.0	1.5	110.4	85.54	199.6	59.53	193.0	34.38	61.9	24.23	61.1	16.27	88.8	4.70	23.3	1.62		00/300 m	7
D3	1359.8	1338.5		190.5		84.2		92.8		40.4		32.1		48.0		14.1		0.4	200 mm	20
G5	1345.20	1322.26	1.91	206.28		35.33		34.96		12.71		10.53		13.90		4.56		0.16	200 mm	
L4	466.2	460.6	1.2	64.2	86.23	127.4	58.90	117.0	33.81	47.2	23.68	37.1	15.72	52.3	4.50	14.9	1.31	0.5	300 mm	10
N5	483.7	478.6	1.05	69.1	85.67	134.6	57.85	119.8	33.08	48.2	23.11	38.2	15.20	53.0	4.24	15.1	1.12	0.4	300 mm	10
M5	683.2	669.8	0.98	102.30	85	192.49	57	160.91	33	71.21	23	55.32	15	65.34	5	18.98	2	1.05	200 mm	
D7	714.7	699.8	2.2	100.9	86	187.8	60	183.5	34	64.3	25	61.6	16	79.2	5.3	22.4	2.2		200 mm	
V8	638.3	627.4		91.8		166.14		321.28		60.16		50.26		53.39		42.03		2.07	300 mm	15
C6	605.3	594.9	1.7	87.20	85.53	158.45	59.35	149.44	34.66	64.41	24.02	50.38	15.70	65.11	4.94	18.77	1.84		300 mm	
K6	600.20	588.91	1.9	87.81	85	167.75	56	248.94	14	23.72	10	18.41	7	29.91	2	10.06	0	0.41	300 mm	
W7	712.9	695.9	2.38	93.0	86.84	42.2	61.92	41.3	37.53	17.6	27.13	15.3	18.09	20.5	5.99	5.9	2.50	0.2	200 mm	
Z7	657.6	646.6	1.7	78.8	88	178.8	61	167.2	35	67.8	25	56.7	16	73.6	5	22.3	2	0.4	200 mm	
Y4	305.6	301.5	1.4	47.1	84.40	78.6	58.70	76.6	33.60	39.5	23.90	25.0	15.70	34.3	4.50	9.4	1.40	0.4	300 mm	20
G6	299.6	296.6	1.4	40.3	86.50	76.5	61.00	75.5	35.80	30.8	25.50	26.3	16.70	35.7	4.80	10.2	1.40	0.1	300 mm	15

Note 1 : Blank entries indicate no result was supplied. Particpants that used a mechanical shaker have the time used shown.

Note 2: Cells shaded in **Green** indicate that the participant supplied more than one mass for the mass retained and that LabSmart Services has totalled the individual values to display in this table

Appendix A: Instructions for testers

LabSmart Services

Soil Grading & Moisture Content Proficiency Testing Program – 2023 (113)

INSTRUCTIONS FOR TESTERS

1. Please check that the package you have received contains the following:
   - Instructions (for testers)
   - Results Log
   - Sample A – PSD sample, approximately 1.5 kg
   - Sample B – Moisture content sample, approximately 1 kg

   Contact LabSmart Services if a bag is damaged or any item is missing. Phone 0439 208 406.

2. Please do not discuss aspects of this program with other organisations or staff within your organisation who may also be testing a sample from this program. Confidentiality is essential to ensure statistically valid measures of participant performance.

3. Before testing, please read and examine the results log sheet. Follow these instructions carefully.

4. Use AS 1289.3.6.1 and AS 1289.2.1.1 test methods unless you are unable to do so. You may perform a test even if you are not NATA accredited for the test.

5. **IMPORTANT** - Sample A for this proficiency program aims to assess participants' capacity to undertake AS 1289.3.6.1., not AS1289.2.1.1., which we undertake on Sample B, for this reason, we **ask** the participants to undertake the PSD from a dry state. AS 1289.3.6.1. is a complex test, and starting from a dry state also allows us to undertake additional analysis (not easily undertaken when not starting from a dry state). If participants do not wish to undertake their testing from a dry state, please make a note on your Result Log Sheet.

Sample A - PSD

6. **Mix** the contents of the bag marked 'Sample A'. Ensure the whole sample is **thoroughly mixed** and **break up any clumps** that may have formed during transit. This sample has a small amount of material above 4.75mm; this should be recorded and included in your calculation; however, the final report will not focus on this data.

7. A large sample has been supplied so participants can split the sample to obtain a sub-sample

8. **Dry** the sub-sample as per the standard (See step 5 for more information).

Testing

9. Record the **mass obtained in step 8 above** as the **start mass** for the PSD.

10. **Wash the sample** and dry it as per AS1289.3.6.1. Record the washed dry mass.

11. **Calculate** the "% passing 75µm" using the mass recorded under steps 9 and 10.

12. Perform the remaining grading and calculate the "% passing" using the start mass recorded under step 9.

13. Some sieves may become overloaded. If needed, there are two columns on the log sheet to record the mass of each split portion.

14. It is recommended that the entire sample A following testing be retained until the technical report has been issued.

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Instructions continued over the page

Sample B – Moisture Content

15. **Do not open** the bag marked 'Sample B' and read the instructions carefully before testing.

16. The moisture in the sample will be unevenly spread throughout the sample during transit due to vibration, gravity, and differences in temperature.

17. The sample should be kneaded while in the plastic bag to help spread the moisture. This needs to be performed several times a day for at **least two days.** Alternating how the bag is left on the bench to cure will also help promote an even spread of moisture. Curing at around 20^0 C will reduce condensation and promote even moisture dispersion.

18. The whole sample may be used or a subsample as per the test method AS 1289.2.1.1 to determine the moisture content. If the whole sample is used, then no need to perform **step 17**.

19. Record the wet mass of the sample used to determine the moisture content. Make sure it is the wet mass, not the wet mass plus the container.

20. Determine the moisture content.

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21. Record all information and calculations as per the proficiency testing results log sheet and **to the accuracy shown on the results log sheet if possible.** In many cases, greater reporting accuracy is required compared to that nominated by the standard.

22. Have a query? Contact LabSmart Services. Phone 0439 208 406.

23. **Please E-mail the "Results Log" to LabSmart Services by 17th March 2023**

    E-mail: info@labsmartservices.com.au

24. Please retain the completed "Results Log", as this contains your participation code that will identify your results in the technical report covering the proficiency testing program. It is also recommended that a copy of completed worksheets be kept with the results log in your proficiency file.

Thank you for participating in this proficiency testing program.

NATA

Appendix B: Results Log

LabSmart Services

Soil Grading & Moisture Proficiency Testing Program – 2023 (113)

RESULTS LOG **Participation Code: xx** **Laboratory: xxxxx**

F Please E-mail (info@labsmartservices.com.au) the completed results log by 17th March 2023

Date samples received:						
Condition of Samples as received:	**A:**			**B:**		
Sample A - PSD	**Report to:**	**Results**			**Method** AS 1289	Tick or enter method used
Start Mass (g) (Instructions, step 9)	Nearest 0.01 (Where possible)		Ç Use this as your start mass		3.6.1	
Dry Washed Mass (g) (Instructions, step 10)						
"% passing 75 um" (Instructions, step 11)						
Particle Size Distribution (Instructions, step 12)		Mass Retained per sieve (g) Instructions, step 13		% Passing		
4.75 mm						
2.36 mm						
1.18 mm						
600 µm						
425 µm						
300 µm						
150 µm						
75 µm						
Pan						
Diameter of sieves used:	200mm / 300mm					
Was a mechanical shaker used:	YES / NO		If so, for how long:		mins	
Balance LOP from calibration report:						
Tested by:						
Date Tested:						

Sample B - Moisture Content	**Report to:**	**Results**	**Method** AS 1289	Tick or enter method used
Wet mass of sample (g) (Instructions, step 19)	Nearest 0.01 (Where possible)		2.1.1	
Moisture content (%) (Instructions, step 20)				
Balance LOP from calibration report:				
Tested by:				
Date Tested:				

COMMENTS:.....

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Supervisor Name *(Please Print)* **Signature** **Date**

In signing the above, I acknowledge that the above results have been approved and have been checked. I will also ensure that the results are kept confidential both internal and external to the laboratory until the issue of the final technical report covering this proficiency program.

Thank you for participating. Please retain this sheet for your records

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