LabSmart

PROFICIENCY TESTING
PROGRAM REPORT

# Concrete
# 2024 (125)



Accredited for Compliance with
ISO/IEC 17043

NATA

## 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 January 2025.

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## Program Coordinator

The program coordinator for this program was Jeffrey Mulholland, with assistance from Bryan Mott & Shantelle Popple, LabSmart Services.

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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 December 2024. 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.

## LabSmart Services

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## Amendment History

Reports may be downloaded from the LabSmart Services website.

Version 1 – Issued 14 January 2024

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# 1. Program Aim

This proficiency testing program was conducted in October 2024 with thirty-four (34) participants from around Australia. The program involved the performance of:

- AS 1012.9 – 2014, Compressive strength tests — Concrete, mortar and grout specimens
- AS 1012.12.1 – 1998 (R2014), Determination of mass per unit volume.

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 are also used.

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

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.

A Z-score summary was issued on the 4th of December 2024 to facilitate early feedback on performance.

# 2. Performance

## 2.1 Identified Outliers

There were seven (7) outliers across four (4) participants identified across the tests performed.

Participant's test results are tabulated in section 4, along with the robust statistics and a z-score. The z-score indicates how far away a participant is from the program's median value. A z-score between –1 and +1 indicates a strong consensus concerning all other participants and represents a very good outcome. The z-score graph gives a quick visual indication of how a result compares to others in the program.

Outliers are where a z-score value is greater than +3 or less than -3. It is recommended that participants with outliers investigate their performance on 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 5.9.

Technical comments and feedback in section 3 are provided to assist participants in investigating or reviewing their results and for those seeking to improve their testing performance.

*Table* 1: Statistical Outliers

| **Test** | **Investigate (Outliers)** | | **Review (Outside \|2.75\|)** | |
|---|---|---|---|---|
| | ***Sample*** | | ***Sample*** | |
| | **A** | **B** | **A** | **B** |
| **Compressive strength** | **E4, G3, S4, M7** | **G3, S4** | **-** | **-** |
| **Mass per unit volume** | **-** | **S4** | **-** | **-** |

During the reporting process, LabSmart undertakes an analysis of all the data supplied by participants and uses the additional information supplied to replicate each participant's result. If LabSmart identifies a discrepancy during this process, the participant in question will be flagged as a 'Non-Statistical' matter, and it is recommended that this participant Review their process. See Table 2 below and section 3 for further detail.

*Table 2: Results requiring further investigation or review (Non-Statistical)*

| **Test** | **Review (Non-Statistical)** | |
|---|---|---|
| | ***Sample*** | |
| | **A** | **B** |
| **Compressive strength** | **S4** | **D4** & **Y7** |
| **Mass per unit volume** | **-** | **E7** & **S4** |

## 2.2 Program Summary

Thirty-four (34) participants in the program returned results on time for the final report.

The overall performance of all the participants was very good. The spread of results (variation) was within industry expectations. However, greater care needs to be taken in completing proficiency testing log sheets and better checking by supervisors.

The majority of the participants' results (for compressive strength and mass per unit volume) were within 1 s.d, which was a good outcome. Only a small number of results had a z-score below -2 or above 2, and it is strongly recommended that these participants review their performance.

Overall, the results are within industry expectations and demonstrated that most participants had a good understanding of performing these tests.

*Table 3: Summary* of test results statistics.

| Statistic | Sample A | | Sample B | |
|---|---|---|---|---|
| | **Compressive Strength** (MPa) | **Mass per unit volume** ($kg/m^3$) | **Compressive Strength** (MPa) | **Mass per unit volume** ($kg/m^3$) |
| **No of participants** | 34 | 34 | 34 | 34 |
| **Median** | 42.9 | 2272 | 42.2 | 2274 |
| **N-IQR** | 1.69 | 18.90 | 2.58 | 20.57 |
| **CV (%)** | 3.9 | 0.8 | 6.1 | 0.9 |
| **Range *** | 6.7 | 57 | 14.0 | 78 |

* Excludes outlier results.

## 3. Technical Comment

General

A summary of submitted results for all participants may be found in section 6. The reporting requirements under the Australian Standard are 'compressive strength' and 'Mass Per Unit Volume'. Outlier assessment was undertaken based on these results; the robust statistical analysis can be found in section 4 of this report.

*Table 4: Summary of CV for current and past programs*

| Coefficient of Variation (%) | | | |
|---|---|---|---|
| **Program** | **Sample** | **Mass per Unit Volume** | **Compressive Strength** |
| 2024(125) | A | 0.8 | 3.9 |
| | B | 0.9 | 6.1 |
| 2024(122) | A | 0.4 | 4.7 |
| | B | 0.7 | 8.2 |
| 2023(115) | A | 0.7 | 7.8 |
| | B | 0.8 | 3.5 |
| 2022 (111) | A | 0.7 | 3.2 |
| | B | 0.6 | 3.7 |
| 2022 (108) | A | 0.6 | 5.5 |
| | B | 0.7 | 4.0 |
| 2021(102) | A | 0.8 | 2.4 |
| | B | 0.6 | 2.0 |
| 2020(95) | A | 1.0 | 6.1 |
| | B | 0.6 | 3.9 |
| 2019(88) | A | 0.5 | 3.7 |
| | B | 0.6 | 3.9 |
| 2018(80) | A1 | 1.3 | 2.8 |
| | B1 | 1.2 | 4.9 |
| | A2 | 0.9 | 5.0 |
| | B2 | 1.0 | 4.0 |
| 2017(70) | A1 | 0.6 | 5.7 |
| | A2 | 0.4 | 2.6 |
| | B1 | 0.7 | 5.8 |
| | B2 | 1.0 | 8.3 |

Outcome

Overall, participants had a very good agreement for both the 'Mass per Unit Volume' and the 'Compressive Strength'. The coefficient of variation (CV) shown in Table 4 is one way to **broadly evaluate** that the participant performance is consistent from one program to another. Based on this, participants did well, However, it should be noted that the actual fluctuation in CV values may be attributed to a range of factors. Therefore, further conclusions should not be inferred from the fluctuations observed. See section 5.9 for further details.

Missing Information & Accurate Measurement

Most participants provided all the information requested to the requested accuracy on the results log sheet. Thank you to all participants, as this makes it far easier to provide informative feedback. However, it was noted that some participants didn't complete all sections and/or in the unit of measurements requested, this should be reviewed.

## 3.1. Compressive Strength

Nominated Test Date

At times, it is not possible to test a sample on its nominated test date, and this can be the result of a range of factors (for example, staff/equipment availability). In this instance, there was one (1) participant who did not test on the nominated date of November 13th 2024. (see Table 5).

*Table 5: Variation in test date*

| **Participant** | **L2** | |
|---|---|---|
| **Sample** | **A** | **B** |
| **Difference in days** | +2 | +2 |
| **Result** (MPa) | 42.8 | 44.1 |
| **Median** (MPa) | 42.9 | 42.2 |
| **Z-score** | **-0.06** | **0.76** |

Participant **L2** didn't test on the nominated test date (13/11/2024); for this participant, testing was two days overdue. Analysis of the data showed that it did not significantly affect the final outcome.

Incomplete crushing

It was noted during past programs that some cap failures can cause the compression machine to register that the maximum load had been reached, even though it had not reached its maximum load. For these cases, further crushing (retesting) could yield a higher strength. Some participants may have found this, while some may not have been aware that this can occur. This is an area of the test that LabSmart cannot assess, but laboratories need to monitor.

Calculation of compressive strength (Non-Statistical)

From the reported diameter and maximum force, the 'Compressive Strength' results can be determined. This was done for each participant and the calculated result compared to the reported compressive strength. Most participants obtained good agreement. As it is a reporting requirement to round the compressive strength to the closest 0.5 MPa; therefore, participants showing a difference greater than 0.3 MPa can be found in Table 6. These participants should review these results.

*Table 6: Recalculated 'Compressive Strength' results (Non-Statistical)*

| Code | Compressive Strength | | |
|---|---|---|---|
| | **Submitted** (MPa) | **Recalculated** (MPa) | **Difference** (MPa) |
| **S4 - Sample A** | 36.0 | 35.7 | -0.3 |
| **D4 - Sample B** | 44.6 | 44.1 | -0.5 |
| **Y7 - Sample B** | 38.8 | 38.5 | -0.3 |

Statistical Outliers

Overall, most participants achieved a satisfactory level of testing for compressive strength, with only six (6) outliers across both Sample A and B.

LabSmart assessed the 'Results Log' sheets for all 6 outliers for compressive strength. All information supplied by participants supported the outcome of their final results; participants recorded a range of capping methods and failure types (See section 6 for these details).

Except for participant **E4**, further comment is limited for these participants, given that all the supplied information matches the final outcome. However, as all these results were on the low side of the Median, 'Incomplete Crushing' (see earlier subsection) may have been an issue for some of the samples. Additionally, centring the specimens on the platens may have been a factor, but it is hard to check post-testing. Furthermore, checking for transcription errors may be worth considering.

**E4**

Participant **E4** appears to have mixed up their samples. LabSmart asked for cylinder IDs, and participant **E4** supplied these around the wrong way. Had participant **E4** supplied their results for both Sample A and B around the other way, they would have had a more favourable outcome. However, they still would have been an outlier for one sample. Participant **E4** should review their testing process.

Overall, when it comes to outliers for compressive strength, if no issues can be found with the testing practices, then the outcome would suggest an issue that cannot be checked, e.g. platen centring, grinding, etc.

Failure Modes

Out of all the participants who returned results, ~12% reported 'Cap Failure' for Sample A and ~18% for Sample B. In addition, ~20% reported 'shear failure 'or 'Abnormal SF for Sample A and ~18% for Sample B. All other participants results reporting either a 'Normal' or 'Conical Failure'. Table 7 shows the 'normal/conical' failure statistics vs abnormal (Both 'Cap' and 'Shear') failures.

The median values of each break type (looked at individually) are very close to the combined results in section 4 regardless of the failure mode. The variation associated with an abnormal failure was not much different from those showing 'normal' failure.

The comparisons drawn above have been observed in previous programs as well. There is no substantial evidence to suggest that 'Shear failure' or 'Cap failure' values should be discounted or excluded from the data set.

The effect the mode of failure has on the compressive strength result is difficult to determine except in instances where unrealistic results are obtained. Equipment configuration, air voids, variability in compaction, and aggregate distribution are only some of the factors that affect the mode of failure. Possible causes of abnormal failures might include capping and crushing practices, the stability of the load frame (i.e. alignment, squareness, and rigidity), and the correct working/alignment of platens.

*Table 7: Normal/Conical and Shear/Cap failure statistics for Samples A & B*

| **Compression Statistic** **MPa** | **Sample A** | **Sample B** |
|---|---|---|
| | ***Normal - Conical failure results only.*** | |
| **Median** (MPa) | 42.6 | 41.7 |
| **NIQR** | 1.63 | 2.71 |
| **Number of Participants** | 23 | 22 |
| **Compression Statistic** **MPa** | **Sample A** | **Sample B** |
| | ***Abnormal - Cap or shear failure results only.*** | |
| **Median** (MPa) | 43.6 | 42.6 |
| **NIQR** | 1.15 | 1.78 |
| **Number of Participants** | 11 | 12 |

Capping Methods

Out of the thirty-four (34) participants who returned results, twenty-three (23) participants (~68%) used rubber caps, with eleven (11) participants (~32%) using grounded ends or sulphur capping

In this program, it was not possible to determine if there was any statistical variation due to the capping method employed, this was due to the small numbers in some groupings. Previous proficiency programs have not encountered any adverse correlation between reported 'compressive strength' and the capping method.

Based on the data for this program, 'rubber caps', 'sulphur capping' and 'end-ground' were considered to yield equivalent results and were analysed as a group.

## 3.2. Mass Per Unit Volume

Calculation of Mass Per Unit Volume

The 'Mass Per Unit Volume' result can be determined from the reported height, diameter, and weight. For this program, all participants 'Mass Per Unit Volume' results were recalculated based on the intermediate data supplied. This was done for each result and compared to the reported 'Mass Per Unit Volume'. Generally, good agreement was obtained.

The test method requires the 'Mass Per Unit Volume' result to be rounded to the nearest 20kg/m$^3$. However, for this proficiency program, Participants were requested to report to the nearest 1 kg/m$^3$. Some participants reported results that may have been rounded to the nearest 20 kg/m$^3$ and this reduces the quality of feedback that can be given to participants. For this report, we focused on results that differed by greater than or equal to 10 kg/m$^3$ (Table 8). These are considered a 'Non-Statistical' matter.

*Table 8: Recalculated 'Mass Per Unit Volume' results (Non-Statistical)*

| Participant | Submitted (kg/m$^3$) | Recalculated (kg/m$^3$) | Difference (kg/m$^3$) |
|---|---|---|---|
| **E7** (Sample B) | 2248 | 2295 | -47 |
| **S4** (Sample B) | 2364 | 2340 | -24 |

The calculation process must be correct and accurate. Instructions on the calculation process can be found in Section 8 of AS 1012.12.1. It states that 'Mass Per Unit Volume' is the mass divided by the cylinder volume. The volume of a cylinder is given by $V=\pi r^2 h$ where 'h' is the cylinder height, and 'r' is the average radius, (i.e. Half the average diameter).

Unrounded values for diameter and height should be used when calculating the volume. The value of pi used can also have an effect. Those using Excel can use the pi() function. Those with calculators that do not have a pi function should use 333/106. The use of 22/7 does not have enough accuracy for this test.

Statistical Outliers

Overall, the majority of participants achieved a satisfactory level of testing for 'Mass Per Unit Volume'. However, there was only one (1) outlier identified across both samples. This Outlier was for participant **S4** on Sample B.

**S4**

Participant **S4** was identified as an Outlier for Sample B. As noted in the above section (Calculation of Mass Per Unit Volume), LabSmart identified a discrepancy between their supporting data (on the 'Result Log' sheet) and the final result. Participants **S4** should review why their supporting data does not match their final result.

Reporting of cylinder weights

Some participants cylinder weights were reported in grams instead of kilograms. See section 6 for a breakdown of supplied data. Participants need to ensure they follow proficiency program instructions. Conversions were undertaken as these values were used to verify the participants' reported MPUV results.

## 4. Statistics: Z-score & Graph

### Sample A - Compressive Strength: Z - Scores

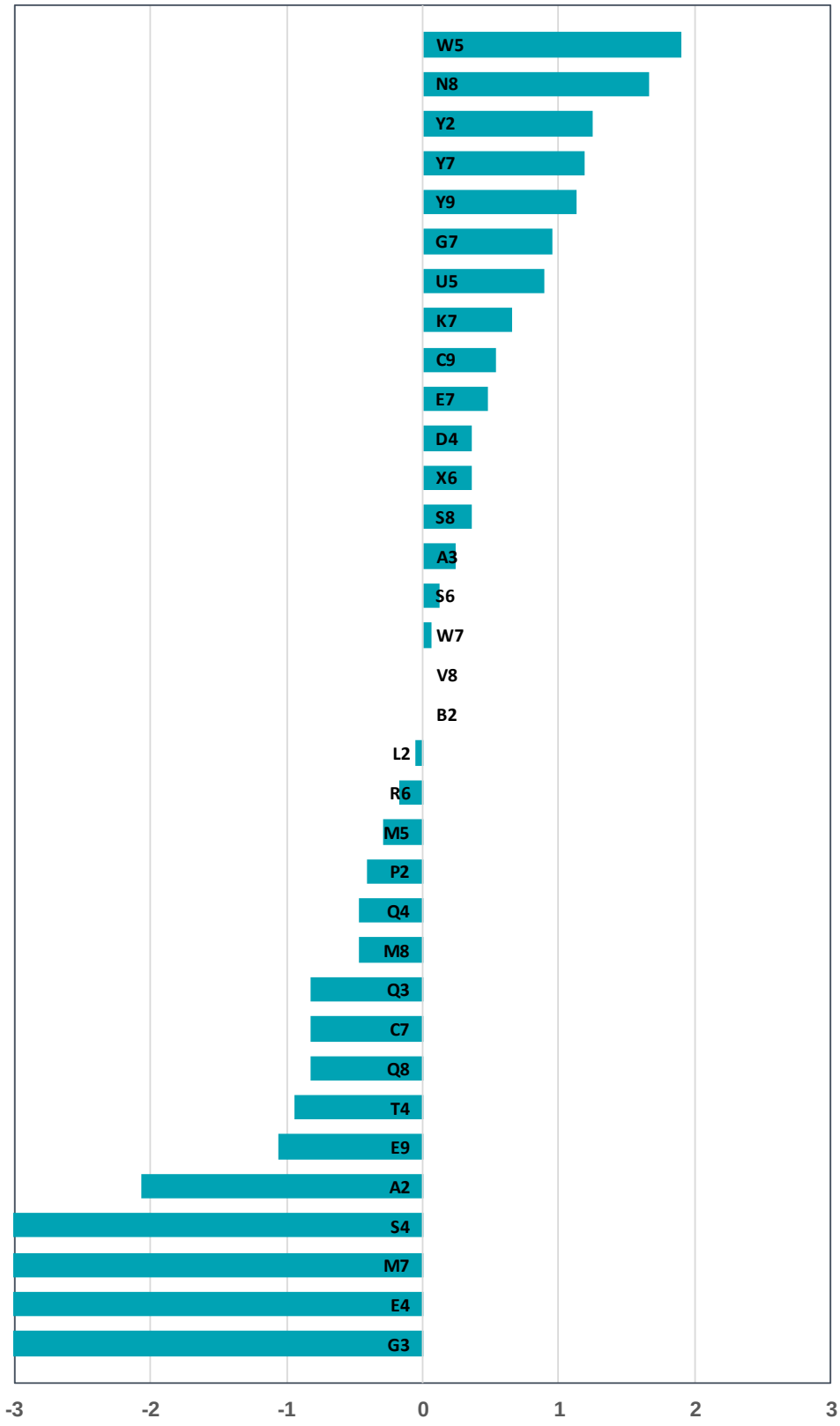
| Code | Test Result MPa | Z Score |
|---|---|---|
| Q4 | 42.1 | -0.47 |
| W7 | 43.0 | 0.06 |
| S6 | 43.1 | 0.12 |
| Y9 | 44.8 | 1.13 |
| T4 | 41.3 | -0.95 |
| E7 | 43.7 | 0.47 |
| P2 | 42.2 | -0.42 |
| D4 | 43.5 | 0.36 |
| E4 | 29.70 | **-7.83 #** |
| M8 | 42.1 | -0.47 |
| C9 | 43.8 | 0.53 |
| N8 | 45.7 | 1.66 |
| K7 | 44.0 | 0.65 |
| Q3 | 41.5 | -0.83 |
| L2 | 42.8 | -0.06 |
| G7 | 44.5 | 0.95 |
| W5 | 46.1 | 1.90 |
| R6 | 42.6 | -0.18 |
| A2 | 39.4 | -2.08 |
| Y2 | 45.0 | 1.25 |
| A3 | 43.3 | 0.24 |
| G3 | 29.1 | **-8.18 #** |
| Y7 | 44.9 | 1.19 |
| V8 | 42.9 | 0.00 |
| C7 | 41.5 | -0.83 |
| E9 | 41.1 | -1.07 |
| Q8 | 41.5 | -0.83 |
| S4 | 36.0 | **-4.09 #** |

| Code | Test Result MPa | Z Score |
|---|---|---|
| M5 | 42.4 | -0.30 |
| X6 | 43.5 | 0.36 |
| M7 | 30.1 | **-7.59 #** |
| S8 | 43.5 | 0.36 |
| B2 | 42.9 | 0.00 |
| U5 | 44.4 | 0.89 |

| *Statistic* | *Value* | |
|---|---|---|
| Number of results | **34** | |
| Median | **42.9** | |
| Median MU | **0.36** | |
| First Quartile | **41.5** | |
| Third Quartile | **43.8** | |
| IQR | **2.28** | |
| Normalised IQR | **1.69** | |
| CV (%) | **3.9** | |
| Minimum | **39.4** | (29.1) |
| Maximum | **46.1** | (46.1) |
| Range | **6.7** | (17.0) |

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 - Compressive Strength: Z - Score Graph




| Review | Weak Consensus | Strong Consensus | Weak Consensus | Review |
|---|---|---|---|---|

## Sample A - Mass per unit volume : Z - Scores

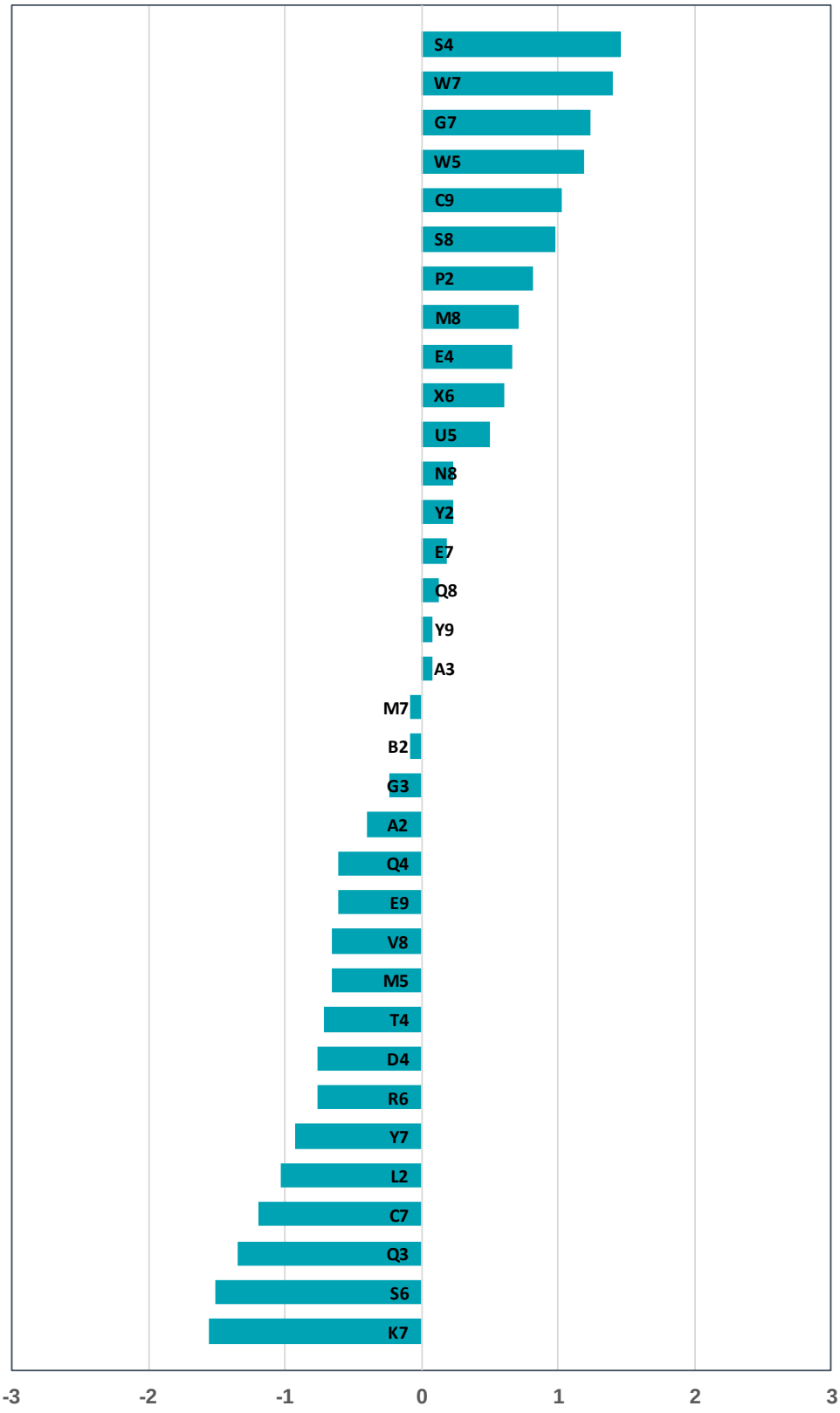
| Code | Test Result kg/m³ | Z Score |
|---|---|---|
| Q4 | 2260 | -0.61 |
| W7 | 2298 | 1.40 |
| S6 | 2243 | -1.51 |
| Y9 | 2273 | 0.08 |
| T4 | 2258 | -0.71 |
| E7 | 2275 | 0.19 |
| P2 | 2287 | 0.82 |
| D4 | 2257 | -0.77 |
| E4 | 2284 | 0.66 |
| M8 | 2285 | 0.71 |
| C9 | 2291 | 1.03 |
| N8 | 2276 | 0.24 |
| K7 | 2242 | -1.56 |
| Q3 | 2246 | -1.35 |
| L2 | 2252 | -1.03 |
| G7 | 2295 | 1.24 |
| W5 | 2294 | 1.19 |
| R6 | 2257 | -0.77 |
| A2 | 2264 | -0.40 |
| Y2 | 2276 | 0.24 |
| A3 | 2273 | 0.08 |
| G3 | 2267 | -0.24 |
| Y7 | 2254 | -0.93 |
| V8 | 2259 | -0.66 |
| C7 | 2249 | -1.19 |
| E9 | 2260 | -0.61 |
| Q8 | 2274 | 0.13 |
| S4 | 2299 | 1.45 |

| Code | Test Result kg/m³ | Z Score |
|---|---|---|
| M5 | 2259 | -0.66 |
| X6 | 2283 | 0.61 |
| M7 | 2270 | -0.08 |
| S8 | 2290 | 0.98 |
| B2 | 2270 | -0.08 |
| U5 | 2281 | 0.50 |

| *Statistic* | *Value* | |
|---|---|---|
| Number of results | **34** | |
| Median | **2272** | |
| Median MU | **4.05** | |
| First Quartile | **2258** | |
| Third Quartile | **2284** | |
| IQR | **25.50** | |
| Normalised IQR | **18.90** | |
| CV (%) | **0.8** | |
| Minimum | **2242** | () |
| Maximum | **2299** | () |
| Range | **57** | () |

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. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers. Results highlighted Orange have had the units of measurement changed e.g Grams to kilograms.

## Sample A - Mass per unit volume : Z - Score Graph




| Review | Weak Consensus | Strong Consensus | Weak Consensus | Review |
|---|---|---|---|---|

## Sample B - Compressive Strength: Z - Scores

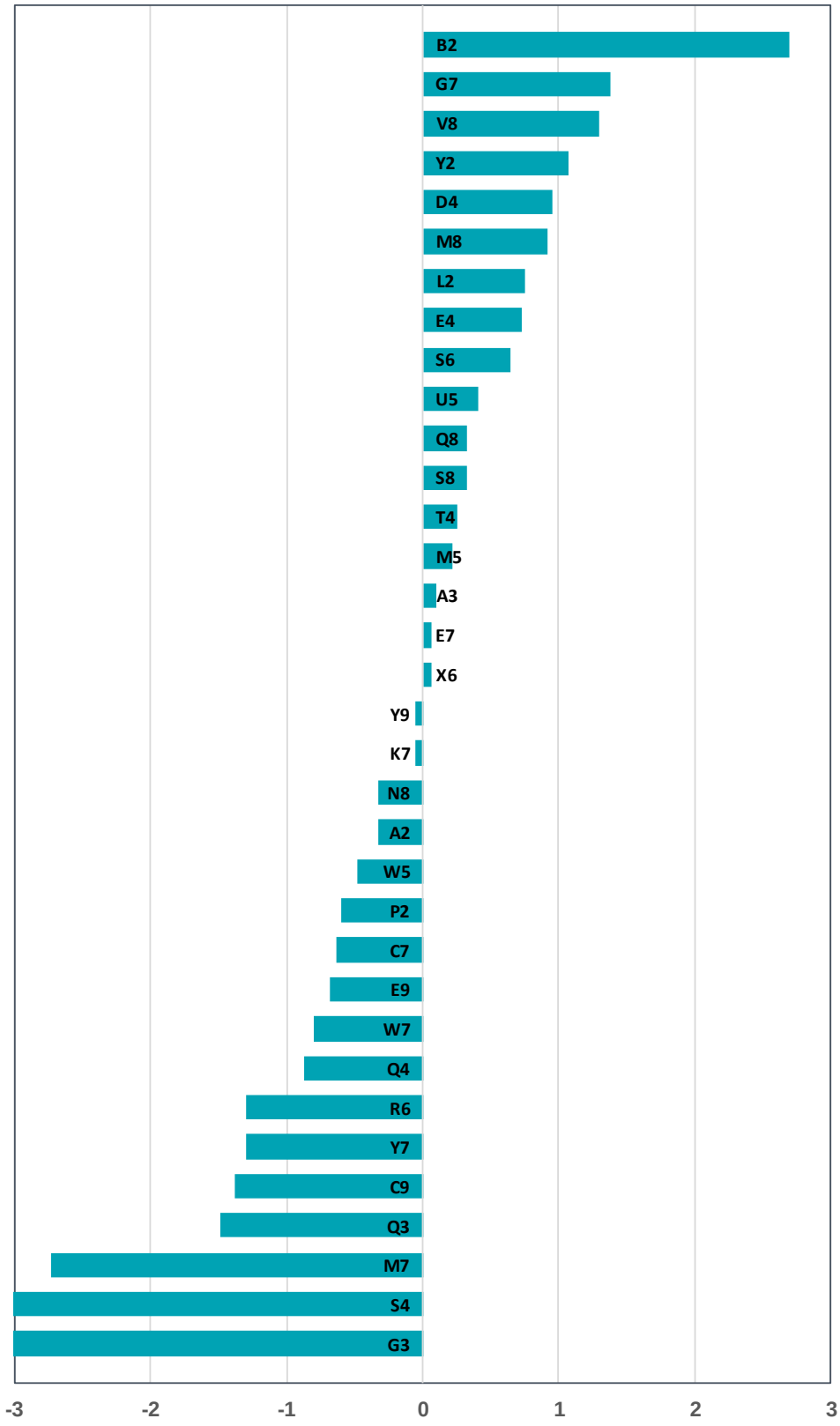
| Code | Test Result Mpa | Z Score |
|---|---|---|
| Q4 | 39.9 | -0.87 |
| W7 | 40.1 | -0.80 |
| S6 | 43.8 | 0.64 |
| Y9 | 42.0 | -0.06 |
| T4 | 42.8 | 0.25 |
| E7 | 42.3 | 0.06 |
| P2 | 40.6 | -0.60 |
| D4 | 44.6 | 0.95 |
| E4 | 44.01 | 0.72 |
| M8 | 44.5 | 0.91 |
| C9 | 38.6 | -1.38 |
| N8 | 41.3 | -0.33 |
| K7 | 42.0 | -0.06 |
| Q3 | 38.3 | -1.49 |
| L2 | 44.1 | 0.76 |
| G7 | 45.7 | 1.38 |
| W5 | 40.9 | -0.49 |
| R6 | 38.8 | -1.30 |
| A2 | 41.3 | -0.33 |
| Y2 | 44.9 | 1.07 |
| A3 | 42.4 | 0.10 |
| G3 | 30.2 | **-4.64** # |
| Y7 | 38.8 | -1.30 |
| V8 | 45.5 | 1.30 |
| C7 | 40.5 | -0.64 |
| E9 | 40.4 | -0.68 |
| Q8 | 43.0 | 0.33 |
| S4 | 33.0 | **-3.55** # |

| Code | Test Result Mpa | Z Score |
|---|---|---|
| M5 | 42.7 | 0.21 |
| X6 | 42.3 | 0.06 |
| M7 | 35.1 | -2.74 |
| S8 | 43.0 | 0.33 |
| B2 | 49.1 | 2.70 |
| U5 | 43.2 | 0.41 |

| *Statistic* | *Value* | |
|---|---|---|
| Number of results | **34** | |
| Median | **42.2** | |
| Median MU | **0.55** | |
| First Quartile | **40.2** | |
| Third Quartile | **43.7** | |
| IQR | **3.48** | |
| Normalised IQR | **2.58** | |
| CV (%) | **6.1** | |
| Minimum | **35.1** | (30.2) |
| Maximum | **49.1** | (49.1) |
| Range | **14.0** | (18.9) |

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 - Compressive Strength: Z - Score Graph



## Sample B - Mass per unit Volume: Z - Scores

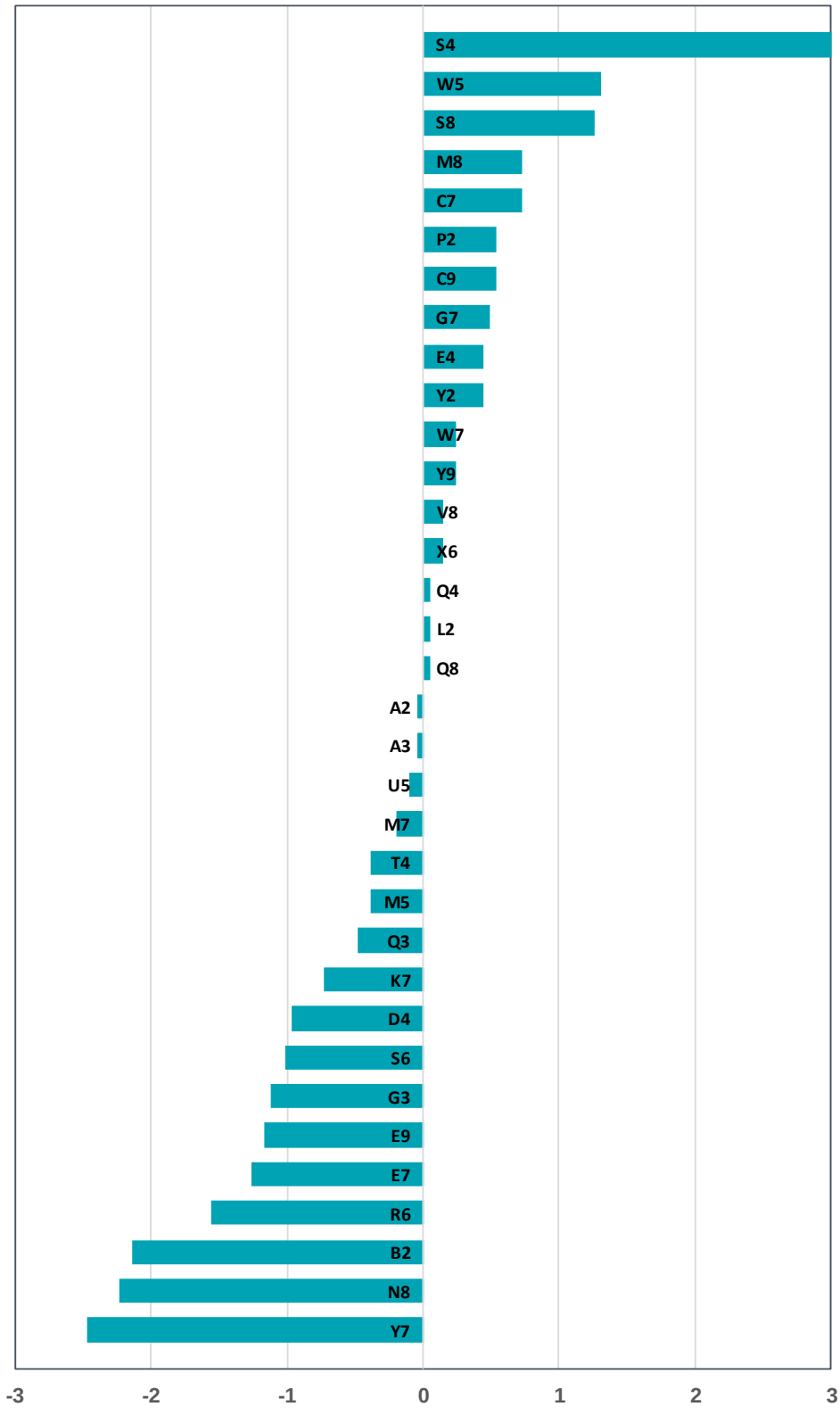
| Code | Test Result kg/m³ | Z Score |
|---|---|---|
| Q4 | 2275 | 0.05 |
| W7 | 2279 | 0.24 |
| S6 | 2253 | -1.02 |
| Y9 | 2279 | 0.24 |
| T4 | 2266 | -0.39 |
| E7 | 2248 | -1.26 |
| P2 | 2285 | 0.53 |
| D4 | 2254 | -0.97 |
| E4 | 2283 | 0.44 |
| M8 | 2289 | 0.73 |
| C9 | 2285 | 0.53 |
| N8 | 2228 | -2.24 |
| K7 | 2259 | -0.73 |
| Q3 | 2264 | -0.49 |
| L2 | 2275 | 0.05 |
| G7 | 2284 | 0.49 |
| W5 | 2301 | 1.31 |
| R6 | 2242 | -1.56 |
| A2 | 2273 | -0.05 |
| Y2 | 2283 | 0.44 |
| A3 | 2273 | -0.05 |
| G3 | 2251 | -1.12 |
| Y7 | 2223 | -2.48 |
| V8 | 2277 | 0.15 |
| C7 | 2289 | 0.73 |
| E9 | 2250 | -1.17 |
| Q8 | 2275 | 0.05 |
| S4 | 2364 | **4.38 #** |

| Code | Test Result kg/m³ | Z Score |
|---|---|---|
| M5 | 2266 | -0.39 |
| X6 | 2277 | 0.15 |
| M7 | 2270 | -0.19 |
| S8 | 2300 | 1.26 |
| B2 | 2230 | -2.14 |
| U5 | 2272 | -0.10 |

| *Statistic* | *Value* | |
|---|---|---|
| Number of results | **34** | |
| Median | **2274** | |
| Median MU | **4.41** | |
| First Quartile | **2255** | |
| Third Quartile | **2283** | |
| IQR | **27.75** | |
| Normalised IQR | **20.57** | |
| CV (%) | **0.9** | |
| Minimum | **2223** | (2223) |
| Maximum | **2301** | (2364) |
| Range | **78** | (141) |

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. Minimum, Maximum and Range are calculated with outliers excluded, those in brackets include outliers. Results highlighted Orange have had the units of measurement changed e.g Grams to kilograms.

## Sample B - Mass per unit Volume: Z - Score Graph




| Review | Weak Consensus | Strong Consensus | Weak Consensus | Review |
|---|---|---|---|---|

# 5. Program Information

## 5.1 Z-Score Summary

This proficiency program was conducted in October 2024. A 'Z-score Summary' was issued on 4th of December 2024. The summary was e-mailed to participants and is intended as an early indicator of participant performance. The 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

This program is held one to two times a year. Participants are required to test two concrete cylinders. The cylinders may be matched (same strength) or unmatched in strength (different strengths). The compressive strength also changes from program to program.

The test requires a minimum skill level. Adherence to the test method is essential for consistent test results. Participant results are checked where possible.

It is expected 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.

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

### 5.2.2 Selection of material used in the program

Materials used in the preparation of concrete cylinders are selected to ensure that the desired characteristics, such as finish, compressive strength, etc., are obtained.

The concrete cylinders used for this program are made specifically for the program under controlled conditions to ensure uniformity in the strength of the cylinders provided.

### 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 to 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 not normally available in a final report. 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 further details.

### 5.2.5 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.

### 5.2.6 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 and 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 beneficial from “an end-user” perspective but are not as useful when considering laboratory performance. The test method acknowledges that additional decimal places may be used for statistical purposes.

For this program, it was decided that the benefits of using additional decimal places would not significantly improve the aim of the proficiency testing program. However, participants were asked not to round their results.

Participant results were analysed as received regardless of whether there were ‘more or less’ significant figures than the number indicated by the test method or if rounding was undertaken.

### 5.2.7 Additional information requested

This program requested additional information, as detailed in section 6, that may not usually be reported. However, the additional information is 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 comments, including feedback on outliers and possible participant improvement.

### 5.2.8 Data checks

As often observed, 'operator errors' can occur in the result calculation process. Every participant's results were recalculated. Both strength and unit mass results were recalculated based on the data provided. Such checks, however, are only as accurate as the raw data supplied by each participant. These checks help ensure that the data is comparable. Any inconsistencies identified during this process are identified as possible feedback for participant improvement. In some cases, inconsistencies identified may need to be investigated by participants.

## 5.3 Sample Preparation

Two batches of concrete were prepared using two different mix designs. For each mix, there were around 80 cylinders cast. Each cylinder was individually numbered. Cylinders were then cured in water baths after casting.

After curing, each cylinder was removed from the tank and was wrapped in paper and double sealed in two plastic bags. One batch was marked as 'Sample A' and the other 'Sample B'. After removing homogeneity samples, participant samples were drawn at random from each batch to make a pair. Each pair of cylinders was assigned a unique participant code.

## 5.4 Packaging and Instructions

Each pair of cylinders was placed into a sturdy box with bubble wrap. The boxed samples weighed approximately 8 kg. 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 the log sheet used. A set of instructions and 'Result Log' sheets were placed in the box prior to sealing and dispatch.

## 5.5 Quarantine

For all participants, Quarantine requirements were assessed and met. There were no steps taken that would have affected individual participants.

## 5.6 Sample Dispatch

Samples were dispatched to participants on 18th October 2024 using Pack and Send Couriers. Dispatched samples are tracked from dispatch to delivery for each participant by LabSmart Services.

## 5.7 Homogeneity Testing

Samples for homogeneity testing were treated in the same manner as those used for all participants. The homogeneity samples were tested prior to dispatch by a NATA-accredited laboratory. The laboratory was issued the same instructions as the participants to approximate the same conditions.

Testing was undertaken before releasing samples to participants. This allows for early assessments, however, due to how concrete cures homogeneity data will be different from participant results. The homogeneity data was reviewed and found to be satisfactory. A summary of the homogeneity data is provided in Table 9.

*Table* 9: Homogeneity results

| | Sample A | | | Sample B | |
|---|---|---|---|---|---|
| | Compressive Strength MPA | Mass per Unit Volume kg/m^3 | | Compressive Strength MPA | Mass per Unit Volume kg/m^3 |
| H1 | 43.7 | 2260 | H11 | 35.7 | 2283 |
| H2 | 40.7 | 2257 | H12 | 36.3 | 2277 |
| H3 | 43.7 | 2291 | H13 | 33.4 | 2283 |
| H4 | 42.5 | 2280 | H14 | 36.5 | 2287 |
| H5 | 40.3 | 2282 | H15 | 36.2 | 2280 |
| H6 | 41.9 | 2270 | H16 | 35.8 | 2280 |
| H7 | 42.4 | 2273 | H17 | 35.3 | 2286 |
| H8 | 43.2 | 2290 | H18 | 35 | 2280 |
| H9 | 41.3 | 2280 | H19 | 34 | 2261 |
| H10 | 40.4 | 2273 | H20 | 33.4 | 2270 |
| Average | 42.0 | 2276 | Average | 35.16 | 2278.7 |
| Standard Deviation | 1.3 | 11.3 | Standard Deviation | 1.2 | 7.9 |
| Range | 3.4 | 34 | Range | 3.1 | 26 |
| Coefficient of Variation (%) | 3.1 | 0.50 | Coefficient of Variation (%) | 3.3 | 0.34 |

## 5.8 Participation

Thirty-four (34) participants entered the program. The nominated date for participants to return their results was the 15th of November, 2024. All participants return results in time to be included in this 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. Therefore, 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.

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

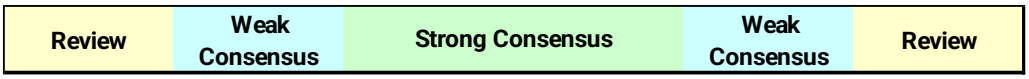



*Figure 1*: Z-score interpretation bar

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 that is 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 that is outside 3 standard deviations, then 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 LabSmart Services or by downloading the 'Participant Guide' from the LabSmart Services website.

### 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 up 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. Including late results or corrections is at the discretion of the program coordinator. This may change some of the z-scores slightly in some instances, but generally, the performance outcome remains the same. If there is any impact, it will be discussed within 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
- The number of participants
- Experience of participants
- Test methodology variations
- Equipment used
- Test methods used
- Experience of supervisors
- Range of organisations involved
- Program design and the 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 a proficiency program at a given time, 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 proficiency testing providers face 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 have a significant impact on the statistics calculated. This can cause biased (or unfair) outcomes for other participants.

To limit the effect erroneous results 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 statistical bias, it is left in the program.

The result, however, is incorrect even though it may have a satisfactory z-score. This is considered a 'non-statistical' matter to highlight that the participant needs to investigate erroneous results.

This may also be applied to non-compliance with 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 Participants Results - Sample A**

| Code | Condition | Surface | Conditioning | Capping | Height mm | Diameter mm | | Weight kg | Mass per unit volume kg/m³ | Maximum Force kN | Compressive Strength MPa | Failure | Date Tested |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q4 | N/A | SS Wet | Temperate | Rubber | 200 | 100.0 | 100.0 | 3.550 | 2260 | 331 | 42.1 | Conical F | 13/11/2024 |
| W7 | N/A | Wet | Temperate | Rubber | 198 | 100.2 | 100.2 | 3.587 | 2298 | 339 | 43.0 | Normal | 13/11/2024 |
| S6 | Nil | Wet | Temperate | Rubber | 200 | 100.0 | 100.0 | 3.523 | 2243 | 339 | 43.1 | Cap Failure | 13/11/2024 |
| Y9 | N/A | SS Wet | Tropical | Rubber | 200 | 99.8 | 100.6 | 3.585 | 2273 | 353 | 44.8 | Shear F | 13/11/2024 |
| T4 | Nil | Wet | Tropical | Rubber | 199 | 100.4 | 100.4 | 3.558 | 2258 | 327 | 41.3 | Abnormal SF | 13/11/2024 |
| E7 | N/A | SS Wet | Tropical | Rubber | 199 | 100.4 | 100.4 | 3.591 | 2275 | 347 | 43.7 | Abnormal SF | 13/11/2024 |
| P2 | | SS Wet | Tropical | Rubber | 197 | 100.1 | 100.9 | 3574.6 | 2287 | 335 | 42.2 | Normal | 13/11/2024 |
| D4 | N/A | Wet | Tropical | Rubber | 200 | 100 | 100 | 3545.5 | 2257 | 342 | 43.5 | Abnormal SF | 13/11/2024 |
| E4 | 0 | SS Dry | 0 | Rubber | 197 | 100.2 | 100.0 | 3.536 | 2284 | 233.5 | 29.70 | Conical F | 13/11/2024 |
| M8 | undamaged | Wet | Tropical | End Grind | 198 | 99.8 | 100.0 | 3.546 | 2285 | 330 | 42.1 | Normal | 13/11/2024 |
| C9 | 0 | 0 | Temperate | Rubber | 200 | 99.8 | 99.8 | 3.584 | 2291 | 343 | 43.8 | Cap Failure | 13/11/2024 |
| N8 | 0 | 0 | Temperate | Rubber | 200 | 100.0 | 100.0 | 3.575 | 2276 | 359 | 45.7 | Abnormal SF | 13/11/2024 |
| K7 | 0 | SS Dry | Temperate | End Grind | 197 | 100.6 | 100.4 | 3.508 | 2242 | 349 | 44.0 | Normal | 13/11/2024 |
| Q3 | none | SS Wet | Tropical | Rubber | 202 | 100.0 | 100.0 | 3.564 | 2246 | 326 | 41.5 | Cap Failure | 13/11/2024 |
| L2 | nil | SS Dry | Temperate | Rubber | 199 | 99.8 | 100.4 | 3.527 | 2252 | 337 | 42.8 | Conical F | 15/11/2024 |
| G7 | | SS Dry | Temperate | Sulphur | 197 | 100.4 | 100.4 | 3580 | 2295 | 352 | 44.5 | Normal | 13/11/2024 |
| W5 | | SS Dry | Temperate | Sulphur | 199 | 100.2 | 100.0 | 3593 | 2294 | 363 | 46.1 | Normal | 13/11/2024 |
| R6 | | Wet | Temperate | Sulphur | 199 | 100 | 100.8 | 3556 | 2257 | 337.3 | 42.6 | Normal | 13/11/2024 |
| A2 | 0 | SS Wet | Tropical | End Grind | 197 | 99.8 | 100.0 | 3.496 | 2264 | 308.5 | 39.4 | Normal | 13/11/2024 |
| Y2 | | SS Wet | Temperate | Rubber | 199 | 99.8 | 99.6 | 3.533 | 2276 | 351 | 45.0 | Conical F | 13/11/2024 |
| A3 | | SS Dry | Tropical | Rubber | 198 | 99.8 | 99.8 | 3.521 | 2273 | 339 | 43.3 | Normal | 13/11/2024 |
| G3 | 0 | SS Wet | Temperate | Rubber | 199 | 100.0 | 100.0 | 3.542 | 2267 | 229 | 29.1 | Normal | 13/11/2024 |
| Y7 | none | 0 | Temperate | Rubber | 201 | 100.2 | 100.0 | 3.565 | 2254 | 353 | 44.9 | Normal | 13/11/2024 |
| V8 | no defect | SS Wet | Temperate | Rubber | 199 | 100.0 | 100.2 | 3.538 | 2259 | 337.3 | 42.9 | Normal | 13/11/2024 |
| C7 | none | SS Wet | Temperate | Rubber | 201 | 99.8 | 100.0 | 3.543 | 2249 | 326 | 41.5 | Normal | 13/11/2024 |
| E9 | N/A | Wet | Temperate | Rubber | 199 | 100.6 | 100.2 | 3566.741 | 2260 | 325 | 41.1 | Conical F | 13/11/2024 |
| Q8 | Surface bubbles | Wet | Tropical | End Grind | 196 | 99.8 | 100.2 | 3501 | 2274 | 327.2 | 41.5 | Shear F | 13/11/2024 |
| S4 | Surface Bubbles | Wet | Tropical | End Grind | 197 | 100.0 | 100.1 | 3.561 | 2299 | 280.8 | 36.0 | Normal | 13/11/2024 |
| M5 | nil | SS Wet | Tropical | End Grind | 197 | 99.6 | 99.8 | 3.474 | 2259 | 331 | 42.4 | Conical F | 13/11/2024 |
| X6 | nil | SS Wet | Temperate | End Grind | 197 | 99.8 | 99.8 | 3.518 | 2283 | 340 | 43.5 | Conical F | 13/11/2024 |
| M7 | air voids - minor | SS Dry | Temperate | End Grind | 198 | 99.8 | 100.0 | 3518 | 2270 | 236.7 | 30.1 | Normal | 13/11/2024 |
| S8 | 0 | SS Dry | Tropical | Rubber | 199 | 99.0 | 100.8 | 3.570 | 2290 | 342 | 43.5 | Normal | 13/11/2024 |
| B2 | N/A | Wet | Tropical | Rubber | 200 | 100.0 | 100.0 | 3.558 | 2270 | 336.9 | 42.9 | Cap Failure | 13/11/2024 |
| U5 | no | SS Dry | Tropical | Rubber | 200 | 100.2 | 100.4 | 3.605 | 2281 | 351 | 44.4 | Abnormal SF | 13/11/2024 |

**Note** Denotes when units have been changed e.g Grams to Kilograms

**Summary of Participants Results - Sample B**

| Code | Condition | Surface | Conditioning | Capping | Height mm | Diameter mm | | Weight kg | Mass per unit volume kg/m3 | Maximum Force kN | Compressive Strength MPa | Failure | Date Tested |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q4 | N/A | SS Wet | Temperate | Rubber | 196 | 100.2 | 100.0 | 3.508 | 2275 | 314 | 39.9 | Conical F | 13/11/2024 |
| W7 | N/A | Wet | Temperate | Rubber | 197 | 99.8 | 99.8 | 3.512 | 2279 | 314 | 40.1 | Normal | 13/11/2024 |
| S6 | Nil | Wet | Temperate | Rubber | 198 | 100.0 | 99.8 | 3.495 | 2253 | 343 | 43.8 | Normal | 13/11/2024 |
| Y9 | n/a | SS Wet | Tropical | Rubber | 196 | 100.0 | 99.4 | 3.487 | 2279 | 328 | 42.0 | Cap Failure | 13/11/2024 |
| T4 | Nil | Wet | Tropical | Rubber | 199 | 99.4 | 100.0 | 3.521 | 2266 | 334 | 42.8 | Abnormal SF | 13/11/2024 |
| E7 | N/A | SS Wet | Tropical | Rubber | 198 | 100.2 | 100.4 | 3.517 | 2248 | 334 | 42.3 | Abnormal SF | 13/11/2024 |
| P2 | None | SS Wet | Tropical | Rubber | 197 | 99.2 | 100.8 | 3.535 | 2285 | 319 | 40.6 | Cap Failure | 13/11/2024 |
| D4 | N/A | | Tropical | Rubber | 196.4 | 100.7 | 100.6 | 3521.9 | 2254 | 350.8 | 44.6 | Normal | 13/11/2024 |
| E4 | 0 | SS Dry | Temperate | Rubber | 200 | 100.2 | 100.2 | 3.598 | 2283 | 346.8 | 44.01 | Conical F | 13/11/2024 |
| M8 | umdamaged | Wet | Tropical | End Grind | 197 | 99.8 | 100.0 | 3.535 | 2289 | 349 | 44.5 | Shear F | 13/11/2024 |
| C9 | 0 | 0 | Temperate | Rubber | 197 | 99.8 | 99.8 | 3.522 | 2285 | 302 | 38.6 | Cap Failure | 13/11/2024 |
| N8 | 0 | | Temperate | Rubber | 200 | 100.2 | 100.2 | 3.512 | 2228 | 326 | 41.3 | Cap Failure | 13/11/2024 |
| K7 | 0 | SS Dry | Temperate | End Grind | 195 | 100.0 | 100.2 | 3.476 | 2259 | 331 | 42.0 | Normal | 13/11/2024 |
| Q3 | None | SS Wet | Tropical | Rubber | 198 | 100.0 | 100.0 | 3.520 | 2264 | 301 | 38.3 | Normal | 13/11/2024 |
| L2 | | | | | | | | | | | | | |
| G7 | N/A | 0 | Temperate | Sulphur | 196 | 100.6 | 100.8 | 3566 | 2284 | 364 | 45.7 | Normal | 13/11/2024 |
| W5 | N/A | 0 | Temperate | Sulphur | 196 | 100.0 | 100.0 | 3542 | 2301 | 321 | 40.9 | Normal | 13/11/2024 |
| R6 | | | | | | | | | | | | | |
| A2 | 0 | SS Wet | Tropical | End Grind | 196 | 100.2 | 100.4 | 3.520 | 2273 | 326.0 | 41.3 | Normal | 13/11/2024 |
| Y2 | | SS Wet | Temperate | Rubber | 197 | 99.8 | 100.0 | 3.526 | 2283 | 352 | 44.9 | Abnormal SF | 13/11/2024 |
| A3 | | Wet | Tropical | Rubber | 198 | 99.8 | 99.8 | 3.521 | 2273 | 332 | 42.4 | Normal | 13/11/2024 |
| G3 | 0 | SS Wet | Temperate | Rubber | 198 | 100.0 | 100.0 | 3.506 | 2251 | 238 | 30.2 | Normal | 13/11/2024 |
| Y7 | None | 0 | Temperate | Rubber | 202 | 100.4 | 100.5 | 3.559 | 2223 | 305 | 38.8 | Cap Failure | 13/11/2024 |
| V8 | No Defects | SS Wet | Temperate | Rubber | 198 | 100.4 | 100.6 | 3.576 | 2277 | 359.5 | 45.5 | Normal | 13/11/2024 |
| C7 | none | SS Wet | Temperate | Rubber | 197 | 100.0 | 100.0 | 3.542 | 2289 | 318 | 40.5 | Normal | 13/11/2024 |
| E9 | N/A | Wet | Temperate | Rubber | 199 | 100.8 | 100.3 | 3551.371 | 2250 | 321 | 40.4 | Conical F | 13/11/2024 |
| Q8 | Surface Bubbles | Wet | Tropical | End Grind | 194 | 99.9 | 100.2 | 3.469 | 2275 | 339.0 | 43.0 | Normal | 13/11/2024 |
| S4 | Surface bubbles | Wet | Tropical | End Grind | 193 | 99.5 | 100.5 | 3.547 | 2364 | 260.9 | 33.0 | Normal | 13/11/2024 |
| M5 | Nil | SS Wet | Tropical | End Grind | 195 | 99.8 | 100.0 | 3.464 | 2266 | 335 | 42.7 | Conical F | 13/11/2024 |
| X6 | Nil | SS Wet | Tropical | End Grind | 196 | 99.6 | 99.8 | 3.484 | 2277 | 330 | 42.3 | Conical F | 13/11/2024 |
| M7 | Air voids | SS Dry | Temperate | End Grind | 196 | 99.6 | 100.0 | 3479 | 2270 | 276.2 | 35.1 | Normal | 13/11/2024 |
| S8 | 0 | SS Dry | Tropical | Rubber | 197 | 99.4 | 99.2 | 3.514 | 2300 | 338 | 43.0 | Shear F | 13/11/2024 |
| B2 | N/A | Wet | Tropical | Rubber | 200 | 100.4 | 100.0 | 3.519 | 2230 | 387.4 | 49.1 | Cap Failure | 13/11/2024 |
| U5 | no | SS Dry | Tropical | Rubber | 198 | 100.0 | 99.8 | 3.526 | 2272 | 338 | 43.2 | Shear F | 13/11/2024 |

**Note** Denotes when units have been changed e.g Grams to Kilograms

# Appendix A: Instructions for Testers

LabSmart

## Concrete Proficiency Program 2024 (125)
## INSTRUCTIONS FOR TESTER

1. **Do not open the plastic bags until the 13th of November. Store at room temperature away from fluctuating temperatures and sunlight.**
2. Please read these instructions carefully on receipt of samples.
3. Please check that the package you have received contains the following:
   - Results Log sheet
   - Two nominal 100 mm by 200 mm concrete cylinders sealed in plastic bags marked 'Sample A' and 'Sample B'.
4. Inspect packaging on arrival for damage or leakage. Contact LabSmart Services if the box is wet, or damaged, or if anything is missing (Phone 0439 208 406).
5. It is strongly recommended that participants follow AS 1012, Method 9 when testing the concrete cylinders, but an alternative equivalent method may also be used.
6. On the **13th of November,** remove each cylinder from the plastic bag. Remove the paper covering. Inspect each cylinder and record its condition on the proficiency testing results log sheet (AS 1012, clause 4.1 (a) to (h)). If surface bubbles appear excessive, record it on the log sheet but continue with the test. If cylinders show any chipping or damage caused by transport, please contact LabSmart Services before testing.
7. Within 10 minutes of opening the plastic bag, immerse each concrete cylinder into the curing tank. Allow the cylinders to pre-condition for at least three hours prior to capping and testing by full immersion in water at 23 ± 2° C temperate zone or 27 ± 2° C tropical zone.
8. Follow AS 1012, Method 9. Test both cylinders within 15 minutes of each other.
9. Record all information and calculations as per AS 1012, Method 9 on the proficiency testing results log sheet **but to the accuracy shown on the results log sheet.**
10. Ensure to have the Laboratory Supervisor check & approve prior to signing the log sheet.
11. Please E-mail the "Results Log" to LabSmart Services by **15th of November 2024**

    E-mail: info@labsmart.com.au
12. 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. Results can also be used for technical auditing or training.
13. Have a query? Contact LabSmart Services. Phone 0439 208 406.

*Thank you for participating in this proficiency testing program.*

NATA

2024 (125) Concrete PT Instructions V2024.1

## Appendix B: Results Log

LabSmart

### Concrete Compression Proficiency Program – 2024 (125)

RESULTS LOG

**Participant:** XXXXXXX **Participation Code:** XX

**Please test cylinders on the 13th of November 2024**

*Please E-mail the completed results log by 15th of November 2024*

E-mail: info@labsmart.com.au

| TEST | | Sample A | Sample B |
|---|---|---|---|
| Date samples received | | | |
| Cylinder ID: | | | |
| Describe the condition of the samples | List defects, damage | | |
| | SS Wet or Dry | | |
| Test Method used | AS 1012.9 OR | | |
| Conditioning | Temperate or Tropical | | |
| Capping Method # | Rubber or Sulphur | | |
| Height | Report to 1 mm | | |
| Diameter | Report to 0.2 mm | | |
| Weight | Report to 0.001 kg | | |
| Maximum Force | Report to 1 kN | | |
| Compressive Strength | Report to 0.1 MPa | | |
| Type of cylinder failure v | Normal – CON F<br>Abnormal – SF, CAP F | | |
| Test Method used | AS 1012.12.1 OR | | |
| Tested | Capped or Uncapped | | |
| Weight | Report to 0.001 kg | | |
| Mass per unit volume | Report to 1 kg/m$^3$ | | |
| Date Tested | | | |
| Tested by: | | | |

**COMMENTS:**.....

.....

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

*In signing the above, I acknowledge that the above results are 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 program.*

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

# If cylinder end grinding only is available, please report. For a description of cylinder failures, please turn over page.

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LabSmart

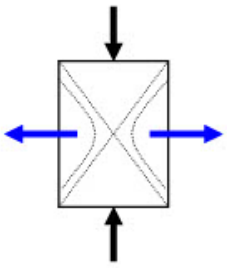
Concrete Compression Proficiency Program – 2024 (125)

## *Concrete Cylinder Failure Modes*

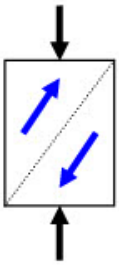
**"Normal"**

**OR**

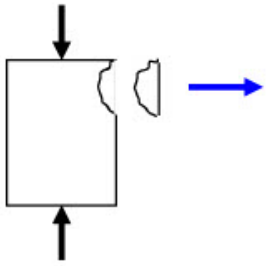
**"Conical Failure"**



**"Shear Failure"**



**"Cap Failure"**



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

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