



## Z-SCORES SUMMARY

### Plasticity – November 2023(119)

The proficiency program was conducted in November 2023 with participants throughout Australia. AS 1289 test methods were preferred but other methods were allowed in this program. This summary provides the z-scores for the following tests.

- AS 1289 3.1.1 Determination of the **liquid limit** of a soil – Four point Casagrande method
- AS 1289 3.2.1 Determination of the **plastic limit** of a soil – Standard Method
- AS 1289 3.3.1 Calculation of the **plasticity index** of a soil
- AS 1289 3.4.1 Determination of the **linear shrinkage** of a soil – Standard Method

A z-score summary is provided to allow participants to gauge performance and address outliers as early as possible. It is recommended that any remedial action be undertaken cautiously until the final report for the program has been consulted.

The z-scores shown are unlikely to change significantly. Small changes however may become necessary during the preparation of the final report. The final report provides other information, apart from z-scores, that may be used to assess performance and interpret the significance of outliers.

Participants may forward the summary report to NATA as an indication of a participant's general performance.

**All participants need to assess their overall performance once the final report has been issued.**

\* Participant had result taken from their supplied worksheet for the liquid limit used.

The final report, once issued, supersedes the z-score summary.

Please direct questions to:

**Program Coordinator:** Shantelle Popple – 0439 208 406

**Approved by:** Jeffrey Mulholland – General Manager

**E-mail:** [Info@labsmartservices.com.au](mailto:Info@labsmartservices.com.au)

**Web:** [www.labsmartservices.com.au](http://www.labsmartservices.com.au)

**Sample A - Liquid Limit: Z - Scores**

| Code | Test Result | Z Score      | Code | Test Result | Z Score |
|------|-------------|--------------|------|-------------|---------|
|      | %           |              |      | %           |         |
| G3   | 32          | -1.18        | Z7   | 35          | 0.59    |
| F8   | 35          | 0.59         | F7   | 33          | -0.59   |
| X4   | 34          | 0.00         | U5   | 35          | 0.59    |
| B3   | 34          | 0.00         | L3   |             |         |
| S6   | <b>34*</b>  | 0.00         | S9   |             |         |
| Q3   | 33          | -0.59        |      |             |         |
| A6   | 35          | 0.59         |      |             |         |
| P6   | 33          | -0.59        |      |             |         |
| B2   | 29          | <b>-2.95</b> |      |             |         |
| N2   | 37          | 1.77         |      |             |         |
| B6   | 35          | 0.59         |      |             |         |
| G4   | 33          | -0.59        |      |             |         |
| G2   | 34          | 0.00         |      |             |         |
| R6   | 32.32       | -0.99        |      |             |         |
| C5   | 32.42       | -0.93        |      |             |         |
| T7   | 35          | 0.59         |      |             |         |
| K8   | 37          | 1.77         |      |             |         |
| F9   | 30          | -2.36        |      |             |         |
| Z4   | 35          | 0.59         |      |             |         |
| A2   | 34          | 0.00         |      |             |         |
| D3   | 34          | 0.00         |      |             |         |
| V7   | 37          | 1.77         |      |             |         |
| S2   | 31          | -1.77        |      |             |         |
| K3   | 30.90       | -1.83        |      |             |         |
| D2   | 33          | -0.59        |      |             |         |
| Y2   | 35          | 0.59         |      |             |         |
| P7   | 33          | -0.59        |      |             |         |
| T6   | 30.11       | -2.29        |      |             |         |

| Statistic         | Value    |
|-------------------|----------|
| Number of results | 31       |
| Median            | 34.00    |
| Median MU         | 0.38     |
| First Quartile    | 32.71    |
| Third Quartile    | 35.00    |
| IQR               | 2.29     |
| Normalised IQR    | 1.70     |
| CV (%)            | 5.0      |
| Minimum           | 29.00 () |
| Maximum           | 37.00 () |
| Range             | 8.00 ()  |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Plastic Limit: Z - Scores**

| Code | Test Result | Z Score        | Code | Test Result | Z Score |
|------|-------------|----------------|------|-------------|---------|
|      | %           |                |      | %           |         |
| G3   | 18          | -0.57          | Z7   | 18          | -0.57   |
| F8   | 17          | -1.92          | F7   | 19          | 0.78    |
| X4   | 18          | -0.57          | U5   | 20          | 2.13    |
| B3   | 18          | -0.57          | L3   |             |         |
| S6   | 13.0        | <b>-7.31 #</b> | S9   |             |         |
| Q3   | 17          | -1.92          |      |             |         |
| A6   | 18          | -0.57          |      |             |         |
| P6   | 19          | 0.78           |      |             |         |
| B2   | 18          | -0.57          |      |             |         |
| N2   | 19          | 0.78           |      |             |         |
| B6   | 19          | 0.78           |      |             |         |
| G4   | 20          | 2.13           |      |             |         |
| G2   | 20          | 2.13           |      |             |         |
| R6   | 18.42       | 0.00           |      |             |         |
| C5   | 18.59       | 0.23           |      |             |         |
| T7   | 20          | 2.13           |      |             |         |
| K8   | 18          | -0.57          |      |             |         |
| F9   | 19          | 0.78           |      |             |         |
| Z4   | 21          | <b>3.48 #</b>  |      |             |         |
| A2   | 18          | -0.57          |      |             |         |
| D3   | 17          | -1.92          |      |             |         |
| V7   | 18          | -0.57          |      |             |         |
| S2   | 17          | -1.92          |      |             |         |
| K3   | 18          | -0.57          |      |             |         |
| D2   | 19          | 0.78           |      |             |         |
| Y2   | 19.0        | 0.78           |      |             |         |
| P7   | 20          | 2.13           |      |             |         |
| T6   | 19          | 0.78           |      |             |         |

| Statistic         | Value         |
|-------------------|---------------|
| Number of results | 31            |
| Median            | 18.42         |
| Median MU         | 0.17          |
| First Quartile    | 18.00         |
| Third Quartile    | 19.00         |
| IQR               | 1.00          |
| Normalised IQR    | 0.74          |
| CV (%)            | 4.0           |
| Minimum           | 17.00 (13.00) |
| Maximum           | 20.00 (21.00) |
| Range             | 3.00 (8.00)   |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Plasticity Index: Z - Scores**

| Code | Test Result | Z Score       | Code | Test Result | Z Score |
|------|-------------|---------------|------|-------------|---------|
|      | %           |               |      | %           |         |
| G3   | 14          | -0.54         | Z7   | 17          | 1.08    |
| F8   | 18          | 1.62          | F7   | 14          | -0.54   |
| X4   | 16          | 0.54          | U5   | 15          | 0.00    |
| B3   | 16          | 0.54          | L3   |             |         |
| S6   | 21.0        | <b>3.24 #</b> | S9   |             |         |
| Q3   | 16          | 0.54          |      |             |         |
| A6   | 17          | 1.08          |      |             |         |
| P6   | 14          | -0.54         |      |             |         |
| B2   | 11          | -2.16         |      |             |         |
| N2   | 18          | 1.62          |      |             |         |
| B6   | 16          | 0.54          |      |             |         |
| G4   | 13          | -1.08         |      |             |         |
| G2   | 14          | -0.54         |      |             |         |
| R6   | 14.00       | -0.54         |      |             |         |
| C5   | 13.00       | -1.08         |      |             |         |
| T7   | 15          | 0.00          |      |             |         |
| K8   | 19          | 2.16          |      |             |         |
| F9   | 11          | -2.16         |      |             |         |
| Z4   | 14          | -0.54         |      |             |         |
| A2   | 16          | 0.54          |      |             |         |
| D3   | 17          | 1.08          |      |             |         |
| V7   | 19          | 2.16          |      |             |         |
| S2   | 14          | -0.54         |      |             |         |
| K3   | 13          | -1.08         |      |             |         |
| D2   | 14          | -0.54         |      |             |         |
| Y2   | 16          | 0.54          |      |             |         |
| P7   | 13          | -1.08         |      |             |         |
| T6   | 11          | -2.16         |      |             |         |

| Statistic         | Value                |
|-------------------|----------------------|
| Number of results | <b>31</b>            |
| Median            | <b>15.00</b>         |
| Median MU         | <b>0.42</b>          |
| First Quartile    | <b>14.00</b>         |
| Third Quartile    | <b>16.50</b>         |
| IQR               | <b>2.50</b>          |
| Normalised IQR    | <b>1.85</b>          |
| CV (%)            | <b>12.4</b>          |
| Minimum           | <b>11.00</b> (11.00) |
| Maximum           | <b>19.00</b> (21.00) |
| Range             | <b>8.00</b> (10.00)  |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Linear Shrinkage: Z - Scores**

| Code | Test Result | Z Score | Code | Test Result | Z Score |
|------|-------------|---------|------|-------------|---------|
|      | %           |         |      | %           |         |
| G3   | 7.9         | 0.21    | Z7   | 8.5         | 0.53    |
| F8   | 9.0         | 0.79    | F7   | 9.0         | 0.79    |
| X4   | 8.5         | 0.53    | U5   | 7.5         | 0.00    |
| B3   | 9.0         | 0.79    | L3   |             |         |
| S6   | 5           | -1.32   | S9   |             |         |
| Q3   | 6.5         | -0.53   |      |             |         |
| A6   | 10.0        | 1.32    |      |             |         |
| P6   | 5.5         | -1.06   |      |             |         |
| B2   | 6.5         | -0.53   |      |             |         |
| N2   | 9           | 0.79    |      |             |         |
| B6   | 7.5         | 0.00    |      |             |         |
| G4   | 5.5         | -1.06   |      |             |         |
| G2   | 7.0         | -0.26   |      |             |         |
| R6   | 5.4         | -1.11   |      |             |         |
| C5   | 5.3         | -1.16   |      |             |         |
| T7   | 7.5         | 0.00    |      |             |         |
| K8   | 9.0         | 0.79    |      |             |         |
| F9   | 8.0         | 0.26    |      |             |         |
| Z4   | 9.0         | 0.79    |      |             |         |
| A2   | 8.3         | 0.42    |      |             |         |
| D3   | 7.5         | 0.00    |      |             |         |
| V7   | 9.5         | 1.06    |      |             |         |
| S2   | 5.0         | -1.32   |      |             |         |
| K3   | 5.0         | -1.32   |      |             |         |
| D2   | 9.5         | 1.06    |      |             |         |
| Y2   | 6.5         | -0.53   |      |             |         |
| P7   | 6.5         | -0.53   |      |             |         |
| T6   | 6.4         | -0.58   |      |             |         |

| Statistic         | Value    |
|-------------------|----------|
| Number of results | 31       |
| Median            | 7.50     |
| Median MU         | 0.42     |
| First Quartile    | 6.45     |
| Third Quartile    | 9.00     |
| IQR               | 2.55     |
| Normalised IQR    | 1.89     |
| CV (%)            | 25.2     |
| Minimum           | 5.00 ()  |
| Maximum           | 10.00 () |
| Range             | 5.00 ()  |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Liquid Limit: Z - Scores**

| Code | Test Result | Z Score | Code | Test Result | Z Score |
|------|-------------|---------|------|-------------|---------|
|      | %           |         |      | %           |         |
| G3   | 56          | 0.00    | Z7   | 58          | 0.57    |
| F8   | 57          | 0.29    | F7   | 59          | 0.86    |
| X4   | 54          | -0.57   | U5   | 62          | 1.72    |
| B3   | 58          | 0.57    | L3   |             |         |
| S6   | <b>55*</b>  | -0.29   | S9   |             |         |
| Q3   | 53          | -0.86   |      |             |         |
| A6   | 59          | 0.86    |      |             |         |
| P6   | 51          | -1.44   |      |             |         |
| B2   | 48          | -2.30   |      |             |         |
| N2   | 60          | 1.15    |      |             |         |
| B6   | 57          | 0.29    |      |             |         |
| G4   | 57          | 0.29    |      |             |         |
| G2   | 53          | -0.86   |      |             |         |
| R6   | 55.10       | -0.26   |      |             |         |
| C5   | 55.41       | -0.17   |      |             |         |
| T7   | 59          | 0.86    |      |             |         |
| K8   | 59          | 0.86    |      |             |         |
| F9   | 59          | 0.86    |      |             |         |
| Z4   | 55          | -0.29   |      |             |         |
| A2   | 53          | -0.86   |      |             |         |
| D3   | 55          | -0.29   |      |             |         |
| V7   | 59          | 0.86    |      |             |         |
| S2   | 57          | 0.29    |      |             |         |
| K3   | 53.61       | -0.69   |      |             |         |
| D2   | 53          | -0.86   |      |             |         |
| Y2   | 56          | 0.00    |      |             |         |
| P7   | 55          | -0.29   |      |             |         |
| T6   | 49.89       | -1.76   |      |             |         |

| <i>Statistic</i>  | <i>Value</i>    |
|-------------------|-----------------|
| Number of results | <b>31</b>       |
| Median            | <b>56.00</b>    |
| Median MU         | <b>0.78</b>     |
| First Quartile    | <b>53.81</b>    |
| Third Quartile    | <b>58.50</b>    |
| IQR               | <b>4.70</b>     |
| Normalised IQR    | <b>3.48</b>     |
| CV (%)            | <b>6.2</b>      |
| Minimum           | <b>48.00</b> () |
| Maximum           | <b>62.00</b> () |
| Range             | <b>14.00</b> () |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Plastic Limit: Z - Scores**

| Code | Test Result | Z Score | Code | Test Result | Z Score |
|------|-------------|---------|------|-------------|---------|
|      | %           |         |      | %           |         |
| G3   | 22          | 1.62    | Z7   | 19          | 0.00    |
| F8   | 23          | 2.16    | F7   | 18          | -0.54   |
| X4   | 18          | -0.54   | U5   | 18          | -0.54   |
| B3   | 21          | 1.08    | L3   |             |         |
| S6   | 16.0        | -1.62   | S9   |             |         |
| Q3   | 23          | 2.16    |      |             |         |
| A6   | 20          | 0.54    |      |             |         |
| P6   | 21          | 1.08    |      |             |         |
| B2   | 17          | -1.08   |      |             |         |
| N2   | 18          | -0.54   |      |             |         |
| B6   | 18          | -0.54   |      |             |         |
| G4   | 22          | 1.62    |      |             |         |
| G2   | 19          | 0.00    |      |             |         |
| R6   | 18.51       | -0.26   |      |             |         |
| C5   | 18.4        | -0.32   |      |             |         |
| T7   | 20          | 0.54    |      |             |         |
| K8   | 19          | 0.00    |      |             |         |
| F9   | 24          | 2.70    |      |             |         |
| Z4   | 19          | 0.00    |      |             |         |
| A2   | 19          | 0.00    |      |             |         |
| D3   | 21          | 1.08    |      |             |         |
| V7   | 18          | -0.54   |      |             |         |
| S2   | 18          | -0.54   |      |             |         |
| K3   | 19          | 0.00    |      |             |         |
| D2   | 20          | 0.54    |      |             |         |
| Y2   | 19          | 0.00    |      |             |         |
| P7   | 19          | 0.00    |      |             |         |
| T6   | 19          | 0.00    |      |             |         |

| <b>Statistic</b>  | <b>Value</b>    |
|-------------------|-----------------|
| Number of results | <b>31</b>       |
| Median            | <b>19.00</b>    |
| Median MU         | <b>0.42</b>     |
| First Quartile    | <b>18.00</b>    |
| Third Quartile    | <b>20.50</b>    |
| IQR               | <b>2.50</b>     |
| Normalised IQR    | <b>1.85</b>     |
| CV (%)            | <b>9.8</b>      |
| Minimum           | <b>16.00</b> () |
| Maximum           | <b>24.00</b> () |
| Range             | <b>8.00</b> ()  |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Plasticity Index: Z - Scores**

| Code | Test Result | Z Score | Code | Test Result | Z Score |
|------|-------------|---------|------|-------------|---------|
|      | %           |         |      | %           |         |
| G3   | 34          | -0.54   | Z7   | 39          | 0.81    |
| F8   | 34          | -0.54   | F7   | 41          | 1.35    |
| X4   | 36          | 0.00    | U5   | 44          | 2.16    |
| B3   | 37          | 0.27    | L3   |             |         |
| S6   | 39.0        | 0.81    | S9   |             |         |
| Q3   | 30          | -1.62   |      |             |         |
| A6   | 39          | 0.81    |      |             |         |
| P6   | 30          | -1.62   |      |             |         |
| B2   | 31          | -1.35   |      |             |         |
| N2   | 42          | 1.62    |      |             |         |
| B6   | 39          | 0.81    |      |             |         |
| G4   | 35          | -0.27   |      |             |         |
| G2   | 34          | -0.54   |      |             |         |
| R6   | 36.00       | 0.00    |      |             |         |
| C5   | 37.00       | 0.27    |      |             |         |
| T7   | 39          | 0.81    |      |             |         |
| K8   | 40          | 1.08    |      |             |         |
| F9   | 35          | -0.27   |      |             |         |
| Z4   | 36          | 0.00    |      |             |         |
| A2   | 34          | -0.54   |      |             |         |
| D3   | 34          | -0.54   |      |             |         |
| V7   | 41          | 1.35    |      |             |         |
| S2   | 39          | 0.81    |      |             |         |
| K3   | 35          | -0.27   |      |             |         |
| D2   | 33          | -0.81   |      |             |         |
| Y2   | 37          | 0.27    |      |             |         |
| P7   | 36          | 0.00    |      |             |         |
| T6   | 31          | -1.35   |      |             |         |

| <i>Statistic</i>  | <i>Value</i>    |
|-------------------|-----------------|
| Number of results | <b>31</b>       |
| Median            | <b>36.00</b>    |
| Median MU         | <b>0.83</b>     |
| First Quartile    | <b>34.00</b>    |
| Third Quartile    | <b>39.00</b>    |
| IQR               | <b>5.00</b>     |
| Normalised IQR    | <b>3.71</b>     |
| CV (%)            | <b>10.3</b>     |
| Minimum           | <b>30.00</b> () |
| Maximum           | <b>44.00</b> () |
| Range             | <b>14.00</b> () |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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 - Linear Shrinkage: Z - Scores**

| Code | Test Result | Z Score        | Code | Test Result | Z Score |
|------|-------------|----------------|------|-------------|---------|
|      | %           |                |      | %           |         |
| G3   | 15.8        | 0.81           | Z7   | 15.5        | 0.67    |
| F8   | 16.0        | 0.90           | F7   | 16.0        | 0.90    |
| X4   | 12.5        | -0.67          | U5   | 15.5        | 0.67    |
| B3   | 15.5        | 0.67           | L3   |             |         |
| S6   | 12          | -0.90          | S9   |             |         |
| Q3   | 10.0        | -1.80          |      |             |         |
| A6   | 14.5        | 0.22           |      |             |         |
| P6   | 4.5         | <b>-4.27 #</b> |      |             |         |
| B2   | 12.5        | -0.67          |      |             |         |
| N2   | 17.5        | 1.57           |      |             |         |
| B6   | 14.0        | 0.00           |      |             |         |
| G4   | 14          | 0.00           |      |             |         |
| G2   | 13.0        | -0.45          |      |             |         |
| R6   | 10.0        | -1.80          |      |             |         |
| C5   | 10.1        | -1.75          |      |             |         |
| T7   | 15.0        | 0.45           |      |             |         |
| K8   | 17.0        | 1.35           |      |             |         |
| F9   | 14.0        | 0.00           |      |             |         |
| Z4   | 15.0        | 0.45           |      |             |         |
| A2   | 14.2        | 0.09           |      |             |         |
| D3   | 13.5        | -0.22          |      |             |         |
| V7   | 15          | 0.45           |      |             |         |
| S2   | 13.5        | -0.22          |      |             |         |
| K3   | 12.0        | -0.90          |      |             |         |
| D2   | 15.5        | 0.67           |      |             |         |
| Y2   | 14.0        | 0.00           |      |             |         |
| P7   | 12.5        | -0.67          |      |             |         |
| T6   | 12.8        | -0.54          |      |             |         |

| Statistic         | Value                |
|-------------------|----------------------|
| Number of results | <b>31</b>            |
| Median            | <b>14.00</b>         |
| Median MU         | <b>0.50</b>          |
| First Quartile    | <b>12.50</b>         |
| Third Quartile    | <b>15.50</b>         |
| IQR               | <b>3.00</b>          |
| Normalised IQR    | <b>2.22</b>          |
| CV (%)            | <b>15.9</b>          |
| Minimum           | <b>10.00</b> (4.50)  |
| Maximum           | <b>17.50</b> (17.50) |
| Range             | <b>7.50</b> (13.00)  |

Note: A # indicates an outlier where the z-score obtained is either greater than 3 or less than -3. Codes for all participants 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.