



TECHNICAL REPORT ON
FINE AGGREGATE DENSITY & ABSORPTION TEST PROFICIENCY 2015

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| CETANZ Technical Report | TR 8 |
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| Report Date – First Issue | 17 November 2015 |
| Report Revision Date | - |
| Revision Number | 1 |
| Associated Test Method(s) | ASTM C128 - 12 |

FINE AGGREGATE DENSITY & ABSORPTION TEST PROFICIENCY 2012

1. Introduction

In 2012, CETANZ organised and ran an inter-laboratory proficiency scheme on the Density and Absorption test for Fine aggregate, designed to achieve the following outcomes:

1. Provide results that should enable participants to improve their performance.
2. Provide information relevant for calculation of uncertainty.
3. Identify problems with, or between, laboratories.
4. Understand the differences between the two sample preparation methods.

The following Laboratories participated in the scheme:

Bitumen and Pavements Limited - Auckland
Downer New Zealand Limited - Auckland
Downer New Zealand Limited - Christchurch
Downer New Zealand Limited - Mount Maunganui
Downer New Zealand Limited - Wellington
Fulton Hogan Laboratory - Auckland
Fulton Hogan Laboratory - Canterbury
Fulton Hogan Laboratory - Dunedin
Fulton Hogan Laboratory - Nelson
Fulton Hogan Laboratory - Waikato
Higgins - Auckland
Higgins - Palmerston North
OPUS International Consultants - Auckland
OPUS International Consultants - Hamilton
Winstone Aggregate Ltd - Auckland Laboratory

To ensure anonymity of results each laboratory was assigned a unique identifier by Keith Towl of IANZ.

2. Sample Preparation & Instruction

A bulk sample of <4.75mm Crusher Dust from the Fulton Hogan Flaxmore Quarry was sampled and split down into smaller test samples. Each Laboratory was sent two identical aggregate test samples of approximately 1.2kg each.

Each Laboratory was instructed to carry out testing using both sample preparation methods below:

1. As per the main body of the standard <75µm particles retained.
2. As per <75µm particles removed by washing (ASTM C117).

Each Laboratory was invited to have multiple competent technicians take part. Completed results were to be returned identifying the Laboratory Number and Technician I.D. For example, Laboratory's 1 test results from Technicians A and B would be labelled ...1A <75 µm Retained & 1B <75 µm Retained, 1A <75 µm Washed Away, 1B <75 µm Washed Away.

Laboratories were advised that the samples had not been held in a continuously wet state and were not a lightweight aggregate.

3. Results

| ASTM C128-12 Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate Proficiency < 0.075mm Retained (Whole Sample) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|------------|----|-------|----|------------|----|-----------|----|------|----|-----------|----|-------------|----|-------|-----|-------|-----|-----------|-----|-----------------|-----|------------|-----|-----------|-----|-----------|-----|------------|-----|-----|
| Laboratory ID | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B | 5A | 5B | 6A | 7A | 7B | 8A | 8B | 9A | 9B | 10A | 10B | 11A | 11B | 12A | 12B | 13A | 13B | 14A | 14B | 14C | 15A | 16A | 16B | 17A | 17B |
| IANZ Accredited | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | No | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | No | | Yes | | |
| Balance Used | 0.1g | | 0.1g | | 0.01g | | 0.1g | | 0.1g | | 0.1g | | 0.1g | | 0.1 & 0.01g | | 0.01g | | 0.01g | | 0.1g | | 0.1g | | 0.01g | | 0.01g | | 0.1g | | | | |
| Water Used | Tap | | Tap | | Tap | | Tap | | Deionised | | Tap | | Distilled | | Tap | | Tap | | Tap | | Distilled | | Tap & Distilled | | Distilled | | Distilled | | Distilled | | | | |
| Agitator Used | Hand | | Mechanical | | | | Mechanical | | Hand | | Hand | | Hand | | Mechanical | | Hand | | Both | | Hand | | Hand | | Mechanical | | | | Hand | | Mechanical | | |
| Density (OD) kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Density (SSD) kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Apparent Density kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Relative Density (Specific Gravity) OD | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Relative Density (Specific Gravity) SSD | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Apparent Relative Density (Apparent Specific Gravity) | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Absorption % | <i>Recorded to nearest 0.01%</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| ASTM C128-12 Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate Proficiency < 0.075mm Washed Away | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|------------|----|-------|----|------------|----|-----------|----|------|----|-----------|----|-------------|----|-------|-----|-------|-----|------|-----|-----------|-----|-----------------|-----|-----------|-----|-----------|-----|------------|-----|-----|
| Laboratory ID | 1A | 1B | 2A | 2B | 3A | 3B | 4A | 4B | 5A | 5B | 6A | 7A | 7B | 8A | 8B | 9A | 9B | 10A | 10B | 11A | 11B | 12A | 12B | 13A | 13B | 14A | 14B | 14C | 15A | 16A | 16B | 17A | 17B |
| IANZ Accredited | Yes | | Yes | | Yes | | Yes | | Yes | | No | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | No | | Yes | | |
| Balance Used | 0.1g | | 0.1g | | 0.01g | | 0.1g | | 0.1g | | 0.1g | | 0.1g | | 0.1 & 0.01g | | 0.01g | | 0.01g | | 0.1g | | 0.1g | | 0.01g | | 0.01g | | 0.1g | | | | |
| Water Used | Tap | | Tap | | Tap | | Tap | | Deionised | | Tap | | Distilled | | Tap | | Tap | | Tap | | Tap | | Distilled | | Tap & Distilled | | Distilled | | Distilled | | Distilled | | |
| Agitator Used | Hand | | Mechanical | | | | Mechanical | | Hand | | Hand | | Hand | | Mechanical | | Hand | | Both | | Hand | | Hand | | Mechanical | | | | Hand | | Mechanical | | |
| Density (OD) kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Density (SSD) kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Apparent Density kg/m ³ | <i>Recorded to nearest 1kg/m³</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Relative Density (Specific Gravity) OD | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Relative Density (Specific Gravity) SSD | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Apparent Relative Density (Apparent Specific Gravity) | <i>Recorded to 3.d.p.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Absorption % | <i>Recorded to nearest 0.01%</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Laboratory 11 Technician B completed tests at a temperature outside the required range. i.e. at 25°C.

4. Analysis

For the purpose of analysis, all results, including the possible outliers, have been tabulated. Each participant will need to undertake their own analysis on the data provide to gauge their own performance.

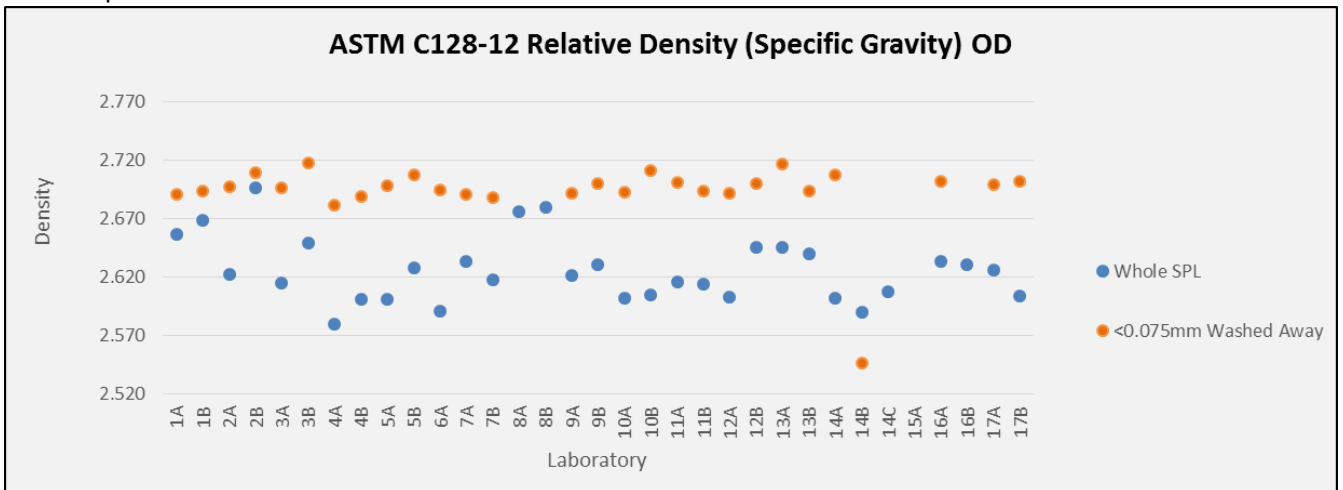
The graphs provided, only display result plots for Relative Density (Specific Gravity) OD, Relative Density (Specific Gravity) SSD, Apparent Relative Density (Apparent Specific Gravity) and Absorption.

Laboratories 3 and 17 did not return results for Density (OD) Density (SSD) and Apparent Density. Laboratory 15 did not return any results.

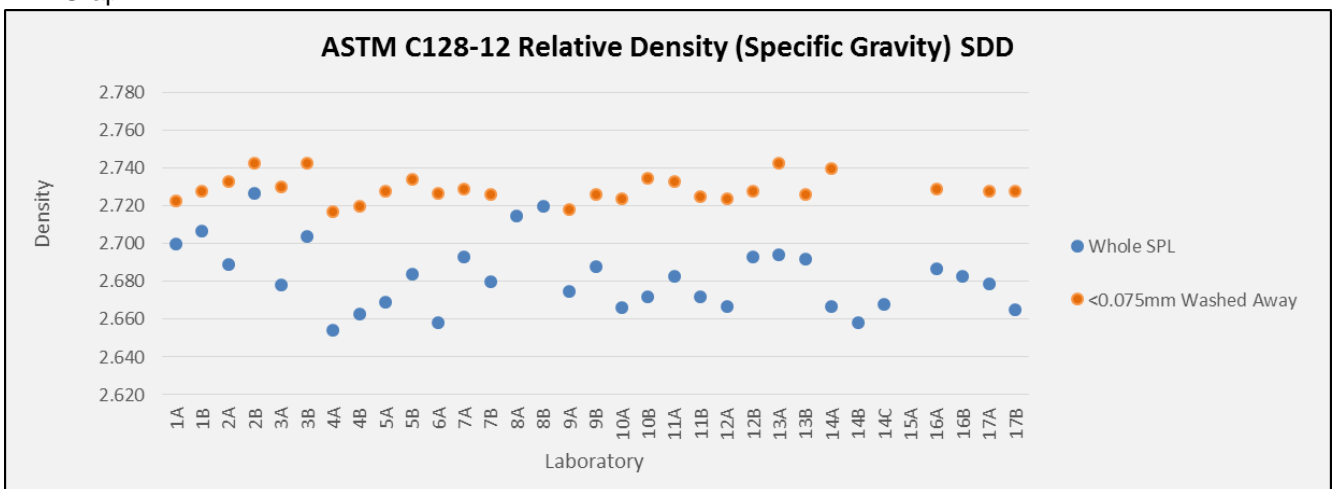
Laboratory 8 did not return and <75 Washed Away test data.

Technicians 14C and 16B did not return <75 Washed Away test data.

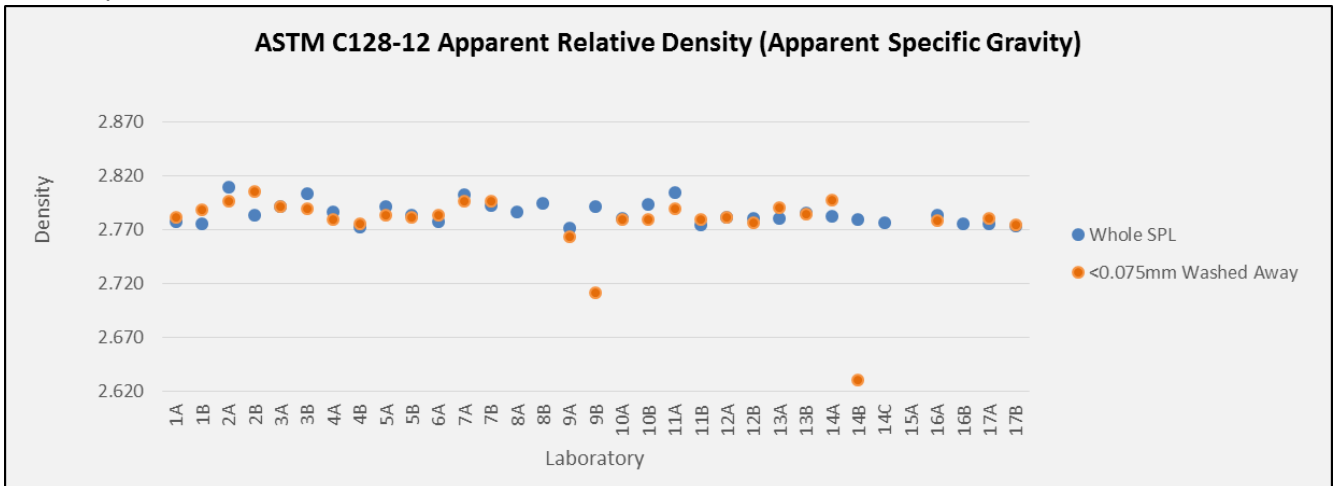
Graph 1



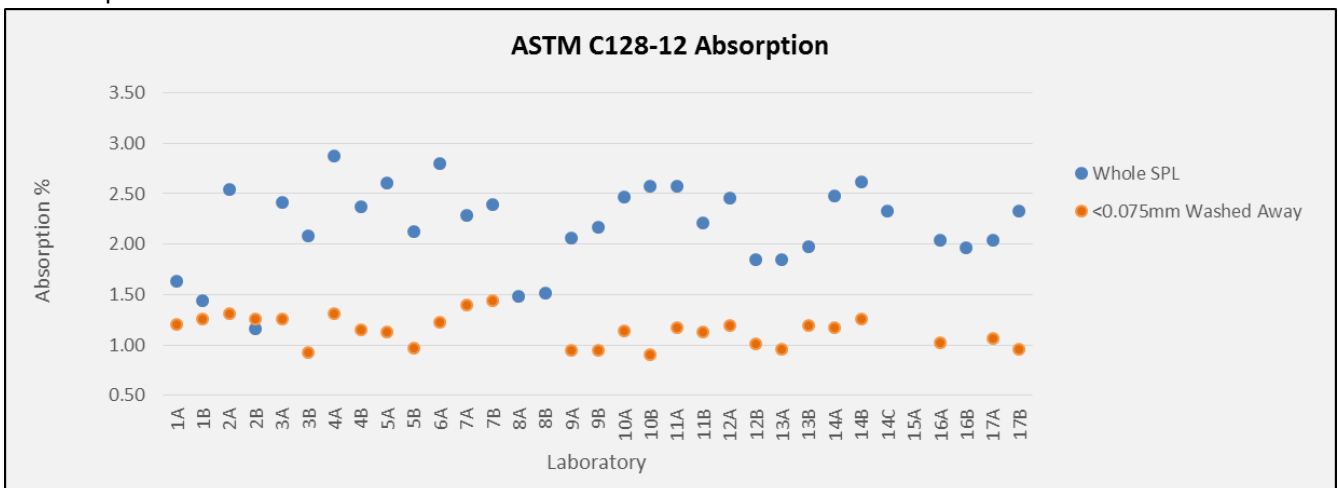
Graph 2



Graph 3



Graph 4



5. Conclusions

The results seem to indicate the possibility of a slightly smaller amount of variation between Laboratories in the '<75µm Washed Away' testing compared to the '<75µm Retained (Whole Sample)' testing. The data also seems to indicate a slight difference in Density and Absorption measurements between the two methods. More advanced analysis is required. Those using this data will need to consider the differences and relative amount of variation possible for each preparation method when designing asphalt mixes etc.

6. Further action

Advise stakeholders of proficiency data and arrange for more in-depth analysis and publication of results.

7. Referenced Documents

ASTM C128-12

8. Disclaimer

The information in this publication is to encourage high standards within the civil engineering testing industry. The information is intended as a technical report for CETANZ members only and in no way purports to be a robust statistical analysis. CETANZ cannot accept any liability of any sort for unsatisfactory site or laboratory work carried out by Companies who are members of CETANZ or organisations who claim to be following this report. CETANZ assumes no responsibility for any loss which may arise from reliance on the report and disclaims all liability accordingly. Specialist and/or legal advice should always be sought on any specific problem or matter.