

Please read these instructions carefully BEFORE you start testing!

Note: The samples shipped in 2021 are used for 2022 CCIL Aggregate Certification.

- Please report the results through the CCIL portal <https://portal.ccil.com/> using the 2022 reporting forms that will be in your labs portal. Results are due no later than **Friday January 7, 2022**. Results reported after the deadline may potentially cause a delay in your laboratory's 2022 certification.

Note: The reports will become available after the 2022 laboratory certification application is completed and submitted through the portal. The tests on the Report will be based on the tests selected on the 2022 Application for CCIL certification, which will be available in the portal by end of July 2021.

- PLEASE DO NOT enter fictitious or 0.0 results for a test that your lab has decided not to report. If the test will not be reported, please check off "Cancel test?" or contact ewordenkwok@ccil.com to discuss the situation. By using the "Cancel test?" option in a report you are indicating that the laboratory does not want to be certified for that test.

- All Questions regarding CCIL 2022 Aggregate submissions shall be addressed to the attention of: Emily Worden-Kwok, P.Eng. ewordenkwok@ccil.com

SAMPLE INFORMATION

These instructions are for 2022 CCIL Aggregate Proficiency Samples distributed and tested in 2021.

Each participant should receive the following samples:

- 1 pair (2 large bags) of coarse and fine aggregate mixture (well graded granular aggregate). These may be labelled G, A or GRA. These samples are referred to as Sample 1.21A and 2.21A.

- 1 pair (2 large bags) of coarse aggregate samples (clear stone). These may be labelled CS or ST. These Samples are referred to as Sample 2.21ST and 2.21ST.

- If you applied for soils tests (not including D698 and /or D1557), you will receive 1 pair of (2 small bags) of soil samples labelled 1.21S and 2.21S.

Note: Soil samples were not provided if only ASTM D698, or D698 and D1557, are on your lab's 2021 certification. Proctor tests are performed on the fine portion of aggregate samples 1.21A and 2.21A as instructed below.

- If you requested participation in LS-609, Petrographic Analysis of Coarse Aggregate, you will receive samples and instructions from MTO in August. Additional samples must be requested for each additional PN Analyst. Contact the office gkermath@ccil.com or Emily ewordenkwok@ccil.com if additional PN samples are required.

- If you requested participation in Accelerated Detection of Potentially Deleterious Alkali-Silica Reactive Aggregate by Expansion of Mortar Bars CSA A23.2-25A (MTO LS-620), you will receive samples in August.

INSTRUCTIONS

- Each test method must be carried out in pairs by the same certified technician. For example, the Technician who performs the sieve analysis on Sample 1.21A must also perform the sieve analysis on Sample 2.21A. The same Technician need not perform every test method. For example, Technician 'A' may perform the Micro-Deval Abrasion (MDA) tests and Technician 'B' may perform the Flat and Elongated tests, as long as the same Technician performs the particular test on both samples.

- Carry out the non-destructive tests first. Material used for the non-destructive tests may be recombined to form samples to prepare for the remaining tests, as indicated below.

NOTE: To maintain certification, you are required to submit results on all Type C tests and those Type D tests for which you are certified.

Each lab is advised to perform the tests in such an order to ensure sufficient material.

TESTS TO BE PERFORMED ON SAMPLES 1.21A AND 2.21A (WELL GRADED AGGREGATE):

1. **PREPARATION OF SAMPLE, ASTM C702:** Dry all aggregate (not soil) samples to a constant mass in an oven at $110 \pm 5^\circ\text{C}$. Reduce the sample to the sample size required for the below test methods.
2. **SIEVE ANALYSIS, ASTM C136:** Test the entire sample of each 1.21A and 2.21A to determine the coarse and fine aggregate gradation. Keep the sieved fractions separate for the purposes of additional testing below.

Both samples shall be tested using the same nest of coarse sieves including sizes 20.0, 16.0, 12.5, 10.0 and 5.0 mm. Label the material passing the 5.0 mm sieve **3.21A and 4.21A** respectively and keep separate for fine aggregate testing below.

Reduce the mass of the fine portion of samples 1.21A and 2.21A (to be labelled 3.21A and 4.21A) by splitting the material passing the 5.0 mm sieve from the above coarse sieve to a minimum 300 g sample as detailed in ASTM C136 Clause 7.3. Remember to record the total mass of the passing 5.0 mm prior to splitting, to be able to calculate the percent passing based on the original sample. Wash the split test portion over a 0.080 mm sieve in accordance with ASTM C117 and dry prior to sieving. Use the same fine aggregate nest of sieves for both samples including sieve sizes 2.50, 1.25, 0.630, 0.315, 0.160, and 0.080 mm.

Compute the fine aggregate cumulative percent passing for each sample based on the total mass sieved (coarse and fine combined) as detailed in ASTM C136 Clause 8.5.1. Do not forget to include the washed material in your fine split sample total. Report the cumulative percent passing for each sieve to the nearest 0.01%.

3. **PERCENT FLAT AND ELONGATED PARTICLES, ASTM D4791:** For both Type C and Type D Flat and Elongated tests, use the material retained on the 5.0 mm sieve of samples 1.21A and 2.21A. Perform the test in accordance with Method B of ASTM D4791 Clause 8.4 on approximately 100 particles of each of the following three fractions: Passing (P) 20.0 / Retained (R) 12.5 mm, P 12.5 / R 10.0 mm, and P 10.0 / R 5.0 mm. Perform the test using 5:1 ratio. For purposes of ASTM D4791 Clauses 8.4.2, 9.1, and 10.1.4.2, the calculations shall be “by mass”. Compute the weighted average based on the gradation on samples 1.21 A and 2.21 A in Step 2, adjusting the percentages so the coarse portion used is 100%. Report the weighted average to the nearest 0.1%.
4. **PERCENT FRACTURED PARTICLES, ASTM D5821:** For both Type C and Type D Fractured Particles tests use the coarse aggregate retained on the 5.0 mm sieve of samples 1.21A and 2.21A. Test a minimum of 1500 g on the Passing (P) 20.0 / Retained (R) 12.5 mm portion, 500 g on the P 12.5 / R 10.0 mm portion, and 200g on the P 10.0 / R 5.0 mm portion. Determine the percentage of fractured particles with at least one fractured face by mass for each portion. Compute the weighted average based on the coarse gradation in Step 2, adjusting the percentages so the coarse portion makes up 100%. Report the weighted average to the nearest 0.1%.
5. **MAGNESIUM SULPHATE SOUNDNESS (COARSE AGGREGATE), ASTM C88:** Prepare test specimens from the samples 1.21A and 2.21A on the following three fractions having the following masses: Passing (P) 20.0 / Retained (R) 12.5 mm = 670±10 g, P 12.5 / R 10.0 mm = 330±5 g and P 10.0 / R 5.0 mm = 300±5. The test is to be run using magnesium sulphate. Run five cycles. Record the initial and final masses to 0.1 g and calculate sample loss to the nearest 0.1%. Compute the weighted average for each of the samples 1.21A and 2.21A based on the coarse gradation obtained in Step 2, after adjusting the percentages so the coarse portion accounts for 100%. Report a weighted sample loss to the nearest 0.1%. **Do not re-use this material.**

FINE AGGREGATE TESTS TO BE PERFORMED ON SAMPLES 3.21A AND 4.21A:

6. **RELATIVE DENSITY AND ABSORPTION (FINE AGGREGATE), ASTM C128:** Use the fine material 3.21A and 4.21A to prepare the test specimens according to ASTM C128 and remove the material finer than 0.080 mm in accordance with ASTM C117 as discussed in ASTM C128 Appendix X1. Saturate the test specimens from each sample by immersion in water for 24 ± 4 hours. Report the Fine Aggregate Oven Dry Relative Density, BRD Fa (OD), to the nearest 0.001. Calculate the Absorption ABS Fa and report the results to the nearest 0.01%.
7. **MICRO-DEVAL ABRASION LOSS (FINE AGGREGATE), ASTM D7428:** Prepare test specimens from samples 3.21A and 4.21A according to ASTM D7428 Clause 8.2. Run a control sample at the same time. If you do not have a supply of the control aggregate on hand, contact the MTO Soils and Aggregates Section at (416) 235 3698 or soils-aggregates@ontario.ca. Report the test Sample Loss to the nearest 0.1%. Report your control aggregate loss and known limits to the nearest 0.1% in the comments. **Do not re-use this material.**

8. **COMPACTION CHARACTERISTICS OF SOIL, STANDARD EFFORT METHOD ASTM D698:** Carry out this test on a minimum of 6 kg of samples 3.21A and 4.21A. This is the unwashed material passing the 5.0 mm sieve from 1.21A and 2.21A, respectively. Follow ASTM D698 Method A to perform the test for compaction. **DO NOT CORRECT** the results to compensate for oversized particles. ASTM D698 does not allow re-use of compacted material, however, for CCIL proficiency testing purposes **ONLY**, you may re-use the material within this test and add water for each succeeding trial. No standing time is required. Should you observe excessive water run-off from the mould during compaction and/or aggregate break-down during the trials, please note it in the comments section on the reporting form. Report the wet and dry maximum densities in Mg/m^3 to the nearest 0.001 and optimum moisture content to the nearest 0.1% on the 2022 Soil reporting form on your portal. (Note: $\text{Mg/m}^3 = \text{g/cm}^3$, i.e. 2.345 Mg/m^3 .) **Do not re-use this material for other tests.**
9. **UNCOMPACTED VOID CONTENT OF FINE AGGREGATE, ASTM C1252:** Prepare the individual test specimens from the gradation done on samples 3.21A and 4.21A. Perform the uncompact void content test in accordance with ASTM C1252 Test Method A. Compute the uncompact void contents using the bulk dry specific gravity values of Samples 3.21A and 4.21A determined according to ASTM C128. Report the uncompact voids to the nearest 0.1%. Indicate the bulk dry specific gravity values used in the comments of the report on the portal.
10. **SAND EQUIVALENT VALUE OF FINE AGGREGATE, AASHTO T 176 OR ASTM D 2419:** Obtain at least 1500 g from each fine aggregate sample 3.21A and 4.21A (This is the material from the fine portion of samples 1.21A and 2.21A). Prepare the test specimens in accordance with Procedure A or B. Report the average sand equivalent value to the nearest 0.1%. Include whether you used Procedure A or B in the comments of the report in the portal.

TESTS TO BE PERFORMED ON SAMPLES 1.21ST AND 2.21ST (CLEAR STONE):

11. After splitting off the required material for the Wash Pass test in Step 12 below perform a coarse aggregate gradation on minimum 10 kg of samples (1.21ST and 2.21ST) from which to calculate the weighted average as required in the freeze-thaw test in point 16. Please report the sieve results (percent passing) on the following sieves in the comments of the portal report. 25, 19, 16, 12.5, 10, 6.7 or 6.3, and 5.0 mm.
12. **WASH PASS 80 μm , ASTM C117:** Use Sample 1.21 ST and 2.21 ST for this test. Obtain an appropriate quantity of material for test method ASTM C117. Split the sample in accordance with ASTM C702 as required by the test method. Wash the entire split test portion. Report the Percent Loss to 0.01%.
13. **RELATIVE DENSITY AND ABSORPTION (COARSE AGGREGATE), ASTM C127:** Prepare the samples for this test from the samples 1.21ST and 2.21ST. Report the Coarse Aggregate Oven Dry

Relative Density, BRD Ca (OD), to the nearest 0.001. Report the Coarse Aggregate Absorption ABS Ca to the nearest 0.01%.

14. **LOS ANGELES ABRASION, ASTM C131:** Prepare the test specimens from the samples 1.21 ST and 2.21 ST. Carry out the test as outlined in the ASTM C131 Table 1 Grading B. Do Not Wash the sample before or after testing. Report the Loss to the nearest 0.1%. **Do not re-use this material.**
15. **MICRO-DEVAL ABRASION (COARSE AGGREGATE), ASTM D6928:** Prepare the test specimens, from the samples 1.21ST and 2.21ST, according to ASTM D6928 Clause 8.2. Run a control sample at the same time. If you do not have a supply of the control aggregate on hand, contact the MTO Soils and Aggregates Section at (416) 235 3698 or soils-aggregates@ontario.ca . Record the Test Sample Loss to the nearest 0.1%. Report your known limits of the control sample tested and loss to the nearest 0.1% in the comments of the portal report. **Do not re-use this material.**
16. **FREEZING AND THAWING OF COARSE AGGREGATE, CSA A23.2-24A:** Prepare the test sample from samples 1.21ST and 2.21ST. Prepare test fractions as follows Passing (P) 20.0 / Retained (R) 12.5 mm = 1250 g, P 12.5 / R 10.0 mm = 1000 g, P 10.0 / R 5.0 mm = 500 g. Determine the freeze-thaw values for each fraction and then calculate the weighted average based on the gradation on samples 1.21 ST and 2.21 ST requested above, adjusting the percentages so the coarse portion used is 100%. Run a control sample at the same time using the gradation in Table 1 of CSA A23.2-24A. If you do not have a supply of the control aggregate on hand, contact the MTO Soils and Aggregates Section at (416) 235 3698 or soils-aggregates@ontario.ca . Report the weighted average freeze-thaw loss to the nearest 0.1%. Report the known limits of the control sample tested and loss to the nearest 0.1% in the comments of the portal report. **Do not re-use this material.**

SOIL PROFICIENCY SAMPLES

- If you applied for soils tests not including D698 or D1557, you will receive 1 pair of (2 small bags) of soil samples labelled 1.21S and 2.21S.

Note: Soil samples were not provided if only ASTM D698, or D698 and D1557, are on your lab's 2021 certification. Proctor tests are performed on the aggregate sample as instructed above.

17. **PARTICLE SIZE ANALYSIS OF SOILS, AASHTO T88:** Prepare individual test specimens from samples 1.21S and 2.21S. Use a freshly prepared dispersing agent with distilled water and 40 grams of sodium hexametaphosphate per litre of solution and ensure the pH value of the solution is adjusted to 8 or 9. The soil samples supplied should be dispersed in the stirring apparatus for 10 minutes. Compute the specific gravity correction factor α and constant K assuming a value of 2.750 for the specific gravity of soil particles (DO NOT use the values determined by your lab). Upon completion of the test, compute Constant K, Coefficient of Viscosity η , and Particle Diameter D to four significant

digits (i.e., 0.0001), and record the results in the comment of the portal report. Report the Percent passing the 2.0 mm, 425 μ m, 75 μ m, 20 μ m, 5 μ m and 2 μ m sieves to the nearest 0.1 percent.

18. **LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS, ASTM D4318:** Determine the Liquid Limit, Plastic Limit and Plasticity Index of soil samples 1.21S and 2.21S according to ASTM D4318. Prepare the test specimens as outlined in ASTM D4318 Clause 11.2 – Dry Preparation and determine the Liquid Limit according to the procedure described in ASTM D4318 Clause 12.0, Method A – Multi-point Liquid Limit. Determine the Plastic Limit using a minimum of two trials and report the mean value. Report the Liquid Limit, Plastic Limit and Plasticity Index to the nearest one decimal, i.e., 0.1 percent.
19. **SPECIFIC GRAVITY OF SOILS, ASTM D854:** Determine the specific gravity of soil samples 1.21S and 2.21S according to ASTM D854. Carry out the test according to the procedures outlined in ASTM D854 Clause 9.3 –Method B - Procedures for Oven Dried Specimen. Perform the test on a minimum of three specimens and report the Mean Specific Gravity of the soil to the nearest three decimal places (0.001). The calculated test results from three specimens (range) should be within 0.020 of each other. If the range exceeds 0.020, the test must be repeated.

TESTS TO BE PERFORMED ON SEPARATE SAMPLES FOR INDIVIDUAL TESTS:

20. **PETROGRAPHIC ANALYSIS OF COARSE AGGREGATE, METHOD LS-609, PART A:** If you have selected this test, instructions and sample for this test method will be provided by MTO in August.
21. **ACCELERATED DETECTION OF POTENTIALLY DELETERIOUS ALKALI-SILICA REACTIVE AGGREGATE BY EXPANSION OF MORTAR BARS, CSA A23.2-25A (MTO LS-620):** If you have selected this test, instructions and sample for this test method will be provided by MTO in August.