

Please read the following instructions carefully **BEFORE** you start testing!

- Please report the results online using the 2021 reporting forms in your lab portal by **Friday January 8, 2021**. Results reported after the deadline may not be included in the analysis, potentially causing a delay in your laboratory's certification.
- PLEASE DO NOT enter fictitious results for a test that your lab has decided not to report. If the test will not be reported, please check off the box "Cancel test?" for the applicable test in the online Type D or Soil reporting form.
- PLEASE DO NOT CANCEL a test using the "Cancel test?" feature in a Type D or Soil reporting form unless you do not want your lab to be certified for that test.

## **INSTRUCTIONS**

### **2021 CCIL AGGREGATE PROFICIENCY SAMPLES**

Each participant should receive the following samples:

- 1 pair (2 large bags) of coarse and fine aggregate mixture (granular base aggregate). These may be labelled **GRA**. If so, please label one bag Sample **1.20A** and the other as Sample **2.20A**
- 1 pair (2 large bags) of coarse aggregate samples (clear stone). These may be labelled **CS**. If so, please label one bag Sample **1.20ST** and the other Sample **2.20ST**
- If you requested participation in LS-609, **Petrographic Analysis** of Coarse Aggregate, you will receive 2 pair (4 small bags) of samples labelled **1.20CPN1, 2.20CPN1, 1.20CPN2, and 2.20CPN2**. Additional samples must be requested if more than one certified analyst from a lab wishes to participate in LS-609. If additional samples were requested on your laboratory's 2020 aggregate lab application and were not received, please contact Sandy Brown at [sbrown@ccil.com](mailto:sbrown@ccil.com).
- If you requested participation in Accelerated Detection of Potentially Deleterious **Alkali-Silica Reactive Aggregate by Expansion of Mortar Bars** (MTO LS-620), you will receive 1 set (6 small bags) of fine aggregate and cement samples labelled **Spratt** (or Control), **2020 Cement, 1.20M1, 2.20M1, 1.20M2 and 2.20M2**.
- If you applied for **soil tests**, you will receive 1 pair of (2 small bags) of soil samples labelled **1.20S** and **2.20S**. However, soil samples were not provided if only ASTM D698, or D698 and D1557, were selected on your lab's 2020 application. Instructions for these Type D tests are included in these aggregate instructions, not the soil instructions.

The tests must be carried out in pairs. The Operator who performs the sieve analysis on Sample 1.20xx must also perform the sieve analysis on Sample 2.20xx. The same Operator need not perform every test in which the laboratory intends to participate. For example, Operator 'A' may perform the Micro-Deval Abrasion (MDA) tests and Operator 'B' the Proctor compaction tests, as long as the Operator 'A' or 'B' performs the particular test on both samples.

Carry out all non-destructive tests first. Material used for the non-destructive tests may be recombined to prepare specimens for the remaining tests as indicated below for certain tests.

**NOTE: In order to maintain certification, you are required to submit results on the tests all Type C tests and those Type D tests for which you are certified plus/minus any Type D tests you added/deleted on your 2020 or 2021 lab application.**

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

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**1. Preparation of Sample, Method ASTM C702:**

Dry all aggregate samples to a constant mass at  $110 \pm 5^{\circ}\text{C}$ .

**TESTS TO BE PERFORMED ON SAMPLES 1.20A AND 2.20A (GRANULAR BASE AGGREGATE):**

**2. Sieve Analysis, Method ASTM C136:**

If you intend to do Compaction Characteristics of Soil, Method (ASTM D698), obtain at least 6.0 kg of material from the Granular base aggregate samples labelled 1.20A and 2.20A by splitting before you start this test. Otherwise, test the entire samples labelled 1.20A and 2.20A provided to determine the coarse aggregate gradation. Both samples must be tested using the same nest of sieves. Report percent passing each sieve, with the exception of 5.00 mm sieve, to the nearest 0.1% on a cumulative basis. Report the percent passing 5.00 mm sieve to 0.01%.

Prepare the **Test Samples 3.20A and 4.20A** for the fine aggregate gradation test by splitting the material passing 5.00 mm sieve from the samples **1.20A and 2.20A**, respectively. Obtain sufficient quantity of samples as required by the test method for the determination of fine aggregate gradation. Use the same nest of sieves for both samples. Compute the fine aggregate gradation for each sample based on the **total mass** (i.e., masses of **1.20A and 2.20A** respectively). **Note: Report a % passing for each sieve for the combined coarse and fine aggregate gradation on the form based on the total mass (i.e., masses of 1.20A and 2.20A respectively). For example:** If the % passing the 5.00 mm sieve is 51.1% and the % passing the 0.630  $\mu\text{m}$  sieve of the fine aggregate is 19.4%, the

reported % passing for the 0.630  $\mu\text{m}$  sieve of the combined coarse and fine aggregate gradation will be  $.511 \times 19.4 = 9.9\%$ .

Report percent passing each sieve, with the exception of 80  $\mu\text{m}$  sieve, to the nearest 0.1% on a cumulative basis. Report the percent passing the 80  $\mu\text{m}$  sieve to 0.01%. In the event of a conflict between the rounding of the test results specified in these instructions and the format for reporting test results required by the Type C reporting form in the lab portal, **these instructions take precedence**.

### 3. **Compaction Characteristics of Soil, Method ASTM D698:**

Perform this test on approximately 6.0 kg of aggregate from the material passing the 5.00 mm sieve, i.e., the portion of the material finer than 5.00 mm from samples **1.20A** and **2.20A**. Prepare the sample by adding appropriate amount of water so that the plot of the first run **Dry Density** and **Moisture Content** falls below the **Optimum Moisture Content**. **Do not re-use this material.**

Carry out the test using a 101.6 mm diameter mould using Method 'A'. Compact the sample manually using 25 blows per layer. Determine the **Dry Density** and **Moisture Content** from four trials. Plot the value of **Dry Density** and **Moisture Content** according to Section 11 of the method. DO NOT CORRECT the results to compensate for oversized particles. D698 does not allow re-use of compacted material. However, for CCIL proficiency testing purposes only, you may re-use the material and add water for each succeeding trial. 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  $\text{Mg/m}^3$  to the nearest 0.001 and optimum moisture content to the nearest 0.1% on the 2021 Soil reporting form on your portal. (Note:  $\text{Mg/m}^3 = \text{g/cm}^3$ , i.e. 2.345  $\text{Mg/m}^3$ )

### 4. **Freezing and Thawing of Coarse Aggregate, Method CSA A23.2-24A:**

Prepare the test sample from the samples labelled **1.20A** and **2.20A**. Prepare a test sample of pass 20.0 mm and retained on 5.00 mm material according to Section 7 of the method. **Do not reuse this material.**

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.

Calculate the **weighted average** using the percentage of each fraction and corresponding freeze-thaw loss. For the fraction coarser than 20 mm, assign the same freeze-thaw value of the next smaller fraction (i.e. 20.0 – 12.5 mm). All fractions shall be used to compute the weighted average.

Report the weighted average freeze-thaw loss to the nearest 0.1%. **Report your lab control sample tested** (Drain Brothers or RM CA2), your lab's internal Control Sample Number and control sample's freeze-thaw **loss** to the nearest 0.1% in the comments.

**5. Micro-Deval Abrasion (Coarse Aggregate), Method ASTM D6928:**

Prepare the test samples from the samples labelled **1.20A** and **2.20A**. Prepare a 1500 g sample of pass 20.0 mm and retained on 10.0 mm material according to the table in Clause 8.2 of the method. **Do not reuse this material.**

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.

Report the **Test Sample Loss** to the nearest 0.1%. **Report your control sample tested** (Drain Brothers or RM CA2), lab Control Sample Number and Loss to the nearest 0.1% in the comments.

**FINE AGGREGATE TESTS**

**Each laboratory must prepare its own fine aggregate test samples (3.20A and 4.20A) from the material passing 5.00 mm portion of Samples 1.20A and 2.20A.**

**6. Relative Density and Absorption (Fine Aggregate), Method ASTM C128:**

Prepare the test specimens according to the test method and Appendix X1, from the fine aggregate samples **3.20A** and **4.20A**. Remove the material finer than 80 µm following the procedure in C117 prior to testing. **Do not reuse this material.**

Saturate the test specimens from both samples by immersion in water for 24 ± 4 hours. Report the "Oven Dry" **Relative Density (OD)** to the nearest 0.001. Calculate the absorption and report to the nearest 0.01%.

**7. Micro-Deval Abrasion Loss, (Fine Aggregate) Method ASTM D7428:**

Prepare 500 g test samples according to the table in Clause 8.2 of the test method, from samples **3.20A** and **4.20A**. **Do not reuse this material.**

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.

Report the test **Sample Loss** to the nearest 0.1%. **Report your control sample tested** (Sutherland or RM FA3) and Loss to the nearest 0.1% in the comments.

**TESTS TO BE PERFORMED ON SAMPLES 1.20ST AND 2.20ST (CLEAR STONE):**

Please Note: Perform a coarse aggregate gradation test on the clear stone samples (1.20ST and 2.20ST) using Sieve Analysis, Method ASTM C136, with sieves meeting the ASTM E-11 series, in order to prepare samples and to calculate the weighted average test results for the test methods below as required.

**8. Wash Pass 80 µm, Method ASTM C117:**

Obtain appropriate quantity of sample as required by the test method from the samples labelled **1.20ST** and **2.20ST**. Report the **Percent Loss** to 0.01%. Following testing, this material may be recombined to form the sample for other tests.

**9. For CCIL TYPE C test: Percentage of Fractured Particles in Coarse Aggregate, Method ASTM D5821:**

Use the coarse aggregate portion, i.e., the materials retained on 5.00 mm sieve from samples **1.20ST** and **2.20ST**. Determine the percentage of fractured particles by mass. Report the **percentage of material with at least one fractured face** to the nearest 0.1%. This material may be recombined to form samples for other tests.

**10. Los Angeles Abrasion, Method ASTM C131:**

Prepare the test sample from the samples labelled **1.20ST** and **2.20ST**. Carry out the test as outlined in the test procedure using the grading given in Table 1 Grading B. **Do not re-use this material.**

Do not wash the samples before or after testing. Report the **loss** to the nearest 0.1%.

**11. Relative Density & Absorption (Coarse Aggregate), Method ASTM C127:**

Prepare the samples for this test from the samples labelled **1.20ST** and **2.20ST**. Report the "Oven Dry" Relative Density (OD) to the nearest 0.001. Calculate the Absorption and report to the nearest 0.01%. This material may be recombined to form the sample for other tests.

**12. Magnesium Sulphate Soundness (Coarse Aggregate), Method ASTM C88:**

Prepare your test samples from the samples labelled **1.20ST** and **2.20ST**. The test is to be run using magnesium sulphate. Run five cycles on the following sizes: pass 20.0 mm and retained on 10.0 mm; pass 10.0 mm and retained on 5.00 mm. **Do not re-use this material.**

Record the initial and final masses to 0.1 g, and **Test Sample Loss** to the nearest 0.1%. Compute the percentages of each fraction, i.e., 20.0 mm to 10.0 mm and 10.0 mm to 5.00 mm, based on the total mass of both fractions tested. Report a weighted sample loss calculated using the percentages of each coarse fraction for **1.20ST** and **2.20ST**.

**SUPERPAVE AGGREGATE CONSENSUS PROPERTY TESTING**

Preparation of Samples must be in accordance with the procedures described in each test method.

**13. Uncompacted Void Content of Fine Aggregate, AASHTO T-304 to be performed on Samples 3.20A and 4.20A:**

Prepare the individual test specimens from **3.20A** and **4.20A**. Obtain sufficient quantity of samples from the material passing the 5.00 mm sieve, as required by the test method. Perform the uncompacted void content test using Method A of the test method. Compute the uncompacted void contents using the specific gravity values of Samples **3.20A** and **4.20A** determined according to **ASTM C128**. Report the uncompacted voids to the nearest 0.1%.

**14. Sand Equivalent Value of Fine Aggregate, Test Method AASHTO T 176 or ASTM D 2419:**

Obtain at least 1500 g of fine aggregate sample from the material passing 5.00 mm sieve of samples **1.20A** and **2.20A**. Prepare the test specimens in accordance with the Procedure A or B. Report the average sand equivalent value for the sample to the nearest 0.1%.

**15. For CCIL TYPE D Superpave Aggregate Consensus test: Percentage of Fractured Particles in Coarse Aggregate, Test Method ASTM D5821:**

Perform the test on materials retained on 5.00 mm sieve, of the samples labelled **1.20A** and **2.20A** for this test. Determine the percentage of fractured particles by mass. Report the **percentage of material with at least one fractured face** to the nearest 0.1%. This material may be recombined to form samples for other tests.

**16. Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate, Test Method ASTM D4791:**

Use the materials retained on 5.00 mm sieve from the samples **1.20A** and **2.20A**. Perform the test in accordance with Method B of ASTM D4791. Perform the test using 5:1 ratio. For purposes of Clauses 8.4.2, 9.1, and 10.1.4.2 of D4791, the calculations shall be “by mass”. Compute the percent of each fraction using the gradation test (ASTM C136) results of the coarse aggregate portion of the as-received sample (i.e. based on the total mass of material retained on 5.00 mm sieve).

DO NOT determine the flat and elongated particles of fraction coarser than 20.0 mm. Assign the same flat and elongated value of the next smaller fraction, (i.e. 20.0 mm – 12.5 mm) for the fraction coarser than 20.0 mm. All fractions shall be used to compute the weighted average. Report the **percent flat and elongated weighted average** using the percentages

obtained in the **1.20A** and **2.20A** gradings (ASTM C136), to the nearest 0.1%. This material may be recombined to form the sample for other tests.

**TESTS PERFORMED ON SEPARATE SAMPLES FOR INDIVIDUAL TESTS:**

**17. Petrographic Analysis of Coarse Aggregate, MTO Laboratory Manual - Test Method LS-609, Part A:**

Participation in test procedure LS-609 is restricted to laboratory personnel who are actively in the process of obtaining more experience prior to applying for certification as a Petrographic Analyst and is mandatory for those CCIL laboratories that are certified for LS-609 and their CCIL certified Petrographic Analysts who must participate yearly in order to maintain their certification.

Test Method LS-609 Rev 33 must be followed. LS-609 Rev 33 is available in the MTO Laboratory Test Manual. The test procedure is available for downloading under the tab “Materials” at the following link:

<https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/CAQViews.aspx?lang=en-US>

Samples 1.20CPN and 2.20CPN each contain three fractions: 1) P19 mm/R13.2 mm ~1500g, 2) P13.2 mm /R9.5 mm ~500g, and 3) P9.5 mm/R4.75 mm ~200g. Examine each fraction provided separately. **Do not combine the fractions. Do not reuse this material.**

2020 material **CPN1** consists of crushed carbonate derived from a quarry in the Niagara Escarpment, Ontario area. The 2020 CPN1 material is specifically chosen to assess participant's abilities to properly identify and classify the Silurian-aged dolostone aggregate provided.

2020 material **CPN2** is derived from a carbonate quarry in the Havelock, Ontario area. The 2020 CPN2 material is specifically chosen to assess participant's abilities to correctly identify the Paleozoic-aged mainly carbonate rock types present.

Report the Hot Mix and Concrete Petrographic Number for each fraction to the nearest whole number on Form PH-CC-343a. Calculate the **Weighted Average Petrographic Number (PN)** using the coarse aggregate gradation provided in the table below.

Pass	Retained	Individual Retained, %	Cumulative Retained, %
19.0 mm	13.2 mm	35	35
13.2 mm	9.5 mm	30	65
9.5 mm	4.75 mm	35	100

Submit a copy of Form PH-CC-343a completed in full including the name of the Analyst for each sample by email to Sandy Brown at [sbrown@ccil.com](mailto:sbrown@ccil.com) by **Friday January 8, 2021**. Please also indicate the PN Analyst's CCIL Certification ID number and the date of expiry of the certification.

Report the **Weighted Average Petrographic Number** using the **2021 Type D reporting form** in your lab portal. Only one certified analyst is required to report using the 2021 Type D reporting form, but all analysts must submit Form PH-CC 343a for each sample.

**Note 1:** Additional samples must be requested if more than one certified analyst from a lab wishes to participate in this test. If additional samples were requested on your laboratory's 2020 aggregate lab application and were not received, please contact Sandy Brown at [SBrown@ccil.com](mailto:SBrown@ccil.com) for supply of additional samples.

**Note 2:** Form PH-CC-343a is available on the MTO Public Website at the following link: [Form PH-CC-343](#)

**18. Detection of Alkali-Silica Reactive Aggregate by Accelerated Expansion of Mortar Bars**  
**– Test Method CSA A23.2-25A:**

If you have selected this test, instructions for this test method will be provided by MTO.