State of Illinois
Department of Transportation
Bureau of Materials
Springfield

POLICY MEMORANDUM

Effective: August 25, 2023	33-23.0

TO: REGIONAL ENGINEERS AND BUREAU CHIEFS IN THE OFFICE OF HIGHWAYS PROJECT IMPLEMENTATION AND AGGREGATE PRODUCERS

SUBJECT: AGGREGATE FREEZE-THAW SAMPLING AND TESTING

1. SCOPE

1.1 This document describes the freeze-thaw sampling and testing performed by the Illinois Department of Transportation (IDOT) for rating Class A Quality coarse aggregate for qualification and inclusion on the Freeze-Thaw Rating List in accordance with IDOT specifications.

2. PURPOSE

2.1 This document describes the processes for sampling and freeze-thaw testing used for rating Class A Quality coarse aggregate. Freeze-thaw samples are obtained from materials that are produced by the plant and are tested to determine the aggregate's resistance to expansion by rapidly repeating cycles of freezing and thawing.

3. TERMINOLOGY

3.1 Definitions:

3.1.1 **Beneficiation** – An improvement in **Product** quality and resistance to freeze-thaw expansion resulting from a change in the production method. Changes from an approved production method that would be considered Beneficiation and result in a check sample may include, but are not limited to: 1) crusher change from a compression to an impact crusher; 2) scalping (removing) a base product (e.g., CA06, CA10, CA02); 3) a ledge footage change to eliminate questionable material; 4) reintroduction of RR3 through RR7; and/or 5) any other production method change that does not adversely impact product quality and resistance to freeze-thaw expansion.

3.1.2 **Check Sample** – An **Individual Sample** obtained and tested to verify a change in production method resulted in **Beneficiation**.

3.1.3 **Outlier** – Non-representative expansion result that can occasionally occur. An example of an Outlier may be when an expansive particle is situated under or near the measuring pin of the freeze-thaw beam.

3.1.4 **Individual Sample** – Consists of three beams that are required to meet the requirements in 7.1.1 for qualification. When an **Outlier** is identified, an Individual Sample will consist of two beams.

3.1.5 **Preliminary (PRE) Sample** – A sample used to determine initial qualification of a **Product**.

3.1.6 **Process Control (PRO) Sample –** A sample used for the continued qualification of a **Product**.

3.1.7 **Initial Series** – A sampling and testing sequence for ledges/deposits and/or production methods that have not been previously qualified where material for five **Individual PRE Samples** are obtained.

3.1.8 **Product** – An approved A-quality gradation (CA05, CA07, CA11, CA14) that is defined by its source, ledge or pit footage, and production method.

4. SAMPLING

4.1 Freeze-thaw samples representative of the ledge/deposit and production method will be obtained by District personnel using the AGCS stockpile or production gradation sampling technique.

4.2 Freeze-thaw samples will be obtained by District personnel at pre-arranged dates and times.

4.3 The **Initial Series** samples will be obtained at times spaced far enough apart to properly represent a ledge/deposit and/or production method.

5. GENERAL REQUIREMENTS

5.1 A **Product** approved as a CA14 gradation will also be approved as CA13 and/or CA16 **Product**(s) when they are produced. However, multiple **Product** qualifications are not permitted for gradations CA05, CA07, and CA11.

5.2 New ledges/deposits and/or production methods will not be tested for CA05. Only sources that have had ledges/deposits and/or production methods previously qualified for CA05 will be sampled and tested.

5.3 Gravels in District One that will be tested are limited to gradations CA07, CA11, and CA14. Gravels in Districts Two through Nine that will be tested are limited to gradations CA11 and CA14.

5.4 Sources desiring to combine ledges shall have each ledge approved individually prior to combining.

6. MINIMUM TESTING FREQUENCY

6.1 If all five **Initial Series PRE** samples and all subsequent **PRO** samples have expansion results ≤ 0.010%, **PRO** sample testing of the **Product** will be conducted every three years.

6.2 If all five **Initial Series PRE** samples and all subsequent **PRO** samples have expansion results ≤ 0.020%, PRO sample testing of the **Product** will be conducted every two years.

6.3 If all five **Initial Series PRE** samples and all subsequent **PRO** samples have expansion results > 0.020%, but still meet specification, **PRO** sample testing of the **Product** will be conducted every year.

7. PROCEDURE

Freeze-thaw qualification will be determined by the Central Bureau of Materials.

7.1 ***20 and 30-Year Requirements***

7.1.1 **Individual Sample** Requirements:

7.1.1.1 **Individual Samples** are required to meet the following requirements for qualification:

1. The average expansion shall be less than 0.060% to qualify for 20-Year Freeze-Thaw. A minimum of two of the three beams shall have an expansion less than 0.060% to qualify for 20-Year Freeze-Thaw.
2. The average expansion shall be less than 0.040% to qualify for 30-Year Freeze-Thaw. A minimum of two beams shall have an expansion less than 0.040% to qualify for 30-Year Freeze-Thaw.

7.1.2 Source, Ledge/Deposit, Production Method, and/or **Product** Qualification Requirements:

7.1.2.1 Coarse Aggregate (CA05, CA07, CA11, CA14)

7.1.2.1.1 Ledges/deposits and/or production methods will only be rated for the gradations that have been sampled and submitted for testing.

7.1.2.1.2 All five **PRE** samples for the **Initial Series** shall pass the **Individual Sample** criteria outlined in Section 7.1.1 for qualification with no more than three **Outliers** per series. Once qualified, the minimum test frequency guidelines outlined in Section 6 will be utilized to test qualified gradations, ledges/deposits and/or production methods on a periodic basis.

7.1.3 Change in Production Method for a Qualified **Product**

7.1.3.1 A change in production method for a qualified **Product** that will likely result in product **Beneficiation** will be **Check Sampled** and tested according to Section 6. **Check Sample** test results meeting the requirements of 7.1.1 will allow a qualified **Product** to temporarily remain on the 20 and/or 30-Year Freeze Thaw Rating List using the new production method until an **Initial Series** can be

sampled and tested.

7.1.4 Resampling Process for Failures in Freeze-Thaw Testing

7.1.4.1 Failure in **Initial Series** for Qualification

7.1.4.1.1 If only one **Individual PRE Sample** in the **Initial Series** fails freeze-thaw, resampling will be permitted. The resampling shall consist of a new **Initial Series** and all five **PRE** samples shall pass the **Individual Sample** criteria outlined in Section 7.1.1 for freeze-thaw qualification. No subsequent resampling and retesting will be permitted.

7.1.5.2 Failure in Subsequent Freeze-Thaw Testing

7.1.5.2.1 If a currently qualified source has a freeze-thaw **PRO** or **Check Sample** fail according to 7.1.1, then a resample shall be immediately taken. The previously qualified gradation for that source, ledge, and/or production method may be removed from the 20 and/or 30-Year Freeze-Thaw Rating List until the resample passes. Aggregate produced and stockpiled separately after the resample is taken will be considered approved if the resample passes. If the resample fails, the **Product** will not be qualified for 20 or 30-Year Freeze-Thaw and no additional testing will be performed. A change in the deposit/ledge and/or production method will be required before starting an **Initial Series** for qualification.