

# **Report of Working Group**

**Established Under Section 15 of Public Act 19-192**

**To develop a model quality control plan for quarries and to study the workforce of contractors engaged in the repair and replacement of concrete foundations that have deteriorated due to the presence of pyrrhotite**

**January 17, 2020**

## Background

In the 2019 regular session, the Connecticut General Assembly considered several legislative proposals to address different issues relating to concrete foundation failures in residential homes and condominiums. Evidently, a limited amount of concrete, primarily used for residential foundations, is experiencing deterioration that slowly causes concrete to develop cracks and lose strength. A suspect cause of these concrete failures is quarried rock that contains a mineral called “pyrrhotite” (a form of iron sulfide) that seems to be responsible for the problem. To address two of the issues that were considered during the session, the General Assembly passed section 15 of Substitute House Bill number 7179, which is now Public Act 19-192. That measure established a Working Group to develop a model quality control plan for quarries and to study the workforce of contractors engaged in the repair and replacement of concrete foundations that have deteriorated due to the presence of pyrrhotite.

Accordingly, the Connecticut General Assembly appointed the working group members who reflected a diversity of perspectives including government, materials producers, home builders, and affected residents.

The working group consists of:

- Chairman - Kenneth Boynton – President, Boynton Construction, Inc.
- Saud Anwar – State Senator, CT Senate Third District
- Tim Ackert - State Representative, CT House Eighth District
- James Mahoney – Program Director, Connecticut Transportation Institute
- Henry Suzio – Principal, L. Suzio York Hill Companies, Inc.
- William Stanley – VP Materials Division, O&G Industries, Inc.
- Lyle Wray – Director, Capitol Region Council of Governments
- Debra MacCoy - Homeowner

The process of developing this model quality control plan and study on workforce has involved relevant information gathering and analysis through a series of work group meetings between September 2019 and January 2020. At these meetings, a variety of interested parties, state agency officials, and industry professionals provided insights, information and suggested recommendations for developing a model quality control plan for quarries and provided information on the workforce of contractors engaged in the repair and replacement of concrete foundations that have deteriorated due to the presence of pyrrhotite.

On Tuesday, December 3, 2019 at 12:30 PM the Working Group held a meeting at the Legislative Office Building. During that meeting, the Working Group discussed and voted in favor of an outline of a model quality control plan that is detailed herein.

In regard to this model quality control plan, it is critical to keep in mind that aggregates (stone and rock) are subjected to inspection prior to being used for a variety of

purposes, such as in the production of concrete. The extent of the testing is based on applicable specifications for the intended use. Typical inspection includes several visual examinations that take place during the identification of the blast location, loading of the shot, moving the shot rock to the primary crusher, secondary crushing operations, stock piles, plant feeder piles, and in the final product and placement. Depending on the source and use, more specific inspection and testing may be conducted by collecting samples of aggregate along this process and subjecting the samples to a variety of tests. There are quarries in Connecticut that have a long-standing history of providing quality aggregates for use in concrete under existing quality control plans, and current basic industry standards and protocols.

### **Model Quality Control Plan**

The model Quality Control Plan has two major components. The first component is a Geological Source Report. The second component is aggregate testing.

#### Geological Source Report:

Quarry operators that are producing aggregates for use in concrete shall provide a Geological Source Report (GSR) to the Connecticut State Geologist. The GSR shall be prepared by a geologist, certified by either the American Institute of Professional Geologists (AIPG), the National Association of State Boards of Geology (ASBOG), or with an acceptable equivalent credential or experience. The “content” and “scope” of the GSR are subject to approval by the State Geologist. The GSR should include an Operations Plan. Cores are required as part of the GSR, with the exception of currently active quarries with satisfactory performance histories. Active quarries with satisfactory performance histories require a certified geologist to perform an inspection of the face material, prepare a log of the geology, and prepare an update to the Operations Plan annually. The GSR is to be updated every 4 years.

The purpose of this GSR requirement is to document the mining, processing, storage, and quality control methods used by the producer. The GSR will describe the characteristics of the aggregate to be excavated and the products to be furnished. The portion of the report that relates to the geology of the source shall be prepared by a qualified geologist. The Operations Plan portion must be adhered to by the quarry operator and its personnel.

#### Aggregate Testing:

Aggregate testing is performed to measure total sulfur content and to identify the existence of pyrrhotite.

Stage one of the aggregate testing requires that a rapid total sulfur test is performed to determine whether a representative aggregate sample is at risk to contain deleterious sulfides with a focus on the highly reactive mineral pyrrhotite. This test can be

conducted using an X-ray Florescence (XRF) test, purge and trap gas chromatography analysis, or LECO combustion oven testing method. Representative samples should be collected and managed in accordance with ASTM D75/D75M-19 Standard Practice for Sampling Aggregates. The sample weight should be ten (10) pounds. The sample should be reduced to a size appropriate for the laboratory testing and then pulverized for analysis.

- If the total sulfur content in percent-by-mass is less than 0.1%, the test is filed with State Geologist and the aggregate approved for 4 years.
- If the total sulfur content in percent-by-mass is greater than 1.0%, the aggregate will not be permitted for use in concrete.
- If the total sulfur content in percent-by-mass is less than 1.0% but is greater 0.1%, further testing is required as set forth in Stage two of this aggregate testing protocol.

In Stage two of aggregate testing, additional testing shall include testing for pyrrhotite using XRD X-ray diffraction, magnetic susceptibility, or petrographic analysis to determine the presence and relative abundance of pyrrhotite.

- If no Pyrrhotite is present, the test is filed with State Geologist and the aggregate is approved for 1 year.
- If pyrrhotite is present, petrographic analysis based on ASTM C295 and definitions in ASTM C294 is to be used to make determinations that affect the acceptance and use of an aggregate.

During this testing protocol, a deleterious materials determination is made from aggregate samples that are examined for the presence of various materials known to cause distress such as sulfide minerals. The aggregate may be rejected based on the analytical results, or additional testing may be required as directed by the State Geologist prior to approval of aggregate for use in concrete. Additional testing may include a mortar bar expansion test under ASTM 1293 and/or ASTM 227. In any case, if pyrrhotite is present, the level of admissibility for total sulfur content in percent-by-mass shall be less than 0.1%.

#### Implementation:

The Office of the State Geologist, currently located under the Office of Information Management at the State of Connecticut Department of Energy and Environmental Protection, will need, at a minimum, the following additional staff and resources to implement this protocol.

- One full time geologist to review and manage the Geological Source Reports, and review test results.
- Two full time staff to process and catalog the above-mentioned correspondence and data.
- Office space, furnishings, and technology.

## **Study on the Workforce of Contractors**

On Wednesday, January 15, 2020, the Working Group held a public hearing scheduled from 1:00 to 3:30 PM in Room 2A of the Legislative Office Building for the purposes of identifying workforce needs. The first hour was dedicated to hearing directly from homeowners afflicted with crumbling foundations. The remaining portion of the hearing was reserved for testimony submitted by contractors experienced in lifting homes as well as contractors with experience in various methods of remediating crumbling foundations. The consensus of those that testified was that the current state of the workforce is adequate for the current needs of our residents. Should funding from the state be released in greater quantities and with more consistency, contractors that specialize in the lifting homes can and will mobilize in short order to meet the demand. Similarly, those contractors that specialize in the remediation of a crumbling foundations testified that due, in part, to the protracted downturn in new home construction there is no shortage of labor and new construction crews can be hired and trained to meet demand should demand increase. For these reasons the Working Group concludes that the workforce is adequate to meet the existing needs in addition to any increase in future demands. Therefore, no further action is recommended.

There were two themes, deemed outside the purview of the Working Group's statutory charge, that were consistent in the testimony provided that the Connecticut General Assembly and the Administration may want to consider addressing in the future. They included:

- Ensuring that all afflicted homeowners who are seeking state funds, or who are recipients of state funds are properly educated. Educating homeowners should aid in minimizing the exacerbation of an already stressful situation. Consumer education should cover:
  - The process for obtaining state funds;
  - The process for choosing a contractor; and,
  - The process and what to expect during the remediation process.
- Enhancing inspection options to mitigate any undue delays, especially in municipalities with part time inspectors.