



CONNECTICUT READY MIXED CONCRETE ASSOCIATION, INC.



A DIVISION OF CONNECTICUT CONSTRUCTION INDUSTRIES ASSOCIATION, INC.

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Planning and Development Committee
Crumbling Concrete Foundations Informational Panel Discussion
February 2, 2017

Statement of Connecticut Ready Mixed Concrete Association

The Connecticut Ready Mixed Concrete Association, Inc. (CRMCA) appreciates this opportunity to participate in today's panel discussion. CRMCA members include material producers that mine aggregates and produce construction materials; and product suppliers that provide the cement and admixtures that are used in the production of concrete. CRMCA members have a long-standing history of providing quality concrete for the public benefit. The concrete producer members take numerous steps in their quality control programs to ensure the production and delivery of concrete products that meet the specifications of an order.

CRMCA understands that failing concrete foundations are of major concern for homeowners and municipalities in affected sections of Connecticut. Our industry is available as a resource as these discussions move forward.

Representatives of CRMCA participating today include:

Don Shubert, President of the Connecticut Construction Industries Association, and Executive Director of CRMCA. Early in his career, Don worked in the Balf Quarry in Newington, Connecticut.

Ric Suzio, President of the L. Suzio Concrete Company that has been producing concrete since 1932. The Suzio/York Hill Companies have been mining aggregates since 1898. Ric is a past president of CRMCA, and is a past Chairman of the National Ready Mixed Concrete Association.

Don Penepent, Manager of the Concrete Division of Tilcon Connecticut that has been producing aggregates since 1923 and producing concrete since 1961. Don is a past president of CRMCA, past Board of Directors member of NRMCA, and is a recipient of the American Concrete Institute Lifetime Achievement Award.

Kevin Miller, Director of Quality Control for the Concrete Division of Tilcon Connecticut. He is a National Ready Mixed Concrete Association Level 4 Certified Concrete Technologist. Kevin is the current president of CRMCA.

Bill Stanley PE, Vice President of the Materials Division of O&G Industries that was founded in 1923. Bill is a professional engineer with a focus on civil and structural engineering.

Combined, these companies have a long-standing service record, and this group has over 160 years of experience working with aggregates and concrete.

CRMCA is providing the following briefing paper on the issue at hand.

Deterioration of Concrete in Residential Structures in Connecticut and Quebec

The Problem

A limited amount of concrete, primarily used for residential foundations in northeastern North America, is experiencing deterioration that slowly causes concrete to develop cracks and lose strength, usually over several decades.

Extent of the Problem

For many reasons, the number of homes affected is unclear, but the problem is rare and the risk appears to be limited to a small region of northeastern Connecticut and the Trois Rivières area of Quebec, Canada.



The Suspect Cause

A quarried rock that contains a mineral called “pyrrhotite” (a form of iron sulfide) seems to be responsible for the problem. In Connecticut, the aggregate came from a specific quarry and was used in concrete supplied from one producer during the late 1980s to early 1990s. Because pyrrhotite is rare, it has not been necessary to evaluate aggregate sources for it and may require specialized testing be developed to identify it.

Concrete Deterioration

The chemical reaction that leads to deterioration requires the presence of moisture and oxygen. The oxidation of pyrrhotite results in the formation of sulfuric acid that attacks the cement paste portion of concrete, harming its strength. Sulfate attack also leads to expansive forces within concrete. Damage occurs at a faster rate in lower quality concrete (having high water content at the time of placement), but even better quality concrete that contains pyrrhotite is likely susceptible to this deterioration given enough time and the proper conditions.



Industry's Response

At the request of individuals from Connecticut, the chairman of the American Concrete Institute's (ACI) Residential Concrete Committee (ACI 332) convened a meeting of an ad hoc task group at the Fall 2016 ACI Convention in Philadelphia to discuss the issue of deterioration of foundation walls in residential homes stemming from pyrrhotite aggregate. Included in this first discussion were ACI committees on durability, aggregates, and residential concrete; researchers experienced in concrete deterioration; and representatives of Portland Cement Association, Concrete Foundations Association, and the National Ready Mixed Concrete Association. The purpose of the meeting was to share knowledge about the condition, including its causes and prevention, how widespread it could be, the type of technical information and guidance needed, and to decide on a future course of action.

For more information, contact: Don Shubert, Connecticut Ready Mixed Concrete Association 860-529-6855

CRMCA would like to introduce fundamental concepts on mining aggregates and producing concrete to provide a foundation for today's discussion.

1. Mining Aggregates

Upon reviewing the several legislative proposals that have been filed regarding testing for the mineral Pyrrhotite in aggregates and concrete, CRMCA would like to provide a short briefing on the basics of mining certain aggregates, commonly known as stone or rock.

Aggregates 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. Larger, commercial quarries and aggregate mining operations, will inspect aggregates in accordance with a Quality Control Plan that is designed to ensure the characteristics of the aggregates are suitable for the intended use. Typically aggregates are used for products such as asphalt, concrete, subbase, fill, or other applications.

Typical inspection includes several visual examinations that take place during the identification of the blast location, loading 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.

Testing different size aggregates specifically for the mineral Pyrrhotite is not conducted for the following reasons:

- there has been no deterioration of concrete identified to be caused by Pyrrhotite in the US prior to the specific case in Connecticut;
- the national and state specifications do not include provisions to evaluate aggregates for the presence of Pyrrhotite or associated physical tests;
- there is no standardized testing process established;
- there are no accepted criteria regarding the unacceptable amounts of Pyrrhotite in aggregate that could be detrimental to concrete;
- the cost of this testing is unclear;
- besides a few research institutions, there are no commercial testing agencies equipped to conduct such testing; and
- there is no way to establish the frequency of this type of testing to provide any assurance that the problem will not occur.

Concrete is also subject to various sampling and testing, depending on the application and end-user requirements. Materials used for concrete should comply with applicable specifications. There are no ASTM, AASHTO, or state agency standards for testing aggregate for presence of the mineral Pyrrhotite in concrete while it is in a plastic state.

2. Producing Concrete

Concrete is a product of sand, stone, cementitious materials, water, and admixtures. In simple terms, producing concrete is analogous to baking a cake in many respects. There are different mixtures, and processes used to produce concrete, depending on the specified performance requirements. Basic standards have been developed that provide for best practices. For example:

- Concrete is produced in compliance with ASTM C94 Standard Specification for Ready-Mixed Concrete. This specification governs measuring of materials, batching tolerance, mixing time, batch ticket information, and testing of concrete.
- The specification for aggregates used in concrete are governed by ASTM C33 Standard Specification for Concrete Aggregates. The specification covers ordering aggregates, grading (particle size distribution), quality tests, and specifies limits on certain deleterious materials known to cause problems when used in concrete. This specification does not address the presence of Pyrrhotite.
- Concrete producers are required to follow the guidelines of the International Building Code, which has been adopted in Connecticut. This code references American Concrete Institute (ACI-318) Building Code Requirements for Structural Concrete.

CRMCA appreciates this opportunity to participate in this informational session. The association remains available as a resource as this discussion continues. Please do not hesitate to contact Don Shubert at 860-529-6855, or dshubert@ctconstruction.org for further information.