



USE OF FIELD PERFORMANCE HISTORY IN EVALUATING ALKALI-SILICA REACTIVITY POTENTIAL OF CONCRETE—TECHNOTE

Keywords: alkali-silica reactivity (ASR); existing structures; field performance history.

Introduction

Evaluating field performance history of existing concrete structures provides an opportunity for producers and specifiers to determine the potential for deleterious alkali-silica reactivity (ASR) of concrete and the aggregates it contains. However, field performance history is not typically used and the more traditional accelerated/aggressive laboratory tests such as [ASTM C1260](#), [C1567](#), and [C1293](#) are chosen. This TechNote discusses the evaluation of field performance history and the benefits that it may provide.

Question

Why should producers develop, and specifiers use, field performance history to help determine the potential for deleterious alkali-silica reactivity (ASR) of a concrete mixture?

Response

Evaluating the field performance history of concrete can provide information on the long-term performance of concrete with respect to the potential for deleterious ASR under actual service conditions. This is accomplished through a program that includes field observations, sampling, petrographic evaluation, and comparison of historic and current material characteristics.

Discussion

The use of field performance history in assessing the potential for deleterious ASR has two distinct advantages over relying solely on the commonly specified standard laboratory test methods. These are: 1) assessing ASR based on long-term performance history under ambient temperature and humidity conditions; and 2) evaluating the ASR potential of existing structures having a range of alkalinity and thus not subject to the alkali-boosted conditions used in current test methods. These advantages may provide producers and specifiers with increased confidence in minimizing the risk of deleterious ASR. The use of field history is recognized in ASR standards such as [ASTM C1778](#) and [AASHTO R 80](#), which are referenced in many building codes and specifications. Documenting field performance and correlating that with laboratory test results can prove extremely valuable.

Field history has been underused primarily due to a lack of documentation and testing of the materials used in a specific concrete mixture and correlating that information with observed performance with respect to deleterious ASR. A secondary reason is the reluctance of specifiers to accept this type of documentation. There is a habit within our industry to rely on the results of a single laboratory test as a pass/fail criterion. The currently approved ASR test methods may underestimate or overestimate the ASR potential of an aggregate or concrete mixture. Overreliance on these test results may result in the exclusion of aggregates that are likely to have good field performance or yield a false sense of security.

Establishing field history

Section 7.1 of [ASTM C1778](#) provides an outline of the requirements for establishing field performance history.

A practical preliminary step prior to those listed in [ASTM C1778](#) is to identify a range of representative projects approximately 15 years of age or older, constructed using aggregates from the same source, and collect suitable documentation available regarding the materials used.

Evaluation of representative field projects covering different types of concrete made with the aggregate to be used needs to encompass a range of concrete mixture proportions and service exposures. The question of how many field projects covering the different types of construction is to be evaluated is not addressed in [ASTM C1778](#). Concrete can be broadly categorized into two classifications: 1) concrete exposed to weather and other aggressive environments that contribute to deleterious ASR;