

Influence of Rock Salt Impurities on Limestone Aggregate Durability

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Introduction

Non-durable coarse aggregate in concrete pavement can break down under repeated freeze-thaw cycles. Application of rock salt may increase the severity of exposure conditions because of trace compounds, such as calcium sulfate, in rock salt. Concrete and saw-cut limestone specimens were also subjected to wet-dry cycles in varying salt solutions to examine the influence of trace compounds in rock salt. Subsequently, limestone aggregate in concrete was subjected to freeze-thaw cycling in two methods: salt-treating the aggregate before batching concrete, and half-immersing concrete specimens in rock salt solution during freeze-thaw cycling.



Example of a Saw-Cut Sample Subject to Testing

Project Description

The wet-dry testing of cut limestone was not severe enough to determine the effects of trace compounds in salt solution. Preliminary experiments showed that salt-treating the aggregates before batching concrete showed more promise in differentiating aggregate quality or in gaining insights into concrete pavement performance. Concrete prisms were made using 12 different salt-treated aggregates and were tested according to Kansas Test Method KTMR-22 (2006) and additionally ASTM C666 (2008) using Method A. Companion prisms were made using the same aggregates without salt treatment and were tested using the same two freeze-thaw test methods.

Project Results

Use of saw-cut limestone prisms for testing the freeze-thaw durability of concrete aggregates is not recommended as crushing limestone may change its properties, prisms from the same source have variable quality, and prisms are labor-intensive to make. Further testing should be conducted to validate the potential use of ASTM C666 Method A as a method to achieve similar freeze-thaw acceptance results as Method B in fewer freeze-thaw cycles. Freeze-thaw tests of concrete made with aggregates presoaked in salt brine could provide a good method to test the effects of salt exposure on internal freeze-thaw distress on the paste portion of the concrete. However, salt treatment may not be an effective method to use for coarse aggregate qualification.

Project Information

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