CONCRETE COMPLETED RESEARCH PROJECT

PROJECT NAME: BEST PRACTICES TO ADDRESS ISSUES OF EXCESS AGGREGATE DUST IN NEBRASKA
PROJECT NUMBER: SPR-P1(20) M114

RESEARCHERS

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PROJECT ABSTRACT

“The negative impacts of an excessive amount of aggregate dust have been known and reported in different states. The extent and impact of dust on concrete performance, which depends not only on the quantity but also on the nature of the dust can be complicated. For example, clay coatings showed a more harmful impact on concrete performance compared with carbonates (limestone dust) or stone dust. While clays that weakly adhere to aggregate will be dispersed in the mixing water and could lead to workability or air entrainment issues, clays that are strongly bonded to the aggregate surface will remain at the aggregate surface after the mixing process and may disrupt the aggregate-paste bond and results in strength and durability issues. The upper limits of aggregate dust (fines) currently in most state agencies' specifications are not necessarily sufficient to prevent aggregate issues.

This research included five different types of aggregates which were specified, limestone, gravel, dolomite, granite, and quartz, these aggregates were collected from Nebraska, South Dakota, and Wyoming. A comprehensive evaluation of the aggregate dust was performed using sieve analysis, washing test, sand equivalent test, methylene blue test, and X-ray powder diffraction. Besides the evaluation of fresh, hardened, and durability properties of concrete, advanced tests were used to characterize aggregate-paste bonding inside concrete prepared with different aggregate types and cleanliness. While aggregate collected in this study meet the currents NDOT criteria of coarse aggregate fine content and fine aggregate sand equivalent, additional tests such as methylene blue value could provide more insights into the type of dust on the aggregate surface. The Modified Methylene blue value (MMBV) could potentially be used to reduce the coarse aggregate dust. However, future investigation is needed to establish a correlation between MMBV and field concrete performance that can be eventually used to set up criteria for quality control.”

As quoted by P.I. Jiong Hu, in the December 2020 final report abstract –