Quantification of coarse aggregate angularity by a newly developed auto grader machine

ABSTRACT

The physical properties of aggregates have a direct correlation to the performance of a pavement. Stiffness, fatigue response, shear resistance and permanent deformation are some of the distresses for which aggregate form, texture and angularity have an influence. Angularity is an important property of aggregate shape, more angular are the particles there will be better interlocking, inter friction and greater mechanical stability, hence better pavement distress resistance. A debate has a risen over several methods to capture this physical property either directly or indirectly such as aggregate imaging system (AIMS), Un compacted void content of coarse aggregate (AASHTO T326), University of Illinois Aggregate Image Analyzer (UIAIA) and Indian manual coarse aggregate angularity test. Some are costly some are laborious and time consuming; hence there is a need for better methods that are cost effective, accurate, rapid in measuring aggregate angularity. The research conducted in this study introduces cost effective Aggregate Auto-grader and evaluates the effective set of time and speed for this automated machine to obtain minimum percentage air voids between aggregates (estimation of perfect interlocking) by shaking sample of coarse aggregates in orbital motion. In addition to measure accuracy of automate Aggregate Auto-grader test results are compared to other manual coarse aggregate angularity test. The trend followed by results of aggregate Auto-grader is as same as the manual test, hence based on results a new equation is proposed for obtaining coarse aggregate angularity by Aggregate Auto-grade machine which has more accuracy, reputability and reproducibility compare to the manual test.

Keyword: Coarse aggregate angularity; Aggregate shape characteristic; Voids in coarse aggregate