Kansas Department of Transportation

TECHNICAL SUMMARY

Methods of Predicting Aggregate Voids

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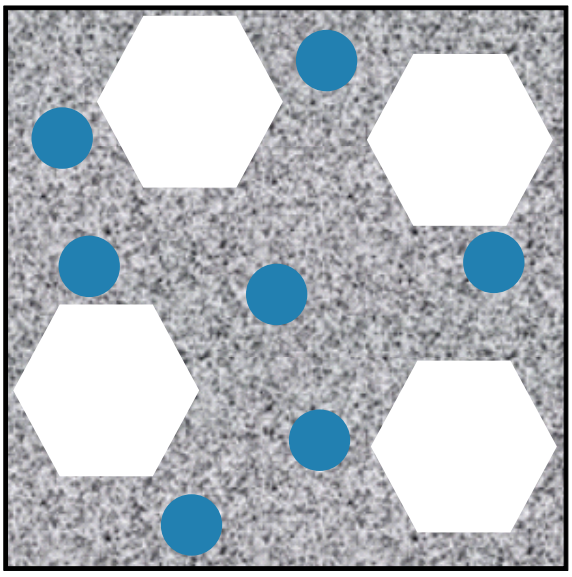
Project Description

Percent voids in combined aggregates vary significantly. Simplified methods of predicting aggregate voids were studied to determine the feasibility of a range of gradations using aggregates available in Kansas.



Coarse Aggregate

The 0.45 Power Curve Void Prediction Method was developed at KDOT as an experimental method of predicting combined aggregate voids. The Coarseness Factor is another option for analyzing aggregate gradation. Rather than analyzing all sieve sizes, the coarseness factor chart looks at aggregate as a whole. The Coarseness Factor separates aggregates into three categories: coarse, fine and intermediate. The Coarseness Factor Void Prediction Method was created at KDOT as a simplified method of predicting percent voids in combined aggregate. The coarseness factor is the dependent variable in the void prediction method; it is easily computed and conveys the overall gradation of combined aggregates with a number.

The 0.45 Power Curve Void Prediction Method and the Coarseness Factor Method were tested using thirty-six combined aggregate gradations, most meeting KDOT gradation standards. The 0.45 Power Curve Void Prediction Method yields more consistent predictions of percent voids in combined aggregate than the Coarseness Factor Void

Prediction Method. The Coarseness Factor Method requires less calibration and physical testing than the 0.45 Power Curve Void Prediction Method. Neither the 0.45 Power Curve nor the Coarseness Factor Void Prediction Method are accurate for combined aggregate that deviates substantially – more than 15% on an individual sieve size – from the 0.45 maximum density line. Well-graded aggregate showed less estimation error than aggregate that was not well-graded using the coarseness factor void prediction method.

Project Results

- The 0.45 Power Curve Void Prediction Method yields more accurate predictions of aggregate voids than the Coarseness Factor Method of aggregate voids.
- The 0.45 Power Curve Void Prediction Method must be calibrated for different combined aggregate types (e.g. limestone/sand or granite/sand).
- The Coarseness Factor Method of Void Prediction requires a suite of previously tested aggregate voids. Higher order regression may be used to increase the R2 value.
- The Coarseness Factor Method should be used only for one type of combined aggregate (e.g. limestone/sand or granite/sand).
- Well-graded aggregate percent voids vary less – and are predicted more accurately – than not well-graded aggregate.

Project Information

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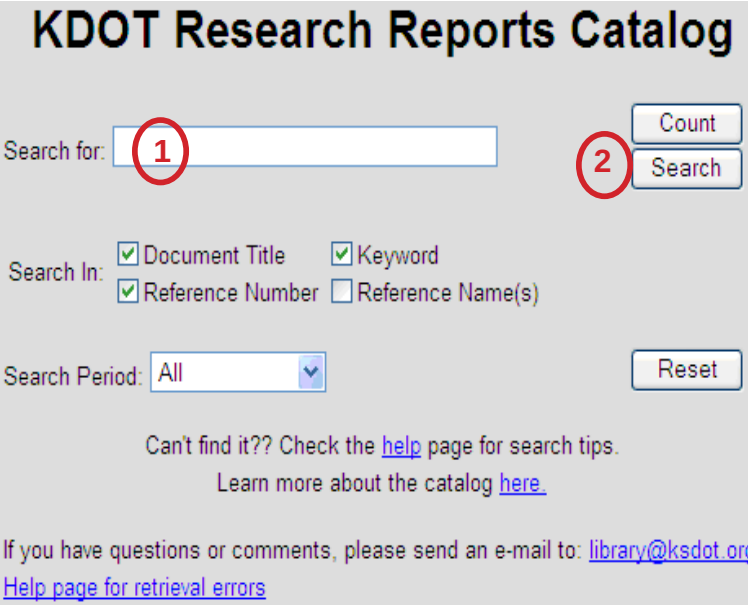

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