Research was conducted to investigate the influence of soil properties and additive characteristics on the resilient modulus ($M_R$) of stabilized soils. Interest in determining the ultimate gain in stiffness and the rate of improvement of this pavement design parameter motivated this study. Soils collected at five construction sites in Oklahoma were tested under a variety of sample configurations and curing periods; 146 $M_R$ tests were performed.

The testing plan consisted of three sets of samples: one designed to simulate field conditions, a second to produce optimum laboratory conditions, and the last to evaluate the effect of additive content on the $M_R$. Properties of both soils and admixtures were evaluated in order to correlate those with the enhanced behavior of the mixed soils. The effect of curing time, additive characteristics, and soil properties on the $M_R$ improvement of soils stabilized with cement kiln dust (CKD) and class C fly ash (CFA) was studied. Timelines were developed and regression equations were calculated so that $M_R$ improvement could be predicted. After 56 days of curing time tested soils showed improvement ranging from 2 to 43 times larger than the initially measured $M_R$ of treated samples. Exponential rates of improvement were estimated for a power type regression analysis. When modeled with the power equation CKD and CFA mixes showed good correlations between improvement parameters and fines fraction, specific surface area, cation exchange capacity, and pH response. Improvement parameters obtained from field mixed samples showed significant variations when compared to laboratory results; these differences and possible causes are addressed in this study.