

## ABSTRACT

Talbott, Aaron M., Ph.D., Purdue University, May 2008. Seismic Resistance of Integral Abutment Bridges. Major Professors: Robert J. Frosch and Michael E. Kreger.

Integral abutment construction has become a popular alternative to conventional bridge construction for short and intermediate length bridges. Integral abutment construction eliminates joints and bearings which reduce long-term maintenance costs. However, in the absence of joints and bearings the bridge abutments and foundations must be able to accommodate lateral movements from thermal expansion and contraction of the superstructure and seismic events. Previous research has focused on the response to thermal expansion and contraction. The current research examines the response of integral abutment bridges to seismic loading. A field investigation was conducted to examine the response of an integral abutment to lateral loading from thermal expansion and contraction. The results were used to calibrate analytical bridge models used to estimate displacements of the abutment during design seismic events. A laboratory investigation was conducted to estimate the lateral displacement capacity of the abutment based on the performance of the abutment-pile connection. Results of the field, analytical, and laboratory investigations were used to evaluate allowable bridge lengths based on seismic performance. Alternate abutment-pile connection details were proposed which would increase seismic performance.