

## **HR-275 Long-Term Structural Movement**

**Key Words:** Integral abutment bridges, Bridge impacts, Long-term movement, Structures

### **ABSTRACT**

There are many cases where the need to obtain long-term structural movement data exists. Each situation has to be reviewed carefully to determine any unique problems that may exist. Two specific applications that require attention in Iowa have been recognized and are addressed in this study. Before attempting field applications, a study was performed to address problems that may be associated with field applications and to determine how reliable and accurate data can be obtained.

A case of possible bridge movement related to impact from barge traffic occurred at the Mississippi River Bridge in Lansing, Iowa. Over the past few years these instances of impact have resulted in some visible damage to the main span concrete pier. However, the magnitude of additional pier and bridge damage is unknown.

Long-term structural movement data are also needed for the integral abutment bridge. This type of bridge has been used for short and moderate spans in Iowa and has been used increasingly in other states. The integral abutment eliminates the use of expansion devices, but in so doing piling stresses in the abutments are induced because of displacements caused by temperature changes. Recent studies at Iowa State University have found that large lateral abutment movements can reduce the vertical load carrying capacity of the pile. Before a design technique can be developed, the bridge's amount of movement due to temperature changes needs to be quantified.

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This research is the first phase of a proposed two-phase research project. The first phase started with a literature study to determine methods of obtaining long-term structural movement data that have practical application based upon reliability and accuracy. Then the methods were tested in the laboratory to determine both the accuracy that could be attained and their applicability for field use. The results and conclusions of these tests are summarized in this report. Recommendations for specific applications have been made to address the proposed second phase of this study. Methods found to be feasible in the first phase of this project will be used in the field during the second phase.