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MCEER Visits Iceland to Investigate Performance of Seismically-Isolated Bridges

On October 9-10, 2000, Michael Higgins, MCEER's Senior Program Officer for Transportation Research, and Benedikt Halldorsson, Ph.D. candidate in the Department of Civil, Structural and Environmental Engineering at the University at Buffalo, and member of the Student Leadership Council, visited the Earthquake Engineering Research Center, University of Iceland (EERCUI), to review the performance of isolated bridges during two recent earthquakes.



■ The Thjorsa bridge in the South Iceland Lowlands was subjected to a peak ground acceleration of 0.84 g.

The earthquakes, magnitudes 6.5 and 6.4, respectively, occurred on June 17 and June 21, 2000, along a strike slip fault in a rural area of the South Iceland Lowlands near the village of Hella. The events took place after 88 years of relative seismic quiescence in the South Iceland Seismic Zone (SISZ) where, based on historic

records, damaging earthquakes have repeatedly taken place. One distinct characteristic of the SISZ is that every 100-140 years or so, strong earthquakes tend to occur in sequences over a period ranging from a few days to a few years, releasing tectonic strain over a large part of the SISZ. Although this summer's earthquakes released considerable strain, it is still possible that an event of comparable size will take place in the near future.

Damage to infrastructure was minor and no significant injuries were reported. The Iceland Public Roads Administration has been using seismic isolation on bridges for several years, and four isolated bridges were located in the epicentral area.

A team, including Mr. Higgins, Mr. Halldorsson, Einar Hafliðason, Head of the Bridge Division, Public Roads Administration, Iceland, and Bjarni Bessason and G.I. Balduinsson, EERCUI, visited the isolated bridges and one non-isolated bridge. All of the bridges were fully operational after the earthquakes, and suffered only minor damage.

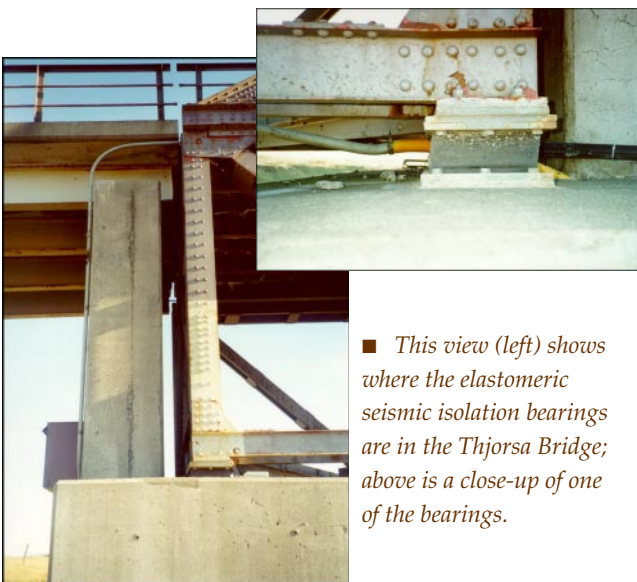


■ The investigative team is pictured standing inside a large surface crack in a parking lot in Skeidar. Front row: M. Higgins and B. Bessason; back row: G.I. Balduinsson and E. Hafliðason.

One of these bridges, the Thjorsa Bridge, was located 5 km from the June 21st epicenter and only 2 km from the closest surface fault. The bridge consists of three spans: two approach spans with slab on girder construction and one center span consisting of a 270 foot steel truss arch (see photos). Only the center span was isolated. The bridge was instrumented with accelerometers and during the June 21st earthquake, the maximum recorded peak ground acceleration was 0.84 g. It suffered minor permanent displacements in both the lateral and longitudinal directions.

The EERCUI is presently analyzing the data recorded by several accelerometers on the Thjorsa Bridge to fully quantify the benefits of seismic isolation and compare the results from their models to the actual performance of the structure. It is anticipated that the results of this study will be published in early 2001.

More information on the Iceland earthquakes and ensuing research efforts will be made available through MCEER and the EERCUI. Check the Highway Project section of our web site at <http://mceer.buffalo.edu/research/HighwayPrj/default.asp>. ❖



■ This view (left) shows where the elastomeric seismic isolation bearings are in the Thjorsa Bridge; above is a close-up of one of the bearings.