

Minneapolis I-35W Bridge Collapse – Engineering Evaluations and Finite Element Analyses

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Abstract: The National Transportation Safety Board (NTSB) investigates accidents to identify the probable cause and to make recommendations that would prevent similar accidents. Following the collapse of the I-35W bridge in Minneapolis on August 1, 2007, the NTSB worked with the Federal Highway Administration, the Minnesota Department of Transportation and other parties with information and expertise, including SIMULIA Central, to determine the circumstances that contributed to the collapse of the bridge, completing the investigation in 15 months. The NTSB concluded that the collapse of the bridge was caused by the inadequate load capacity of gusset plates used to connect the truss members, as a result of an error by the bridge design firm, Sverdrup & Parcel and Associates, Inc. The loading conditions included a combination of (1) substantial increases in the weight of the bridge caused by previous bridge modifications, and (2) the traffic and concentrated construction loads on the bridge on the day of the collapse. Evidence from the collapsed bridge structure, engineering evaluations of the design, and results from the finite element analyses used to support the investigation are reviewed.

Keywords: Bridge Collapse, Gusset Plate, Plasticity, Instability, Riks, Fasteners.

Introduction

About 6:05 p.m. central daylight time on Wednesday, August 1, 2007, the eight-lane, 1,907-foot-long I-35W highway bridge over the Mississippi River in Minneapolis, Minnesota, experienced a catastrophic failure in the central deck truss span over the river. The 1,064-foot-long deck truss