



Research Notes

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Improved Gusset Plate Inspection Method

After the collapse of the I-35W Bridge in Minneapolis, the Federal Highway Administration mandated that owners of steel truss bridges include calculations for gusset plates as part of the capacity analysis. Traditionally, the steel truss members were load rated, but the connections joining the members together were not routinely analyzed. Unfortunately, it was under-capacity gusset plates connecting the truss members on the I-35W Bridge that contributed to the tragedy.

Analysis software for gusset plates is commercially available, but these programs require as-built dimensional and condition data for each connection. Acquiring these field data typically require bridge inspectors to access each connection on a bridge, measure the pertinent dimensions, and record each measurement on paper. Load rating engineers then use the measurements as input into capacity analysis programs. Though Oregon has relatively few steel truss bridges, the new load rating requirements would require a significant effort to obtain the data needed to comply with the new regulations.

In 2009, using funding from ODOT's Bridge Engineering Section, Oregon State University (OSU) provided ODOT with a procedure and computer application to acquire the dimensional data from photographs of gusset plates. The approach enabled rapid collection of field measurements, reduced the likelihood of data entry errors, used readily available technology, and could be practicably employed in the field and the office by personnel with common bridge inspection and engineering skills.

Since the original effort, the Bridge Section has supported further refinement to the photographic method to improve its field applicability for large gusset plates and to acquire images of sections blocked by obstructions. Consequently, OSU developed a method to convert fisheye images to perspective images that can be used in the photographic procedure. Also, multiple images can now be stitched together to make a single image of a gusset plate for analysis. These critical additional features now allow the procedure to be deployed in nearly all field situations.



Gusset plate and obstacle

The Bridge Engineering Section is implementing the photographic method into its bridge inspection and analysis procedures. As a result, ODOT will have a tool that will help bridge inspectors and load rating engineers efficiently check the connection capacity of ODOT's steel truss bridges.



Oregon's bridges have many connections to consider



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The final report for this project was published in September 2011 and is available on the Research Section web page:
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2011/FishStitch_SPR304_581.pdf