

**SYSTEM RELIABILITY BASED DESIGN OF STEEL GIRDER BRIDGES
USING INCREMENTAL LOADING METHOD**

by

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ABSTRACT

Current AASHTO LRFD bridge design specifications are calibrated using structural reliability on elemental level. Ductile structural system consisted of members with the confined reliability requirement usually has extreme low failure probability, which will cause unnecessary material waste in maintaining system reliability requirement. This research is investigating to include system reliability requirement into structural member design for engineering structure.

An improved procedure for incremental loading method is first proposed first. The analysis procedure is outlined as the following. Start increasing load from zero till the first member failure; update structural status and resume the load-increasing procedure till the advent of next member failure; keep updating structural status and resuming load-increasing till the last member; Formulate system performance function in terms of the residual resistance for the last member.

The assessment of failure probability on system performance function for a five girder steel highway bridge is implemented through the adaptive importance sampling. System factors are obtained for girder resistance design equation through iteratively analyzing system reliability on current girder resistance in maintaining the required system reliability.