A Study on the Relationship between Operational Asset Performance and Safety Performance

Jian Gao¹, Inya Nlenanya², Basak Aldemir-Bektas³, Konstantina Gkritza⁴, Omar Smadi⁵, Neal Hawkins⁶

Abstract

Asset management concepts, principles, and performance measures have recently received increased attention by transportation leaders, state agencies, and other transportation-related associations and institutes. However, to date, the improvement of safety performance achieved by an operating asset management system has not been fully studied. Past research has revealed the relationship between pavement condition and safety; roadway lighting and safety; retroreflectivity of pavement marking and safety; but the relationship between operational asset performance and safety performance has not been examined in a multivariate context. This paper investigates the relationship between various operational asset performance measures such as pavement marking retroreflectivity, pavement condition (expressed as roughness and rutting), sign inventory, and safety (crashes). To achieve this, six years of pavement marking retroreflectivity data, pavement condition data, and sign inventory data on all state primary roads were collected from the Iowa Department of Transportation. These data were integrated with corresponding crash and traffic data using GIS. Statistical models were then developed to estimate the relationship between operational asset performance and safety performance. Incorporating safety criteria into asset management can assist agencies to manage more efficiently their aging assets, instead of focusing on individual projects, increase public acceptability of proposed projects, and improve system-wide highway safety.

Key words: asset management- safety- pavement marking- pavement condition- sign inventory

¹. Graduate Student, Iowa State University, Civil, Construction and Environmental Engineering, Institute of Transportation, 2711 South Loop Drive, Suite 4700, Ames, IA 50010-8664, Tel: 515-296-6686, Fax: 515-294-4067, Email: jiangao@iastatu.edu
². Transportation Research Specialist, Iowa State University, Institute of Transportation, 2711 South Loop Drive, Suite 4700, Ames, IA 50010-8664, Tel: 515-294-2373, Fax: 515-294-4067, Email: inya@iastate.edu
³. Research Associate, Iowa State University, Institute of Transportation, 2711 South Loop Drive, Suite 4700, Ames, IA 50010-8664, Tel: 515-294-4067, Email: basak@iastate.edu
⁴. Research Scientist and Adjunct Assistant Professor, Iowa State University, Institute of Transportation, 2711 South Loop Drive, Suite 4700, Ames, IA 50010-8664, Tel: 515-294-7110, Fax: 515-294-4067, Email: smadi@iastate.edu
⁵. Assistant Professor, Iowa State University, Civil, Construction and Environmental Engineering, 404 Town Engineering Building, Ames, IA 50011-3232, Tel: 515-294-2343, Fax: 515-294-7424, Email: nadia@iastate.edu
⁶. Director, Center for Transportation Research and Education, Institute of Transportation, 2711 South Loop Drive, Suite 4700, Ames, IA 50010-8664, Tel: 515-294-7733, Fax: 515-294-4067, Email: Hawkins@iastate.edu