PURPOSE OF THE PROJECT
This project responded to Tennessee Department of Transportation (TDOT) needs of conducting a detailed evaluation of safety effectiveness of its median cable rail systems. The study which was a continuation Phase I, focused on determining at what percentage effectiveness and significant level the cable rail systems reduced overall number of crashes and injury severity since they were installed. Safety effectiveness with respect to cable designs, installation procedures, material types, and other technical specifications were evaluated. A detailed literature review of cable rail system implementation and safety performances as experienced in other states was also part of this project.

SCOPE AND SIGNIFICANCE OF THE PROJECT
Phase 2 evaluated the impact of roadway cross-sectional and geometric features, traffic characteristics and median cable barrier placement to the frequency of median related crashes through statistical modelling. In addition, a survey questionnaire was synthesized and sent to all states to solicit information related to safety effectiveness of the cable barriers. Information of interest in the survey included if the median cable barriers resulted in significant severe crash reductions and what was the safety effectiveness of the cable barriers. The study found that roadway segments with cable barriers located further from the travel lanes resulted with less number of crashes compared to those with barriers closer to the travel lanes. That was the same for roadway segments with large differential elevations between two directions which significantly resulted in more crashes compared to level segments or small elevation differences. In addition, roadway segments along sharp curves resulted in more crashes compared to gentle curve segments. Cable barrier located at segments with 6-lanes experienced fewer crashes compared to 4-lanes while segments with wider median resulted in fewer crashes compared to narrow medians. High speed limits segments experienced more crashes compared to low posted speed segments. Questionnaire survey from other stated showed that the effectiveness of the cable barrier matches those experienced in Tennessee whereby fatal and severe injury crashes were highly reduced while the PDO crashes went up after median cable barrier installation.

OUTCOMES
This study evaluated the impact of roadway cross-sectional and geometric features, traffic characteristics and median cable barrier placement to the frequency of median related crashes through statistical modeling. Apart from number of lanes, inside shoulder width, median width, AADT, VMT and posted speed limit, the modeling included cable offset, horizontal curve data and differential elevation. Negative binomial (NB) model was used in linearizing and quantifying these factors with respect to crash frequency. The following are the overall impact of these variables to crash frequencies:

- Cable Offset as a variable was found to be highly significant and positive in the model: This demonstrates that segments with cable barriers located further from the travel lanes resulted in less number of crashes compared to those which were closer to the travel lanes.

- Differential Elevation as a variable was positive and significant in the model: The interpretation of the positive coefficient is that segments with large differential elevations between two directions significantly resulted in more crashes compared to level segments or small elevation differences.
• Degree of Curve as a variable was positive in the model: The positive coefficient means that increase in the degree of curve increases the crash frequencies, the case for both before and after conditions. Therefore, segments with sharper curves resulted in more crashes compared to straight and gentle curve segments.

• Number of Lanes as a variable was negative in the model: That is, roads with more number of lanes experienced decreased frequency of median barrier crashes. This is the case for both before and after median barrier periods. That means median cable barrier located at segments with 6-lanes experienced low crash frequency compared to 4-lane segments.

• Terrain (Rolling and Mountain) as a variable was positive in the model: Segments located in rolling and mountainous terrains were associated with higher crash frequencies compared to level grade segments.

• Median Width as a variable was negative in the model: The interpretation is the wider the median, the lower the crash frequency compared to segments with narrow median widths.

• Posted Speed Limit as a variable was positive in the model: Segments with high posted speed limits experienced more crashes compared to low posted speed segments.

• The coefficient of traffic volume (AADT) is positive signifying that segments with high traffic volumes experienced more crashes compared to low volume segments.

• Inside Shoulder Width as a variable is positive in the model: Interestingly, this indicates that segments with wider inside shoulders experienced more number of crashes in comparison to those with narrow inside shoulder widths.

• Survey questionnaire from other stated showed that the effectiveness of the cable barrier matches those experienced in Tennessee whereby fatal and severe injury crashes were highly reduced while the PDO crashes went up after median cable barrier installation.

PUBLICATIONS


TIME PERIOD
The project period is 24 months starting 12/15/2011 to 12/14/2013.

CONTACT INFORMATION

Principal Investigator (PI)
Deo Chimba, Ph.D., P.E., PTOE
Associate Professor
Department of Civil and Architectural Engineering
Tennessee State University
Phone: 615-953-5430
Email: dchimba@Tnstate.edu