Roadway Infrastructure and Bus Safety

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Abstract : Very few studies have been conducted to investigate safety issues associated with motorcoach/bus operations. The current study investigates the impact that roadway infrastructure, including locality, roadway grade, traffic flow and traffic density, have on bus safety. A naturalistic driving study was conducted in the U.S.A that involved 43 motorcoaches. Two fleets participated in the study and over 600,000 miles of naturalistic driving data were collected. Sixty-five bus drivers participated in this study; 48 male and 17 female. The average age of the drivers was 49 years. A sophisticated data acquisition system (DAS) was installed on each of the 43 motorcoaches and a variety of kinematic and video data were continuously recorded. The data were analyzed by identifying safety critical events (SCEs), which included crashes, near-crashes, crash-relevant conflicts, and unintentional lane deviations. Additionally, baseline (normative driving) segments were also identified and analyzed for comparison to the SCEs. This presentation highlights the need for bus safety research and the methods used in this data collection effort. With respect to elements of roadway infrastructure, this study highlights the methods used to assess locality, roadway grade, traffic flow, and traffic density. Locality was determined by manual review of the recorded video for each event and baseline and was characterized in terms of open country, residential, business/industrial, church, playground, school, urban, airport, interstate, and other. Roadway grade was similarly determined through video review and characterized in terms of level, grade up, grade down, hillcrest, and dip. The video was also used to make a determination of the traffic flow and traffic density at the time of the event or baseline segment. For traffic flow, video was used to assess which of the following best characterized the event or baseline: not divided (2-way traffic), not divided (center 2-way left turn lane), divided (median or barrier), one-way traffic, or no lanes. In terms of traffic density, level-of-service categories were used: A1, A2, B, C, D, E, and F. Highlighted in this abstract are only a few of the many roadway elements that were coded in this study. Other elements included lighting levels, weather conditions, roadway surface conditions, relation to junction, and roadway alignment. Note that a key component of this study was to assess the impact that driver distraction and fatigue have on bus operations. In this regard, once the roadway elements had been coded, the primary research questions that were addressed were (i) "What environmental condition are associated with driver choice of engagement in tasks?", and (ii) "what are the odds of being in a SCE while engaging in tasks while encountering these conditions?". The study may be of interest to researchers and traffic engineers that are interested in the relationship between roadway infrastructure elements and safety events in motorcoach bus operations.

Keywords : bus safety, motorcoach, naturalistic driving, roadway infrastructure