CHARACTERISTICS AND RISK FACTORS ASSOCIATED WITH WORK ZONE CRASHES

by

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Abstract

In the United States, approximately 1,100 people die and 40,000 people are injured annually as a result of motor vehicle crashes in work zones. These numbers may be a result of interruption to regular traffic flow caused by closed traffic lanes, poor traffic management within work zones, general misunderstanding of problems associated with work zones, or improper usage of traffic control devices. In regard to safety of work zones, this study was conducted to identify characteristics and risk factors associated with work zone crashes in Iowa, Kansas, Missouri, Nebraska and Wisconsin, states currently included in the Smart Work Zone Deployment Initiative (SWZDI) region.

The study was conducted in two stages. In the first stage, characteristics and contributory causes related to work zone crashes such as environmental conditions, vehicles, crashes, drivers, and roadways were analyzed for the five states for the period 2002-2006. An analysis of percentage-wise distributions was carried out for each variable based on different conditions. Results showed that most of the work zone crashes occurred under clear environmental conditions as during daylight, no adverse weather, etc. Multiple-vehicle crashes were more predominant than single-vehicle crashes in work zone crashes. Primary driver-contributing factors of work zone crashes were inattentive driving, following too close for conditions, failure to yield right of way, driving too fast for conditions, and exceeding posted speed limits within work zones. A test of independency was performed to find the relation between crash severity and other work zone variables for the combined states. In the second stage, a statistical model was developed to identify risk factors associated with work zone crashes. In order to predict

injury severity of work zone crashes, an ordered probit model analysis was carried out using the Iowa work zone crash database. According to findings of the severity model, work zone crashes involving trucks, light duty vehicles, vehicles following too close, sideswipe collisions of same-direction vehicles, nondeployment of airbags, and driver age are some of the contributing factors towards more severe crashes.

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CHAPTER 1 - INTRODUCTION

1.1 Background

Transportation in the United States is facilitated by well-developed road, air, rail, and marine networks. A vast majority of the population travels by automobile for shorter and medium distances, with some using this method for even longer distances. Passenger transportation is dominated by personal vehicles that include cars, pickup trucks, vans, and motorcycles, all of which account for 86% of passenger-miles traveled. The remaining 14% of travel is handled by planes, trains, and buses *(1)*.

This predominant usage of the road transportation system emphasizes the importance of proper maintenance and rehabilitation of the highway network, making it more efficient and safer for road users. In this regard, the departments of transportation of various states and other agencies must maintain the roads by proper standards and conditions. Government funding of transportation exists at many levels. Federal funding for highway, rail, bus, and other forms of transportation is allocated by Congress for several years at a time. The current act providing funds for highway maintenance and rehabilitation is the Safe, Accountable, Flexible, Efficient Transportation Equity Act a Legacy for Users (SAFETEA-LU) *(2)*.

As construction of most major highway networks in the United States has already been completed, the majority of current highway work includes maintenance and rehabilitation of those highways, which causes the establishment of work zones. In these work zone areas, disruptions to regular traffic flow are inevitable. These interruptions to regular traffic flows are caused by closed traffic lanes, poor traffic management within work zones, general misunderstanding of the problems associated with work zones, and improper usage of traffic control devices. In this regard, to improve safety and efficiency of traffic operations and highway

work, in 1999 the states of Iowa (the leading state), Kansas, Missouri, and Nebraska created the Midwest Smart Work Zone Deployment Initiative (MwSWZDI). Later in 2001, Wisconsin joined SWZDI. It is supported by the Federal Highway Administration (FHWA). Through SWZDI, researchers investigate better ways of controlling traffic in work zones, thereby improving safety and efficiency of traffic operations and highway workers. SWZDI is currently administered by the Iowa Department of Transportation (IDOT) through the Center for Transportation Research and Education (CTRE) at Iowa State University *(3)*.

1.2 Problem Statement

In the United States, for the past 15 years, nearly 627,433 fatalities have occurred on highways, with nearly 13,643 (2.2%) of these occurring near work zones *(4)* as shown in Figure 1.1**.** This represents a need for additional effort to be put forth in order to increase safety in work zones for both highway users and workers. The percentage of fatalities with respect to different work zone types for the same 15-year period is shown in Figure 1.2**.** Many studies have been conducted on crash characteristics at work zones. However, results are not always consistent with respect to different characteristics identified in each study. When it comes to work zones, even the smallest mistake can be unsafe.

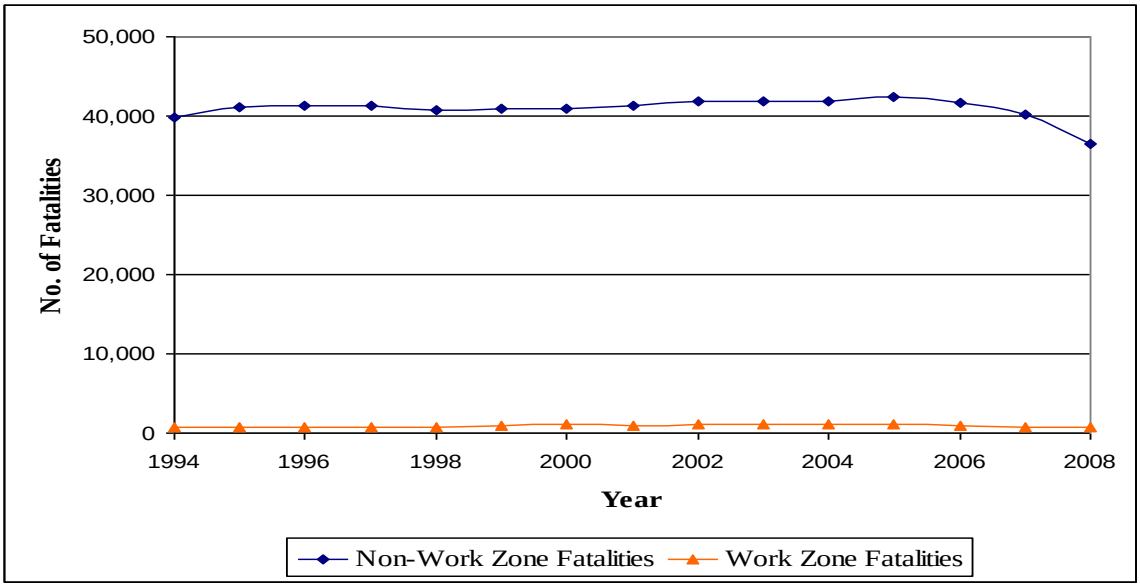

Figure 1.1 Trend of Work Zone and Non-Work Zone Fatalities in the U.S.

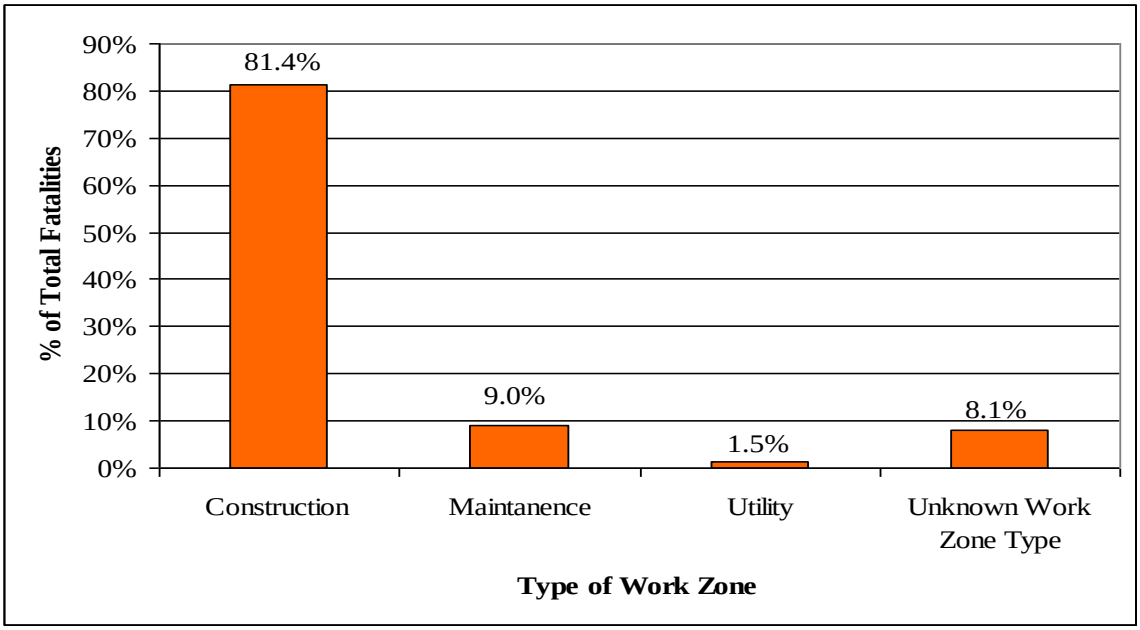

Figure 1.2 Distributions of Work Zone Fatalities Based on the Type of Work Zone

The Manual on Uniform Traffic Control Devices (MUTCD) *(5)* has divided the entire work zone area into four parts: advance warning area, transition area, activity area, and termination area as shown in Figure 1.3. Some research has shown the most dangerous area in a work zone is the activity area in terms of total number of crashes and fatalities *(6)*. However,

other research has shown the advance warning and transition areas to have the highest number of crashes *(7)*.

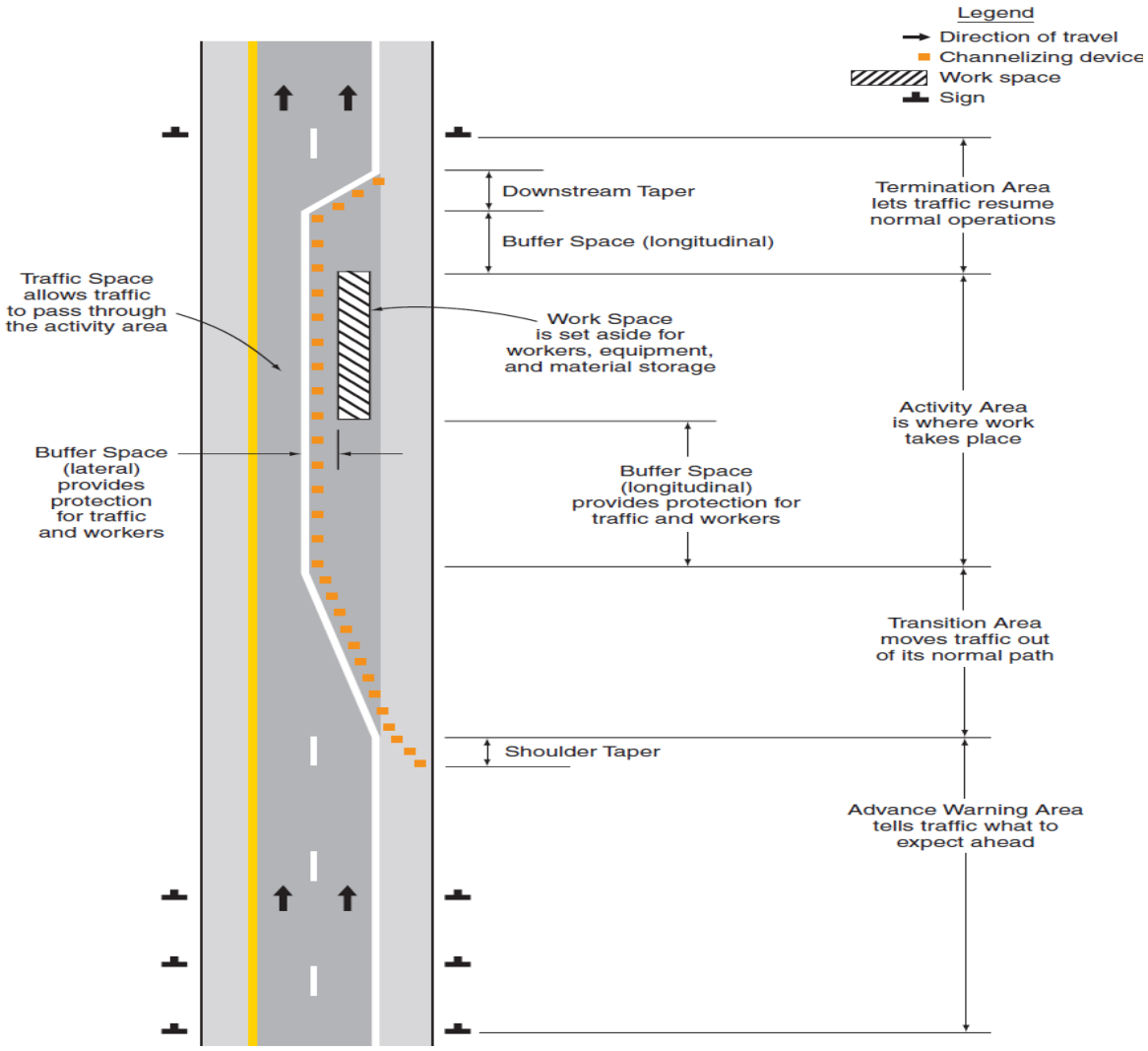

Figure 1.3 Components of a Temporary Traffic Control Zone

1.3 Purpose and Scope

The purpose of this study is to identify characteristics and risk factors associated with work zone crashes occurring in the SWZDI region. Based on the availability of crash data, many aspects were considered such as environmental-related factors, crash-related factors, roadway-related factors, driver-related contributing circumstances, etc. In order to identify characteristics

and risk factors, the crash data was obtained from respective state departments of transportation for the five-year period 2002-2006.

Specific objectives of this study were –

a) To study characteristics and contributory causes of crashes in work zones.
b) To identify risk factors associated with work zone crashes by using statistical model analysis.

1.4 Outline of the Thesis

The first chapter presents a general introduction to work zones and the problem statement of this research, followed by a brief description of the thesis organization. In the second chapter, findings from the literature review on work zone safety-related studies and statistical modeling are presented. The literature review covers work zone safety-related subjects such as previously identified crash characteristics in work zones, comparison of work zone and non-work zone crashes, statistical methods used, suggested countermeasures for particular types of crashes, etc. Data and methodologies used in the analysis are presented in the third chapter along with descriptions of data used in the study. The fourth chapter covers results from both preliminary and statistical analyses, and a detailed discussion is presented by relating results to past findings. Countermeasure ideas suggested by different authors are also presented in the fourth chapter. In the final chapter, summary and conclusions of the findings are presented.

CHAPTER 2 - LITERATURE REVIEW

This chapter presents the literature review related to some of the work zone safety studies completed in the past. It is divided into four parts: work zone crash characteristics, comparison of work zone and non-work zone crashes, work zone countermeasures suggested by previous authors, and injury severity modeling methods.

2.1 Work Zone Crash Characteristics

Previous research related to characteristic analysis of work zone crashes is discussed briefly as follows.

Garber and Zhao *(6)* conducted a study on characteristics of work zone crashes in Virginia occurring between 1996 and 1999. The main objectives of this study were to identify predominant locations within work zones where crashes occurred, to determine frequent types of crashes and distribution of severity at each location, and to study collision type and severity distribution with respect to different road types. In this study, the entire work zone was divided into different areas such as (i) advance warning area, (ii) transition area, (iii) longitudinal buffer area, (iv) activity area, and (v) termination area. All work zone crash locations were identified by careful examination of police accident reports, which included diagrams indicating locations of each crash within the work zone. Results showed that 70% of work zone crashes occurred in the activity area, which indicates the activity area is more susceptible to crashes regardless of the type of highway. For all crashes studied, Property Damage Only (PDO) crashes and rear-end collisions was more predominant in terms of crash severity and collision type. The vast majority (83%) of crashes occurring in the advance warning area were rear-end crashes; hitting a fixed

object off the road was the second highest proportion of crashes accounting for 6% of overall work zone crashes. As one moves from the transition area to the work area, i.e., longitudinal buffer area and activity area, proportions of rear-end and sideswipe crashes decrease and proportions of fixed-object and angle crashes increased. Hargroves *(8)* also found the majority of the crashes occurred in the work area (combining the longitudinal buffer area and activity area), which was 44.7% of total work zone crashes. Nemeth and Migletz *(9)* concluded that 39.1% and 16.6% of accidents occurred in the longitudinal buffer and activity areas, respectively. In another study by Nemeth and Rathi *(10)*, a different set of location categories was used: advance zone, taper zone, crossover zone, and bi-directional zone. Most of these crashes were found to have occurred in crossover and bi-directional (two-lane, two-way operation) zones.

Ha and Nemeth *(11)* identified the nature and seriousness of work zones and major cause and effect relationships between work zone crashes and traffic controls. The researchers analyzed crash data between 1982 and 1986 which had been extracted from accident reports at nine construction sites in Ohio. The analysis focused on impacts of factors such as traffic slowdowns, lane changing or merging, guardrails, and alcohol impairment in work zone crashes. The researchers concluded that work zone crashes as a percentage of all crashes showed a decreasing trend and were less severe than all accidents. The research also showed traffic backups within work zones were the one situation which resulted in most rear-end crashes, and trucks seemed to be the major problem in these situations. Although the number of work zone crashes increased at night, the percentage of nighttime work zone crashes decreased in proportion to all work zone crashes.

Li and Bai *(12)* compared the characteristics of fatal and injury work zone crashes that took place in Kansas for the period 1992-2004. The collected dataset was divided into six

categories with each category consisting of different variables. These variable combinations were identified through statistical independence tests such as the Pearson Chi-Square test and the likelihood-ratio (LR) chi-square test. The study found that head-on collisions were the predominant type for fatal crashes (24%), and rear-end collisions were more predominant in injury crashes (46%). A large percent of fatal crashes involved trucks while a majority of injury crashes involved light-duty vehicles. Researchers also found that multiple-vehicle crashes and crashes occurring within the speed limit range of 51-60 mph were more predominant in both fatal and injury work zone crashes. Driver inattention was the leading cause for both fatal and injury work zone crashes. Results showed that 75% of fatal crashes and 66% of injury crashes involved male drivers, and those drivers aged 35 to 44 were involved in the highest percentage (24%) of fatal crashes among all age groups.

Ullman et al. *(13)* analyzed the effects of night work activity on crashes in two types of construction projects in Texas. The first project type involved both day and night work (hybrid project), whereas the other project type performed work only at night. Researchers determined the change in crash likelihood during periods of active night work, active day work (if applicable), and during periods of inactive work at day and night. Their analysis found that work activity at hybrid projects during both daytime and nighttime resulted in more crashes than during periods of inactive work. At the nighttime projects, a higher percentage of rear-end crashes did appear to occur on nights of work activity. More crashes at night were expected because the night work mostly involved more lane closure than the day work.

2.2 Comparative of Work Zone and Non-Work Zone Crashes

Pigment and Agent *(14)* compared highway work zone crashes with non-work zone highway crashes in Kentucky. Researchers studied traffic crash data and traffic control devices at

20 highway work zones for the three-year period 1983 to 1986. Based on the study, they found that 54.1% of work zone crashes occurred in the work area where the actual work was going on. Results showed that 25.7% of work zone crashes involved trucks, compared to 9.6% of non-work zone highway crashes, and also that most work zone crashes occurred on interstate routes. Results also showed the percentage of rear-end and same-direction, sideswipe crashes in work zone crashes was almost three times the percentage of the same types of crashes in non-work zone crashes. The greatest contributing factor for work zone crashes was vehicles following too close.

Hall and Lorenz *(15)* identified characteristics of work zone crashes that differed from other crashes of comparable roadways in New Mexico. The researchers examined rural, state highway work zone crashes for the three-year period 1983 to1985 to compare crashes on several roadway sections during construction with those in previous years on the same road sections. Results showed the relative proportion of ran-off-road, sideswipe, and overturn crashes decreased by 1 to 2 % during the construction period when compared to the before-construction period. However, the proportion of rear-end collisions increased from 9.4% before construction to 13.8% during construction. In addition, the researchers concluded 1) the proportion of crashes caused mainly by following too close was much higher in during-work-zone periods than in before-work-zone periods; 2) in comparison with the identical period in the prior year, crashes in construction areas increased 33% on the rural interstate system; and 3) improper traffic control was the prevalent problem causing high crash rates in work zones. The researchers suggested work zone safety could be improved by devoting more effort to fields such as education of work-zone-related personnel, preparation and modification of traffic control plans, safety inspections, and better crash record keeping.

Multistate work zone crash characteristics for the states of Alabama, Michigan, and Tennessee were identified and analyzed by Chambless et al. *(16).* Typical work zone crash characteristics and the difference between work zone and non-work zone crashes were determined from analyzed data collected from Critical Analysis Reporting Environment (CARE) software. The over-presentation factor, obtained by dividing the percent of work zone crashes by the percent of non-work zone crashes for that characteristic, was considered in order to determine different crash characteristics. Results showed 63% of work zone crashes took place on interstates and U.S. and state highways, as compared to only 37% of non-work zone crashes. Misjudging stopping distance and following too closely accounted for 27% of work zone crashes, whereas 15% of these types of crashes took place in non-work zone areas. Crashes occurring at speed limits 45 and 55 mph were more predominant (48%) when compared to non-work zone crashes (24%), and drivers more than 25 miles from home were significantly overrepresented in work zone crashes. Pedestrian involvement in work zone crashes occurred at almost the same rate as those involved in non-work zones crashes.

An investigation on fatal crashes in Georgia work zones was carried out by Daniel et al. *(17)* in order to identify countermeasures for improving safety conditions. The main objective of this study was to identify the manner of collision, location, and construction activity most commonly associated with fatal crashes in work zones. Further, fatal crash severity within work zones was compared with fatal crash severity of non-work zone areas. Data was obtained from the Fatality Analysis Reporting System (FARS) database for the period 1995 to1997. Findings showed in work zones, single-vehicle collision crashes were the predominant type with 48.6% of fatal crashes, compared to 56% at non-work zone locations. Passenger vehicles were highly involved in both types of fatal crashes, whereas involvement of trucks in work zone fatal crashes

(20%) were significantly higher when compared to non-work zone (13%) locations. A higher proportion of fatal crashes occurred on rural roadways when compared to urban roadways for both work zone and non-work zone locations. Primary contributing factors to fatal crashes in work zones were driver loosing control, failure to yield, and too fast for conditions, which accounted for nearly 38% of all fatal crashes within work zones. A Chi-Square test was performed to determine the association between fatal crashes within work zones and non-work zone areas. Results showed manner of collision, light conditions, truck involvement, and roadway functional classification of fatal crashes are dependent of the presence of an active work zone.

Garber and Woo *(18)* conducted a study in Virginia to identify prevalent accident and traffic characteristics in urban work zones and to evaluate traffic control devices commonly used in urban work zones. During their study, the researchers collected the before-and-after work zone crash data from several sites in order to find and compare significant crash characteristics. Results showed 1) crash rates increased at a relatively higher rate at urban work zones than at non-work zone locations; 2) angle, rear-end, and sideswipe were predominant collision types in both urban work zones and non-work zones; and 3) work zone crashes were more likely to involve multiple vehicles than non-work zone crashes due to an increase in interaction of vehicles. In terms of traffic control effectiveness, they found 1) the most effective combination of traffic control devices in work zones of multilane highways to be use of cones, flashing arrows, and flagmen; 2) use of barricades as part of any combination of control devices in urban multilane highway work zones seemed to reduce the overall effectiveness of the traffic control devices; and 3) use of flaggers was a highly effective means of traffic control in the work zones on urban, two-lane highways. According to their study results, the researchers suggested urban

work zone lengths should be limited to 0.6 of a mile since longer work zones caused many more crashes.

Rouphail et al. *(19)* compared the crash experience at both long-term and short-term sites before, during, and after freeway construction or maintenance work. The data was obtained from the Chicago Area Expressway System (CAES) for the period 1980 to 1985. Work zone crashes were identified by matching locations and activity dates of a selected number of construction projects (three long-term and 23 short-term projects). The study found 1) at long-term work zone sites, the crash rate increased by an average of 88% during the existence of a work zone site compared to the before period, and decreased by an average of 34% in the after period; 2) for short-term sites, nearly the same crash rate of 0.80 crash/mile-day for construction and maintenance was observed; and 3) predominant work zone crash types were rear-end collisions and ramp-related crashes, especially when lane closures involved the two right lanes adjacent to entrance and exit ramps.

2.3 Work Zone Crash Countermeasures

Past researchers have evaluated several countermeasure ideas in order to mitigate work zone crash risk severity. The following are reviews of studies which suggest suitable countermeasures for parameters which tend to have high work zone crash frequencies**.**

Takemoto et al. *(20)* performed studies on how to improve the understandability of information displayed on road work signs and to examine measures to improve nighttime visibility of traffic control devices. A survey was conducted among road users on road work traffic safety measures and results showed the greatest dissatisfaction with the understandability of road work signs, followed by nighttime visibility of road signs. This study was conducted in two phases; the first phase investigated information road users need from road work signs and

the effect of sign type on driving behavior. The second phase examined Light Emitting Devices used at road work zone signs. The study revealed drivers must first recognize from road work signs that road work is being conducted ahead, which leaves them extra time to think about their reactions. Three display sign boards were used. Sign 1 displayed the text "LANE ENDS," sign 2 displayed the text "LANE ENDS" and a pictograph of merging lanes, and sign 3 displayed the text "MERGE 100 M AHEAD" and showed a pictograph of merging lanes. They divided the entire work zone into three consecutive zones: proceed with caution zone, a lane-changing zone, and a construction zone. The experiment was conducted on an 820 ft (250 m) test track with a speed of 31 mph (50 km/h), and results were analyzed to see where the driver started to change lanes after seeing the road work sign, minimum speed in the construction zone, and speed reduction in the construction zone. Night visibility of work zone road sign boards is very important and several experiments were conducted to come up with the best visibility. The experiment included signs in which an enclosed light source shone through a semi-transparent film, Light Emitting Diode (LED) road work signs brighter than internally illuminated road work signs, and revolving lights used in combination with LED road work signs. Results showed LED road work signs offered the best results.

Christianson et al. *(21)* studied work zone safety with the use of emergency warning lights (EWL) for maintenance vehicles. Accidents associated with roadway work zones suggested that present work zone signals needed improvement. A visual-detection laboratory had worked on improved emergency warning lights for work zone vehicles with the objective of improving visibility and reducing reaction times of drivers approaching work zones. The EWL was literally an orange cone made up of amber-colored LEDs divided into upper and lower sections. The surface of the upper section consisted of LEDs mounted with uniform density and

the lower surface consisted of eight, equally spaced stripes, with each stripe consisting of two closely spaced adjacent columns of LEDs. A very high-intensity signal used on emergency vehicles and other maintenance vehicles presented more light to the eye of the observer and, as a result, the observer and especially the nearby observer needed to close their eyes to avoid being blinded by the excess illumination of the modern signals. The Visual Detection Laboratory (VDL) had come up with a better way to design a signal. It was known as a Motion-Enhanced Warning Signal (MEWS), which consists of four concentric rectangular bars, each with a grid of uniformly spaced LEDs. The bars increase in size as one moves towards the perimeter of the device. These lighted rectangular sequences provide a "looming" effect which alert drivers nearing work zones.

Mattox et al. *(22)* conducted a study on the development and evaluation of a speed-activated sign to reduce speeds in work zones. In South Carolina, work zone crashes tripled from the beginning of the year 2000 to the end of the year 2003, and a leading cause of vehicle crashes near work zones was driving too fast. Due to the increasing number of work zone crashes and fatalities in South Carolina, improving driver attention and reducing vehicle speeds in work zones had become a priority of the South Carolina Department of Transportation (SCDOT). The limited availability of law enforcement and inadequate funding for widespread deployment of expensive technologies, led transportation agencies to require more affordable technologies to reduce speeds near work zones. To address this need, SCDOT deployed a traffic control device known as a speed-activated sign near work zones. A speed-activated sign triggers a flashing beacon when a predetermined speed threshold is exceeded. For the purpose of evaluation of the speed-activated sign, three locations in each work zone were selected such that the three stations were positioned before, at, and after the speed-activated sign. Variability of speeds of the

approaching vehicles was collected using laser speed guns with radar detectors. The speed data was collected for two conditions: one without the speed-activated sign and one with the speed-activated sign in place. Combined results for all locations showed the average mean speed was reduced by 3.29 mph and the 85% speed was reduced by 3.22 mph. Average speed reduction on the percentage of vehicles exceeding the speed limit by more than 3 mph was 23.42% and by more than 10 mph was 5.75%. It was recommended the speed-activated sign be placed in the advance-warning area of work zones to slow vehicles prior to entering activity areas.

Vicki and Jonathan *(23)* conducted a study which examined work zone crash countermeasures to identify effective countermeasures used in Arizona to reduce accidents in work zones. The first objective of this project was to characterize the nature of work zone accidents in Arizona. To accomplish this, a total of 14,905 work zone accidents taking place between 1992 and 1996 were collected from the Accident Location Identification Surveillance System (ALISS) accident record database. This included accidents taking place near three locations: under-construction locations where through-traffic was allowed and where traffic was detoured within the work zones, existing temporary lane closure areas, and under-repair areas. These accidents were analyzed by categorizing them into two different groups: severity (number of fatal, injury, and property damage accidents), and conditions when accidents took place. Based on results obtained from the analysis, different effective countermeasures were recommended in order to reduce accidents in work zones. One countermeasure recommended was police presence in the advance warning area of work zones, which reduced speeding of vehicles. Another countermeasure recommended was speed limit enforcement in work zones by displaying license plate numbers of speeding vehicles, Changeable Message Signs (CMS), and radar-activated sound systems. The researchers also recommended no reduction or a minimal

reduction in speed limit (a reduction of 10 mph or less), temporary pavement markings in work zones, sign credibility, and public education about work zones will also help to reduce crash rates in work zone areas.

A study conducted by Kamyab and Brandon *(24)* dealt primarily with the effectiveness of fluorescent yellow-green background for vehicle-mounted work zone signs. Moving work zones have fewer traffic control devices than stationary work zones and provide no buffer space for vehicles that encroach on work zones on multilane roadways. To improve the safety of moving operations in multilane highways, the Iowa Department of Transportation (Iowa DOT) created a six-inch fluorescent yellow-green (FYG) background for work zone signs mounted on the back of work zone vehicles. This study examined the impact of the sign's improved visibility in encouraging drivers to make an early merge to the open lane prior to a lane closure. Data for this research was collected from four sites on US 30 to 161 and Boone, and I-35 to 118 and 101. Results showed a 5% reduction of right-lane traffic proportion on US 30 to 161 sites and a 2% reduction of right-lane traffic on I-35 to 101 sites.

Another study report *(25)* dealt with use of police in work zones on highways in Virginia for controlling speed by positioning a staffed police car at the beginning of the work zone with its lights flashing and radar on. The criterion considered in determining whether to use police in a work zone depends on the Average Daily Traffic (ADT). Types of work zones in which police are used depend on the duration of the work. Current guidelines suggest the officer be stationed in a lane closure 500 to 1,000 feet in advance of the first work crew. The report on effectiveness of using police in work zones for reducing speeds and improving safety was based on survey results. A questionnaire survey was sent to personnel in the Virginia Department of Transportation (VDOT), Virginia State Police (VSP), and VMS Inc. asking respondents'

opinions about the effectiveness of using police in work zones. Results showed 97% of the people responded positively. Use of police in work zones was almost unanimously felt to be effective in reducing speeds and improving safety with few adverse effects. Current guidelines regarding positioning of officers in work zones are being followed in practice as officers are most typically stationed at the beginning or in advance of the lane closure.

The influence of a combination of fixed and variable message signs on the speeds of motorists approaching an interstate work zone was evaluated by Huebschman et al. *(26).* In Indiana, a series of interstate work zone signs were deployed with the objective of reducing the frequency of rear-end collisions and motorists' speeds approaching to and through the work zone. The work zone signs used were the same signs commonly used in Indiana, along with use of variable message signs displaying the number of traffic fines issued to date in the work zones. This procedure was selected because of anecdotal reports in Illinois of speed reductions when similar signs were deployed in the upstream flow of work zone areas. At each location, the research team collected speed data of approximately 300 vehicles departing from the collection location. This sample size was chosen in order to obtain an adequate number of observations. A t-test was used to determine if a significant speed reduction had occurred and to what degree. The study indicated that the "Construction Zone Traffic Fines" panel sign resulted in a statistically significant reduction, i.e., a 5 mph reduction of mean speed of motorists in the "heart" of the work zones where the construction activity occurred and where workers were present. Although this speed reduction was only found within the work zone locations, the panel signs could be viewed as beneficial. The study also indicated the variable message signs displaying the number of traffic fines issued to date in the work zone, and the updating of this message, did not produce a meaningful reduction in the mean speeds of motorists.

The Georgia Department of Transportation (GDOT) had supported research on smart work zones using sensors to measure traffic density and speed, and how these could affect traffic flow when the information was transmitted via computer to traffic advisory signs located over interstates as analyzed in a study conducted by Kuennen *(27)*. Kuennen reviewed all studies conducted on real-time information systems and briefly summarized them. Real-time traffic control systems were used for construction of a major bridge along I-55 south of Springfield. This system consisted of 17 remotely controlled portable Dynamic Message Signs (DMS), eight portable traffic sensors, and four portable cameras linked to a base station server via wireless communication. The setup covered the work zone area as well as northbound and southbound approaches to it. Traffic sensors collected vehicle speed and presence data, which were transmitted to a central base station that generated predetermined messages through DMS based on the level of traffic congestion. This system led to significant cost savings by leasing it as a bid item. As an extension of this idea, the Washington Department of Transportation used the Roboflagger on projects for doing traffic control at night. The main advantage of the Roboflagger was that it could be used during huge downpours and dense fog situations. It consists of a 12 ft tall steel device with automatic arms and lights remotely operated at a safe distance by a human flagger behind traffic safety barriers.

A system for providing speed advisories to drivers entering work zones called Intellizones was evaluated by Alan et al. *(28)*. Intellizones consist of a series of microwave detectors and portable message signs, linked together by wireless communication. The detectors each record speed, volume, and occupancy for 30 seconds for every traffic lane, and then the system computes a "decision speed" that is a volume-weighted average of speeds over all lanes over the previous three minutes. This decision speed was displayed in 10 mph ranges. The sign

was blanked when speeds were greater than 50 mph, and the sign displayed a "stopped traffic" warning when the speeds were less than 20 mph. The speed advisory alternated with the constant phrase, "Actual Speeds Ahead." The study site selected was northbound US 41 in Green Bay, Wisconsin; because of its anticipated heavy volumes due to the combination of urban peak hour traffic and vacation traffic on Friday afternoons. The evaluation was carried out using Intellizone detectors and a questionnaire administered to drivers who had just passed through the work zone. Results showed that 60% of drivers were generally satisfied with the speed advisory signs and most drivers felt the signs were accurate. The signs did not cause an appreciable fraction of drivers to divert to alternate routes. Drivers diverting from the work zone, regardless of reason, reported the same amount of delay as drivers who did not divert.

"*Evaluation of Supplementary Traffic Control Measures for Freeway Work Zone Approaches*" was studied by Kristen et al. *(29)*. Lane closure on a four-lane high-speed facility during construction or maintenance activity created many potential safety problems. It required the driver to make behavior adjustments, such as reducing speed and/or changing lanes on freeways where the traffic volume was very high. Problems often occur when two or more lanes of traffic are closed for construction activity and drivers must be warned sufficiently in advance in order to travel safely through one lane. In order to improve the flow conditions approaching work zones, four states (Missouri, Kansas, Iowa, and Nebraska) cooperated in a pooled-fund study of various additional traffic control devices, called the Midwest Smart Work Zone Deployment Initiative (MwSWZDI). The three traffic control devices evaluated were white lane drop arrows, a CB wizard alert system, and orange rumble strips. The site selected for the research was an interstate freeway (I-70) passing through Columbia, Missouri. Vehicle speeds, volumes, and vehicle classifications were collected in 15-minute intervals before each of the

devices were in place (before cases) and again after each were installed (after cases). Results showed that although thickness of the rumble strips was not sufficient to provide audible and tactile warning, the color of the strips alone was sufficient to have a positive effect on the 85th percentile speed and mean speed. The CB wizard alert system didn't show statistical significant changes in Kansas, but drivers responded positively in Iowa. Installation and removal of these traffic control devices was proven to be very easy, efficient, and portable.

Design, performance, and validation of an Automated Work Zone Information System (AWIS) using monitored traffic data before and during construction was performed by Lee and Kim *(30).* AWIS was developed and employed in urban freeway construction activities. AWIS consisted of traffic data collecting devices to monitor traffic conditions, portable Changeable Message Signs (CMS) to display traffic information, and a server station where the Virtual Transportation Operation Center (VTOC) was run to estimate travel time in the programmed algorithm. The devices were connected to the server through a wireless communication service. The main purpose of AWIS was to communicate real-time travel information to road users heading into the work zone corridor so that they could decide whether to take a detour route or continue through the Construction Work Zone (CWZ). During the construction process on the I-15 Devore corridor in San Bernardino County, California, travelers were able to observe traffic conditions even before they entered the CWZ corridor and were guided by on-site AWIS messages to detour to either neighboring freeways or arterial roads. The off-site AWIS messages on the project website gave travelers the information required to make decisions about their travel plans and trip patterns, including departure times, modes, and alternate routes.

2.4 Injury Severity Modeling

Kockelman and Kweon *(33)* used ordered probit modeling to examine the risk of different injury levels sustained by drivers under all crash types, two-vehicle crashes, and single-vehicle crashes. Therefore, three data sets were prepared for estimation which had been derived from the General Estimates System (GES). Results showed that in terms of the severity of injuries sustained by drivers, manner of collision, number of vehicles involved, driver gender, vehicle type, and driver's under the influence of alcohol were associated with more severe injuries. In manner of collision, rollover and head-on collisions were particularly contributing to more severe injury levels. In two-vehicle crashes, driver age, female gender, and nighttime driving tended to increase driver injury severity. However, pickups trucks and SUVs were associated with less severe injuries for their drivers and more severe injuries for occupants of the other vehicles involved. In case of single-vehicle crashes, pickups and SUVs were less safe than passenger cars. Another study conducted by Ma and Kockelman *(34)* investigated the relationship between occupant injury and a host of other factors, including traffic and weather conditions present at the time of crash, road design, vehicle type, and occupant characteristics by using ordered probit model. Results showed that speeding, following too close, female drivers, older persons, and those in passenger cars were more prone to increased injury severity.

Khattak et al. *(35)* had applied both ordered probit and binary probit modeling approaches in investigating risk factors in large-truck rollovers and injury severity due to single-vehicle crashes. In this approach, binary probit models had been used to estimate rollover propensity of large trucks, while ordered probit models were used to model injury severity. Results showed that dangerous truck driver behaviors, particularly speeding, reckless driving, alcohol and drug use, non-use of restraints, and traffic control violations, were the factors which

increased injury severities. Duncan et al. *(36)* also analyzed injury severity in truck-passenger car; rear-end collisions using ordered probit modeling. Based on their model, they concluded that darkness, high speeds, grades, alcohol, and being a female were factors which increased passenger vehicle occupant severity.

Khattak et al. *(37)* also conducted a study using ordered probit modeling to isolate factors that contribute to more severe injuries to older drivers involved in traffic crashes. Factors related to vehicle, roadway, driver, crash, and environmental conditions were considered. They found that alcohol-related crashes and crashes involving farm vehicles were more likely to cause serious injuries to older drivers. Klop and Khattak et al. *(38)* also examined the factors influencing bicycle crash severity on two-lane, undivided roadways in North Carolina. Impacts of physical and environmental factors on the severity of injury to bicyclists were examined. Using the ordered probit model, the effect of a set of roadway, environmental, and crash variables on injury severity was explored. Roadway characteristics that increased severity were speed limit, straight grades, and curved grades, which again were likely related to driver- and cyclist-impaired braking, acceleration, and maneuverability. Environmental factors, including fog and unlighted darkness, increased injury severity, most likely related to their effect on driver reaction time and speed differentials at the point of impact. Average annual daily traffic, an interaction of shoulder width, and speed limit variables, and street lighting, were associated with decreased injury severity.

Indike Ratnayake *(39)* carried out an analysis using the Kansas Accident Reporting System (KARS) crash data, considering all ages who met with a crash during 1999 to 2002. Ordered probit modeling was used to investigate critical factors contributing towards higher crash severity in rural/urban highway crashes. According to the author, most of the contributing

factors towards high severity crashes were common for both rural and urban areas. Among the research findings, alcohol involvement, excessive speed, driver ejection, and curved and graded roads were the contributory factors for high-severity crashes.

Abdel-Aty *(40)* analyzed driver injury-severity levels using the ordered probit modeling methodology. Three different models were developed for roadway sections, signalized intersections, and toll plazas in central Florida. Results showed several factors common in all three models such as driver age, gender, seat belt use, vehicle type, point of impact, and speed ratio. Further results revealed that wherever a crash occurred, older drivers, male drivers, and those not wearing seat belts had a higher chance for severe injuries. Results from the roadway section model showed that crashes at curves and those in rural areas were more likely to cause injuries. In the signalized intersection model *(41)*, it was found that driver violation was significant; and in toll plazas, vehicles equipped with electronic toll-collection devices had a propensity for higher injury severity.

It is the usual practice to report crash or injury severity in three or more categories such as fatal, incapacitating, property damage only, etc. This makes it possible to order the severity level from most severe to less severe. In other words, the severity, the response variable in the model, could be considered as an ordinal variable. This type of variable can be modeled using ordered choice models. This phenomenon has been applied to model injury severity using both ordered probit and ordered logit models by O'Donnell and Conner *(42)*. In this study, they considered comparatively higher number of factors to model injury severity. They found that factors such as alcohol involvement, lack of seatbelt usage, occupant being a female, and excessive speed were significant towards increased injury severities. According to their

conclusion, both ordered probit and ordered logit methods produced similar results in modeling injury severity, although the magnitudes of the estimations were different.

CHAPTER 3 - METHODOLOGY

3.1 Data

For the first stage of the study, work zone crash data for the SWZDI region states were obtained from the respective departments of transportation. For the analysis in this study, crash data from years 2002 to 2006 were considered. The first part of this study focused mainly on identifying characteristics of work zone crashes for the SWZDI region states based on past crash data. Therefore, crash data were analyzed based on various aspects such as driver, crash, roadway, and environment-related factors. Crash files from each state were merged by matching the unique crash identification codes using Statistical Analysis System (SAS) software *(45)*. Variables included in crash characteristics of each state were retrieved using Microsoft Excel and Microsoft Access. Detailed work zone crash characteristics are presented in Appendix A.

In the second stage of the study, out of five states, only the Iowa crash data set was used for the statistical modeling analysis. As of 2006, only Iowa and Nebraska had work zone related factors included in their data sets. Other states may have revised their crash report forms after 2006. Crash report forms used for this study are presented in Appendix B. In these two states, the Iowa crash data set had more complete details related to work zone crashes when compared to the Nebraska data. In addition, each individual injury severity resulting from a crash had been categorized into five levels: fatal, incapacitating, non-incapacitating, possible, and property damage only (no injury). Severity of a crash was identified based on the highest injury severity sustained by an involved person due to the crash. For example, if there was at least one fatality resulting from a crash, it was defined as a fatal crash; and if the highest level of injury was an incapacitating injury, then it was defined as an incapacitating injury, and so on. For the ordered

probit analysis, some data lines were deleted where data were missing in at least one variable. After doing that, about 3,764 work zone crashes remained for analysis.

3.1.2 Data Limitations

As data for this project came from five different states, considerable complications were encountered while comparing or combining similar parameters among the five states in the first part of the study. Characteristics considered from the data sets were not always described elaborately creating difficulty in understanding their precise definitions. Sample crash report forms of all five states used in this study are presented in Appendix B. Lack of exposure-related factors in the data sets, such as the number of vehicles passing through the work zones during daytime and nighttime, length and duration of work zone, status of the work whether active or inactive at the time of crash, etc. limited the study in terms of analyzing the work zone crashes more precisely.

3.2 Data Analysis

3.2.1 Test of Independence

This method tests the relation between two variables using Chi-Square distribution *(43)*. Hypotheses for this test of independence are as follows:

H_o: The two variables are "independent" of each other; and

H_a: The two variables are "dependent" on each other

where H_o is the null hypothesis and H_a is the alternative hypothesis.

Let us consider an example of light conditions vs accident severity. The observed frequencies are shown in Table 3.1.

Table 3.1 Observed values for light conditions vs crash severity

Light Condition	Crash Severity			Total
	Fatal	Injury	PDO	
Daylight	n_{11}=175	n_{12} = 8,787	n_{13} = 24,179	n_{1+}= 33,141
Poor Visible Conditions	n_{21}=121	n_{22} = 3,168	n_{23} = 7,574	n_{2+} = 10,863
Total	n_{+1}=296	n_{+2} =11,955	n_{+3} = 1,753	n = 44,004

Expected values are calculated based on the assumption the null hypothesis is true.

$$ExpectedValue = \frac{(Row\ i\ total) \times (Column\ j\ total)}{Sample\ size} \tag{3.1}$$

The expected frequency for the n_{11} can be calculated as follows:

$$n_{11} = \frac{(n_{1+}) \times (n_{+1})}{(n)} \tag{3.2}$$

The expected values for the Table 3.1 values are presented in Table 3.2.

Table 3.2 Expected values for light conditions vs crash severity

Light Condition	Fatal	Injury	PDO	Total
Daylight	222.9	9,003.7	23,914.3	33,141
Poor Visible Conditions	73.1	2,951.3	7,838.7	10,863
Total	296	11955	31753	44,004

The Chi-Square value is calculated using the following formula:

$$\chi^2 = \sum \frac{(\text{Observed Frequency} - \text{Expected Frequency})^2}{\text{Expected Frequency}} \tag{3.3}$$

Once the chi-square value is calculated for the data, it can be compared with the tabular values with a desired degree of freedom and user-defined confidence levels. The degree of freedom can be obtained by multiplying (Number of rows-1)* (Number of columns -1) *(43).*

For the example shown in Table 3.2, the value of the test statistic is χ^2= 74.7. At 95% confidence level, the value shown in the table for two degrees of freedom is 5.991. Since the

calculated χ^2 > the table value, the null hypothesis is rejected and it can be concluded that crash severity and light conditions are dependent of each other. The test of independence was carried out for all other variables considered in this study with crash severity and the results are presented in Table 4.1.

3.2.2 Ordered Probit Modeling

The ordered probit model has the ability to recognize the indexed nature of various response variables *(33)*. A variable can be considered as ordinal when its categories can be ranked from low to high, where the distance between adjacent categories is unknown *(44)*. Injury severity in motor vehicle crashes can also be ordered as fatal injury, disabling or incapacitating injury, non-incapacitating injury, possible injury, or no injury ranging from the highest severity level to the lowest according to the severity of injuries caused to occupants. According to Long *(44)*, simply because the values of a variable can be ordered, does not imply the variable should be analyzed as ordinal. But in this study, the response variable, injury severity, can be analyzed as ordinal because, in reality, when a crash occurs, injury severity of that crash can be ordered from lowest severity to highest severity level as mentioned in the above statement. Further, Long *(44)* has discussed the applicability of ordered logit and probit models in detail in his publication.

The ordered probit model can be derived from a measurement model in which a latent variable y* ranging from -∞ to ∞ is mapped to an observed ordinal variable y, injury severity in this case. The latent variable y* is continuous, unobservable, and used to derive the measurement model as follows:

$$yi = m \qquad if \ \ \tau_{m-1} \le y^* < \tau_m \qquad for \ m = 1 \, to \ J \tag{3.4}$$

The τ's are called thresholds or cutoff points. The extreme categories *1* and *J* are defined by open-ended intervals with $\tau_0 = -\infty$ and $\tau_J = \infty$. The observed y is related to y*, according to the measurement model:

$$y_i = \begin{cases} 1 \rightarrow \textit{No injury} & \textit{if } \tau_0 = -\infty \le y^* < \tau_1 \\ 2 \rightarrow \textit{Possible} & \textit{if } \tau_1 \le y^* < \tau_2 \\ 3 \rightarrow \textit{Non-incapacita ting} & \textit{if } \tau_2 \le y^* \tau_3 \\ 4 \rightarrow \textit{Incapacita ting} & \textit{if } \tau_3 \le y^* < \tau_4 \\ 5 \rightarrow \textit{Fatal} & \textit{if } \tau_4 \le y^* < \tau_5 = \infty \end{cases} \tag{3.5}$$

The structural form for the ordered probit model with binary response can be considered as

$$y_i^* = x_i \beta + \varepsilon_i \tag{3.6}$$

x_i is a row vector with a 1 in the first column for the intercept and the i^{th} observation for x_k in column *k+1*. β is a column vector of structural coefficients with the first elements being the intercept β_0, and ε_i is the error term.

In order to estimate the regression of y* on *x* as in binary regression modeling, the maximum likelihood (ML) estimation can be used with an assumption. In ordered probit modeling, the error term ε_i is assumed to be distributed normally with a mean of 0 and variance of 1, and the respective probability density function (pdf) and cumulative distribution function (cdf) are as follows:

$$\phi(\varepsilon) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{\varepsilon^2}{2}\right) \tag{3.7}$$

$$\Phi(\varepsilon) = \int_{-\infty}^{\varepsilon} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt \tag{3.8}$$

Once the distribution of the error is specified, the probabilities of observing values of y given *x* can be computed. For example, if the injury severity of a crash whose victim of a motor vehicle crash is fatal, the y value is 5 and y* falls between τ_4 and $\tau_5 = \infty$. Accordingly, the probability formula will be

$$\Pr(y_i = 5 | x_i) = \Pr(\tau_0 \le y_i^* < \tau_1 \mid x_i) \tag{3.9}$$

By substituting equations 3.6 and 3.8, the expression becomes

$$\Pr(y_i = 5 | x_i) = \Phi(\tau_5 - x_i\beta) - \Phi(\tau_4 - x_i\beta) \tag{3.10}$$

By generalizing the equation to compute the probability of any observed outcome y = m given *x*, it becomes

$$\Pr(y_i = m | x_i) = \Phi(\tau_m - x_i\beta) - \Phi(\tau_{m-1} - x_i\beta) \tag{3.11}$$

Let β be the vector with parameters from the structural model, with the intercept βo in the first row, and let τ be the vector containing the threshold parameters. Either βo or τ_1 is constrained to 0 to identify the model. In this analysis, the SAS version of 9.1 was used, which considered the τ_1 value as equal to 0.

$$\Pr(y_i = m | x_i, \beta, \tau) = \Phi(\tau_m - x_i\beta) - \Phi(\tau_{m-1} - x_i\beta) \tag{3.12}$$

If the observations are independent, the likelihood equation is

$$L(\beta, \tau | y, X) = \prod_{i=1}^{N} p_i \tag{3.13}$$

By combining equations 3.12 and 3.13,

$$L(\beta, \tau | y, X) = \prod_{j=1}^{J} \prod_{yi=j} \left[\Phi(\tau_j - x_i\beta) - \Phi(\tau_{j-1} - x_i\beta)\right] \tag{3.14}$$

Π y_i=j indicates multiplying in each case where y is observed to equal j. Using logs, the log likelihood is

$$\ln L(\beta, \tau \mid y, X) = \sum_{j=1}^{J} \sum_{yi=j} \ln\left[\Phi(\tau_j - x_i\beta) - \Phi(\tau_{j-1} - x_i\beta)\right] \tag{3.15}$$

Using numerical methods, the equation can be maximized to find τ's and β's. The marginal effect from *x* factors can be considered by computing the partial changes in the equation in order to interpret the regression model. By taking the partial derivative with respect to x_k in equation 3.12, the result becomes

$$\begin{aligned} \frac{\partial \Pr(y = m|x)}{\partial x_k} &= \frac{\partial \Phi(\tau_m - x\beta)}{\partial x_k} - \frac{\partial \Phi(\tau_{m-1} - x\beta)}{\partial x_k} \\ &= \beta_k \left[\phi(\tau_m - x\beta) - \phi(\tau_{m-1} - x\beta)\right] \end{aligned} \tag{3.16}$$

The partial change or marginal effect is the slope of the curve relating x_k to Pr(y=m|x), holding all other variables constant, and is usually computed at the mean values of all variables.

According to the ordered regression model equation, explanatory variables are linearly related to the response variables and thus have an increasing effect on injury severity if the variable estimate has a positive value and vice versa for variable estimates with negative values. Model output under selected categories is as follows.

3.2.2.1 Goodness of Fit Measure

In linear regression models, the goodness of fit is usually measured by the R^2 value, whereas there is no such straightforward measure to evaluate model fitness of ordered probit models. McFadden (1974) suggested using a Likelihood Ratio Index (LRI) analogous to the R^2 in the linear regression model**.**

$$R^2{}_M = 1 - \left[\ln L / (\ln L_0)\right] \tag{3.17}$$

where

L = the value of the maximum likelihood function, and

Lo = likelihood function when regression coefficients, except for the intercept term, are zero.

The R^2_M value is bounded by zero and one, where one denotes perfect fit of the model. Another goodness of fit measure used is the Akaike Information Criterion (AIC) which is calculated as follows

$$AIC= -2 \ln(L) + 2(K) \quad (3.18)$$

where

ln(L) = log likelihood value for the model, and

k = Number of parameters estimated.

The lower AIC value is the better value, which denotes the perfect fit of the model. Similarly, a few other values are given in the SAS output such as Estrella, Adjusted Estrella, Veall-Zimmermann, and McKelvey-Zovoina, which can also be considered in evaluating goodness of fit of a model.

In regression modeling, significance of individual parameters towards the model is important and overall goodness of fit also plays a vital role in that aspect. In SAS *(45)*, a PROC QLIM procedure was used, and in the output for an ordered probit model, a number of goodness of fit measurements was given because unlike other regression modeling, there is no such single value which can determine the model fitness consistently. As a result, various values given in terms of probabilities were considered when selecting models, and out of that, McFadden's LRI was considered in this study. Similarly, the AIC and Estrella values are also desirable in discrete choice modeling.

Complications encountered while merging the five-year crash data sets and different statistical methods used to identify the risk factors associated with work zone crashes were presented in the next results and discussion chapter of this thesis.

CHAPTER 4 - RESULTS

Details of work zone crashes of each state included in the SWZDI were obtained from respective state departments of transportations such as Iowa Department of Transportation (IDOT), Kansas Department of Transportation (KDOT), Missouri Department of Transportation (MoDOT), Wisconsin Department of Transportation (WisDOT), and Nebraska Department of Roads (NDOR). Detailed crash characteristics of each state are presented in Appendix A. As data for this project came from five different states, considerable complications were encountered while comparing or combining similar parameters among the five states. Characteristics considered from the data sets were not always described elaborately and there was difficulty in understanding their precise definitions. Crash report forms of all five states are presented in Appendix B. The data shown only represents the percentages and frequencies of the work zone crashes; it does not show any relation with the respective exposure data. Data obtained was retrieved using accident sample forms of five states, which are presented in Appendix B. Summary statistics of total work zone crashes in the SWZDI region states by severity are presented in Table 4.1, and the non-work-zone crashes are presented in Table 4.2.

Table 4.1 Work zone crash severity for Iowa, Kansas, Missouri, Wisconsin, and Nebraska for the combined 5-yr period from 2002-2006

Crash Severity/ State	Iowa	Kansas	Missouri	Nebraska	Wisconsin	Total
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Fatal	28 (0.6)	69 (0.8)	113 (0.6)	41 (1.4)	59 (0.7)	310 (0.7)
Injury	1,472 (34)	2,092 (23.3)	7,281 (37.4)	1,184 (41)	3,059 (33.8)	15,088 (33.8)
PDO	2,832 (65.4)	6,803 (75.9)	12,056 (62)	1,662 (57.6)	5,927 (65.5)	29,280 (65.5)
Total	4,332 (100)	8,964 (100)	19,450 (100)	2,887 (100)	9,045 (100)	44,678 (100)

Table 4.2 Non-work zone crash severity for Iowa, Kansas, Missouri, Wisconsin, and Nebraska for the combined 5-yr period from 2002-2006

Crash Severity/ State	Iowa	Kansas	Missouri	Nebraska	Wisconsin	Total
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Fatal	1,865 (0.6)	2,001 (0.6)	3,905 (0.9)	1,181 (0.6)	3,485 (0.6)	12,437 (0.7)
Injury	85,725 (29.8)	82,048 (23.3)	121,822 (27.9)	69,345 (35.4)	187,250 (30.1)	546,190 (28.8)
PDO	199,835 (69.5)	268,488 (76.2)	310,784 (71.2)	125,173 (64)	431,842 (69.4)	1,336,122 (70.5)
Total	287,425 (100)	352,537 (100)	436,511 (100)	195,699 (100)	622,577 (100)	1,894,749 (100)

In the SWZDI region, nearly 44,678 crashes occurred in work zones during the combined five-year period from 2002 to 2006 whereas, 1,894,749 crashes took place in non-work zones. As a percentage, work zone crashes represented 2.30% of all crashes. When compared to total crashes, it is small number, but they might be more avoidable than other types of crashes. These crashes indicate a necessity to identify effective countermeasures for improving safety in work zones.

4.1 Work Zone Crash Characteristics for Iowa

As Iowa was one of the two states that had separate work zone crash data sets, the work zone crash characteristics for Iowa for the period 2002-2006 were analyzed and are presented in Figures 4.1 to 4.18. Detailed work zone crash characteristics for Iowa are presented in Appendix A.1. All results presented here do not consider the exposure data such as number of vehicles passing through the work zones, Average Daily Traffic (ADT), etc. The data was divided into different categories such as environmental-related factors, vehicle-related factors, driver-related contributory factors, crash-related factors, road characteristics, and other contributing factors which prevail or contribute to crashes in work zones.

4.1.1 Environmental Related Crashes

Work zone crashes based on different light conditions in Iowa are shown in Figure 4.1. Analysis of work zone crashes showed that most of them (79%) occurred during daylight conditions. Higher traffic volumes and more active work zones during this time might be reasons for this high percentage.

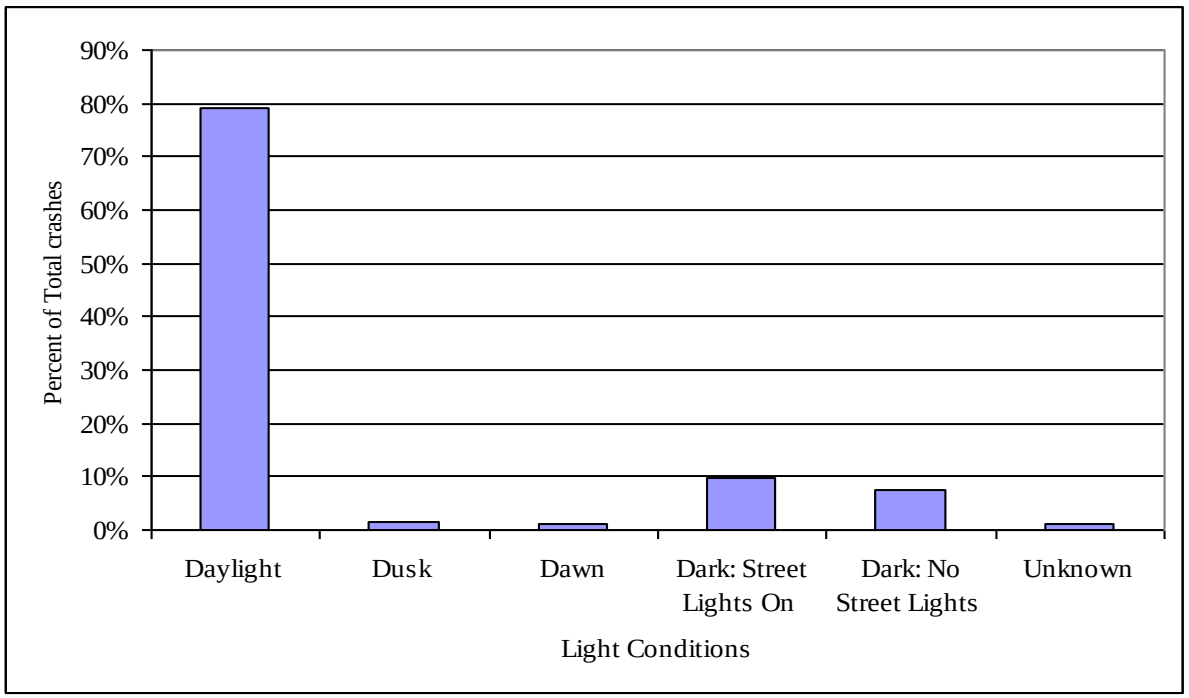

Figure 4.1 Work Zone Crashes Based on Different Light Conditions – Iowa

Work zone crashes based on different weather conditions are shown in Figure 4.2. Weather conditions at the time of work zone crashes showed a major proportion of crashes (58.4%) occurred under clear weather conditions. A minor proportion (18.2%) of work zone crashes occurred under partly cloudy conditions. Detailed weather-related characteristics of Iowa are presented in Appendix A.1.

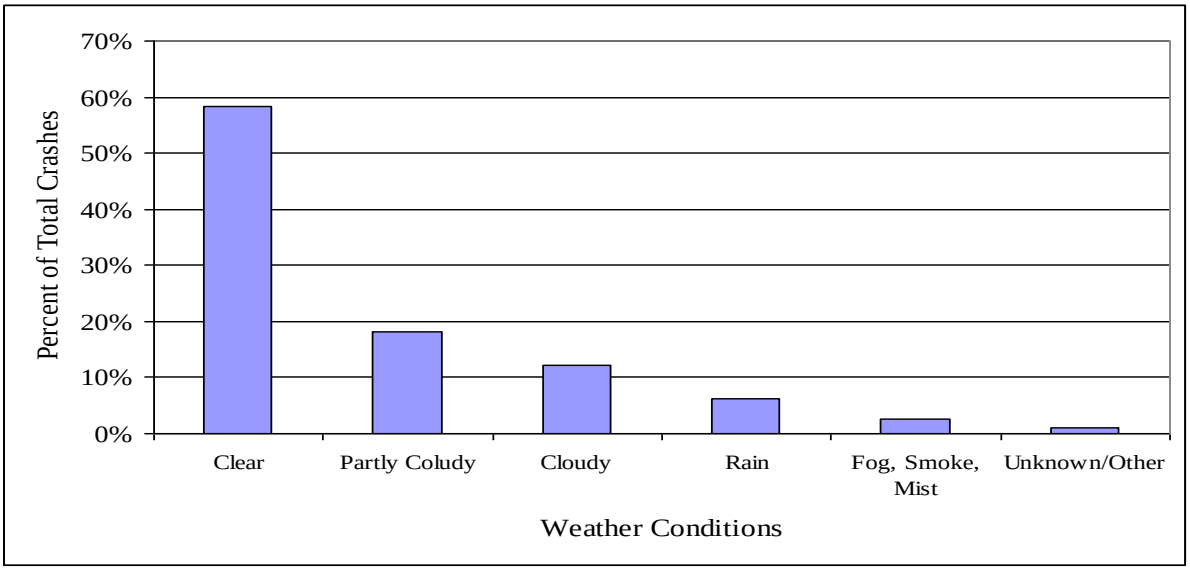

Figure 4.2 Work Zone Crashes Based on Different Weather Conditions – Iowa

Work zone crashes based on road surface conditions in Iowa are shown in Figure 4.3. Results showed the highest percentage of work zone crashes occurred during dry pavement conditions (82.2%). This could be due to major maintenance and rehabilitation work usually being done during clear environmental conditions.

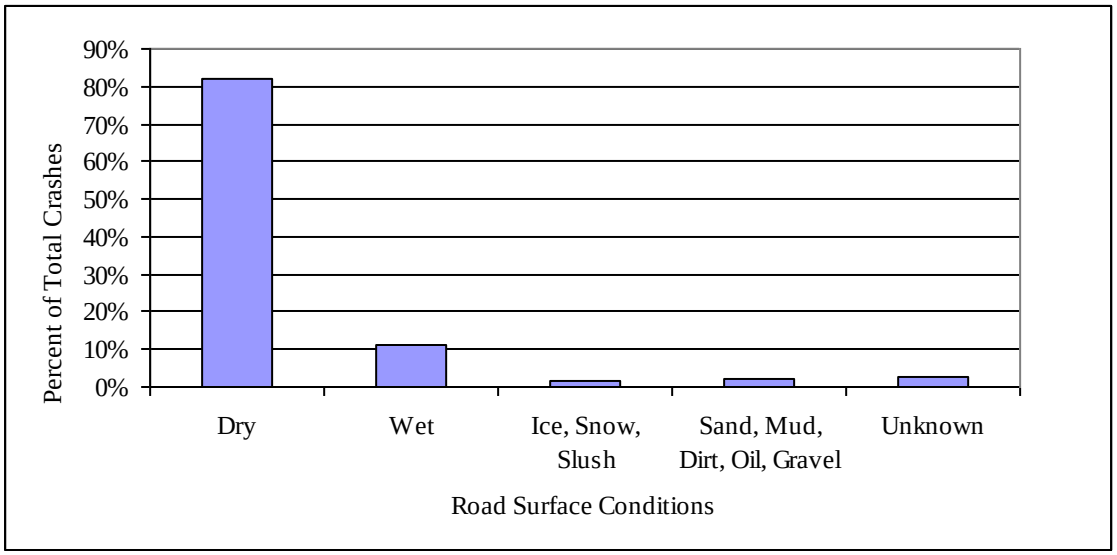

Figure 4.3 Work Zone Crashes Based on Road Surface Conditions – Iowa

4.1.2 Crash Related Factors

Work zone crashes based on level of crash severity are shown in Figure 4.4. When considering crash severity at work zones, most of the crashes were Property Damage Only (PDO) type and only a few fatal crashes (0.7%) occurred during this time period.

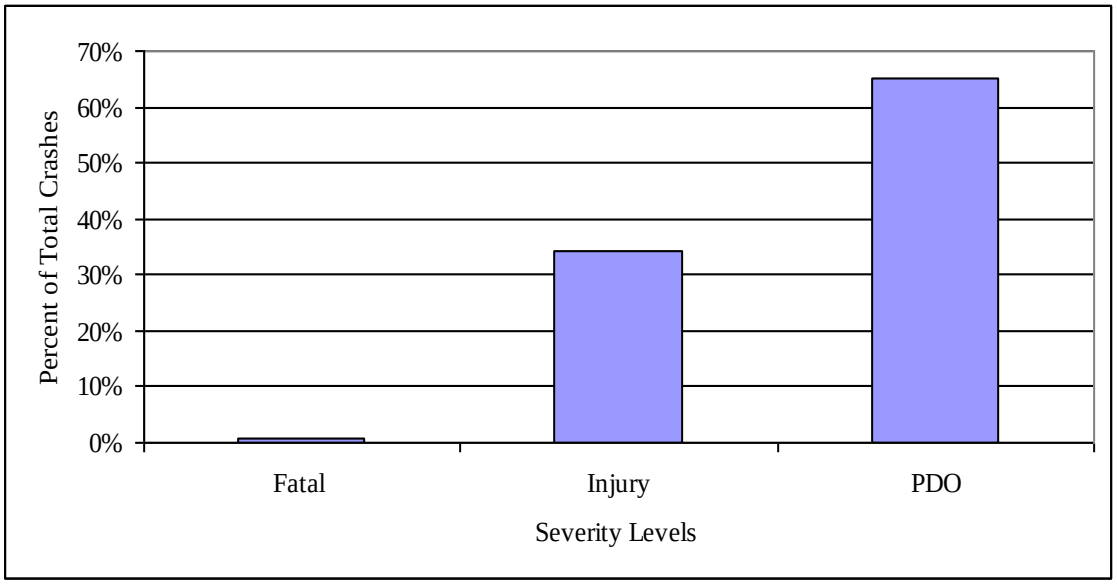

Figure 4.4 Work Zone Crashes Based on Level of Crash Severity – Iowa

Collisions with other motor vehicles were broken down into different types such as head-on collision, rear-end collision, sideswipe collision, etc. Work zone crashes based on collision type are shown in Figure 4.5. Results showed the most common type of collision with other motor vehicles was rear-end collisions (48.7%), which were followed by same-direction sideswipe collisions (14.6%). Level of crash severity also depends on the type of crash class. Work zone crashes based on crash class are shown in Figure 4.6. Results showed most work zone crashes (74.2%) involved collision of the vehicle with another vehicle, which was followed by collision with a fixed object.

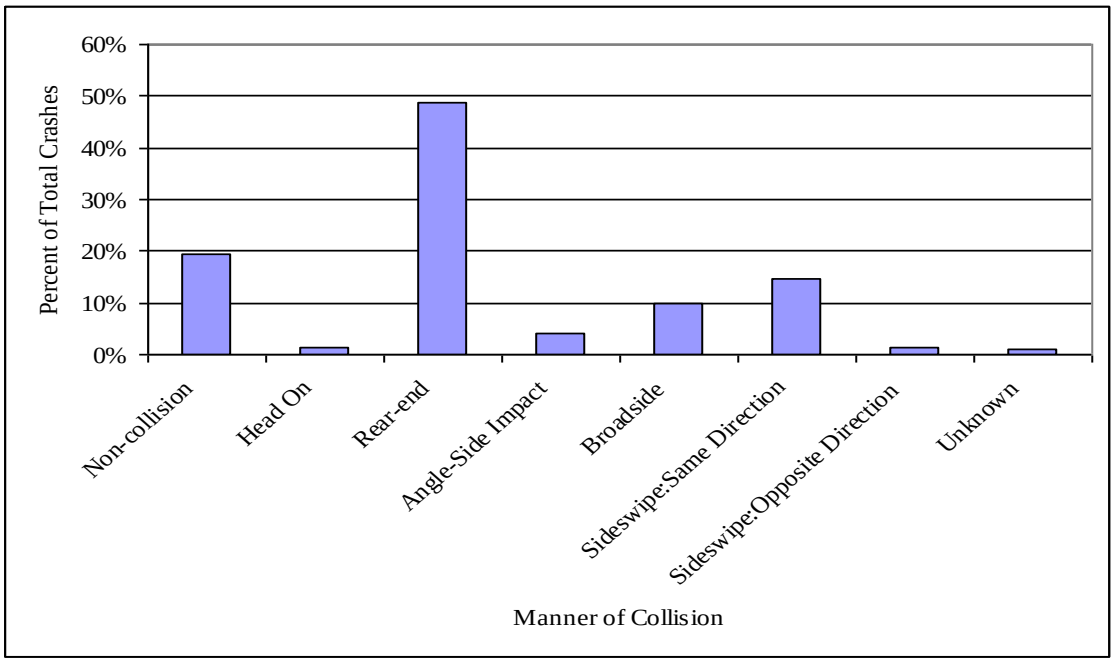

Figure 4.5 Work Zone Crashes Based on Manner of Collision of Vehicles – Iowa

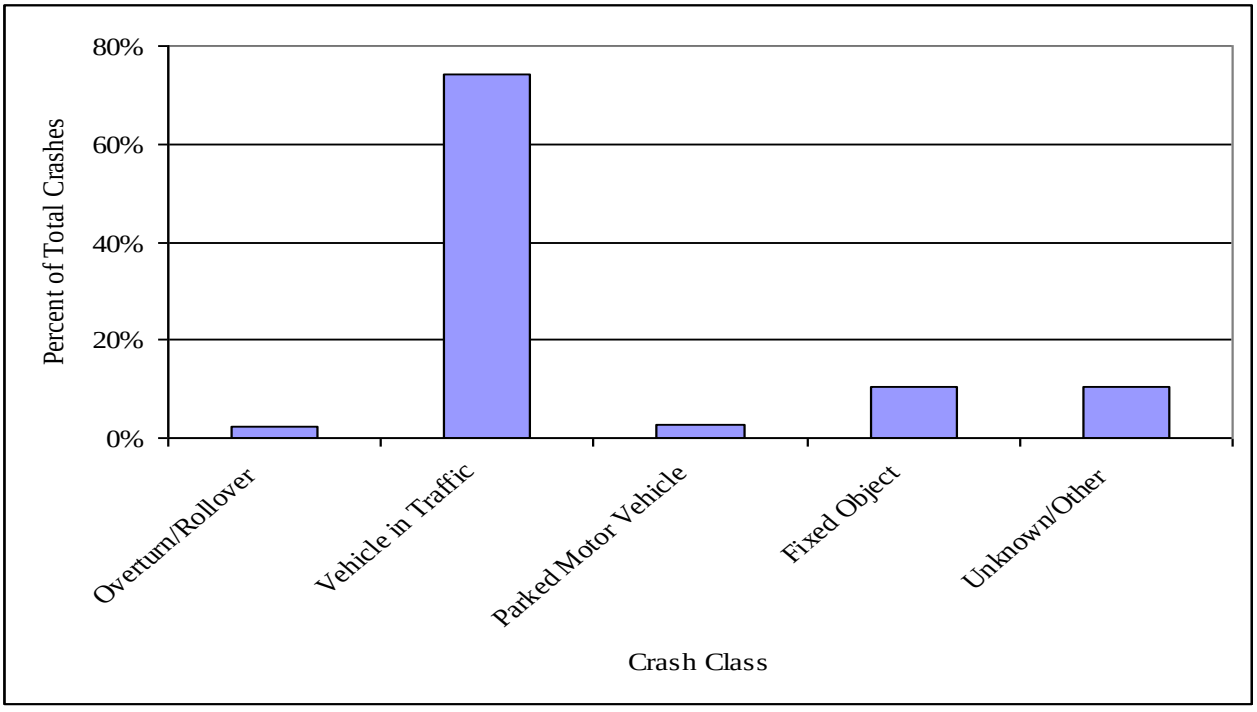

Figure 4.6 Work Zone Crashes Based on Crash Class – Iowa

4.1.3 Road Condition Related Factors

Having posted speed limits in work zone areas was also an important parameter in terms of safety. Posting of speed limits is done for the safety of road users. It only takes a few more minutes to travel at reduced speed limits in work zones which, when ignored, could lead to dangerous situations. Work zone crashes based on posted speed limits at the location of the crashes are shown in Figure 4.7. Results showed that a majority of the crashes occurred under the posted speed limit range of 51 – 60 mph. It was not possible for these values to be normalized with respect to the percentage of work zones with these speed limit ranges.

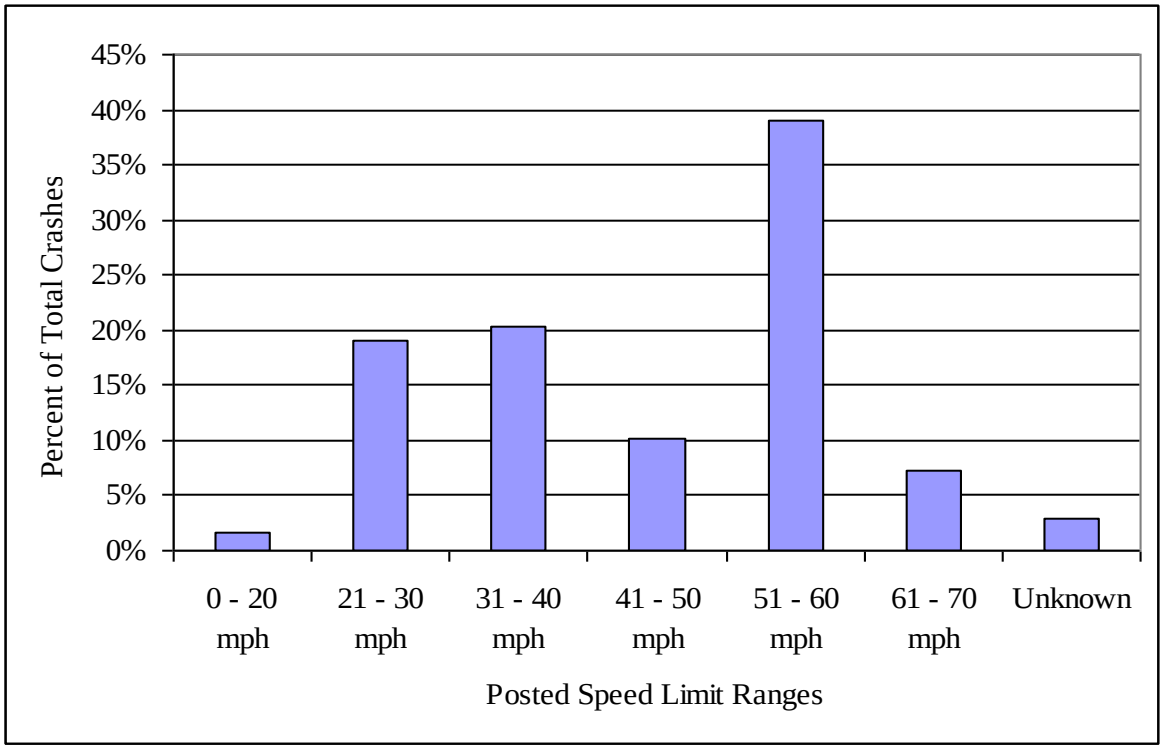

Figure 4.7 Work Zone Crashes Based on Posted Speed Limit – Iowa

Type of traffic controls used in work zones was an important parameter with respect to work zone crashes. Work zone crashes based on type of traffic control present at the time of a crash are shown in Figure 4.8. Results showed a majority of the crashes (48%) occurred when

there were no traffic controls in work zone areas. A predominant percentage (22.6%) of work zone crashes occurred when work zone signs were present than when compared to other traffic control conditions.

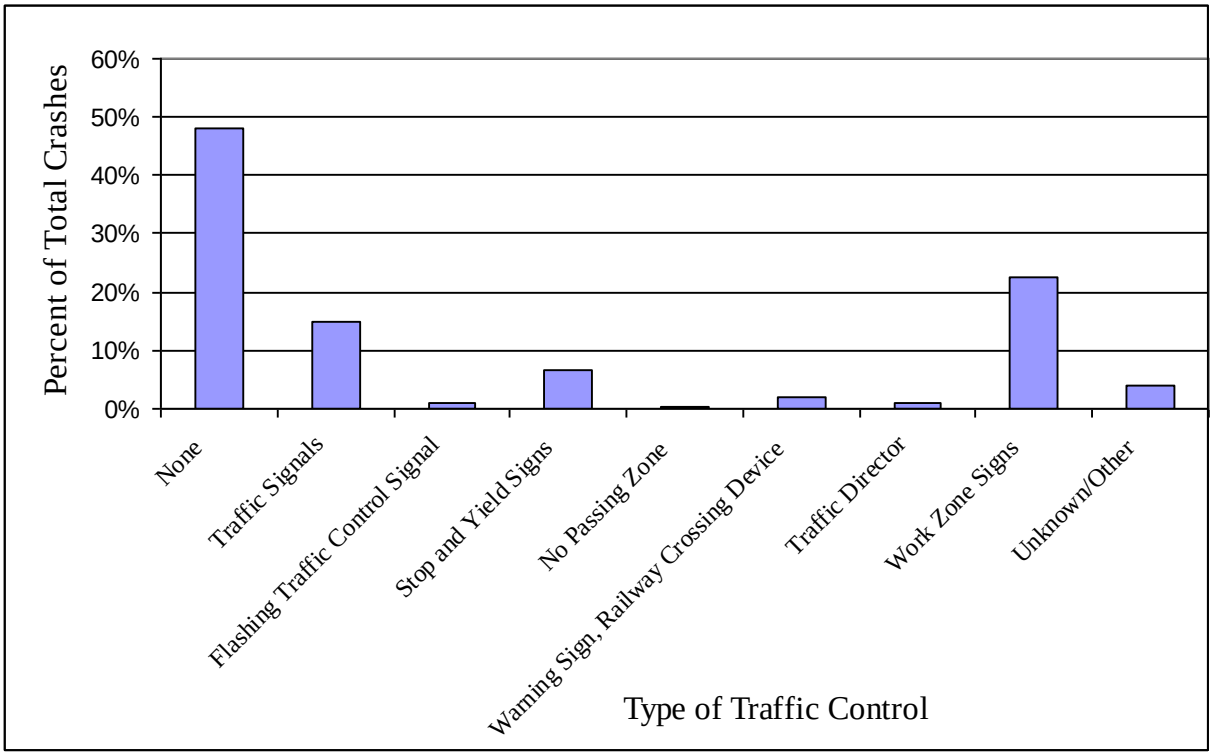

Figure 4.8 Work Zone Crashes Based on Type of Traffic Control – Iowa

4.1.3 Location and Type of Work Zone Related Factors

One of the most important aspects of the analysis of characteristics in work zone crashes was concerned with location of the accident within the work zone components shown in Figure 1.3. Work zone crash characteristics within the work zone area are shown in Figure 4.9. Results showed that a majority of the crashes occurred on the roadway within the work area. The area immediately before the work area, which is called the transition area where the lane shift of vehicles takes place, is the area where the next highest percentage of crashes took place. This

could be due to factors like driver curiosity or confusion about the work area, leading to distraction.

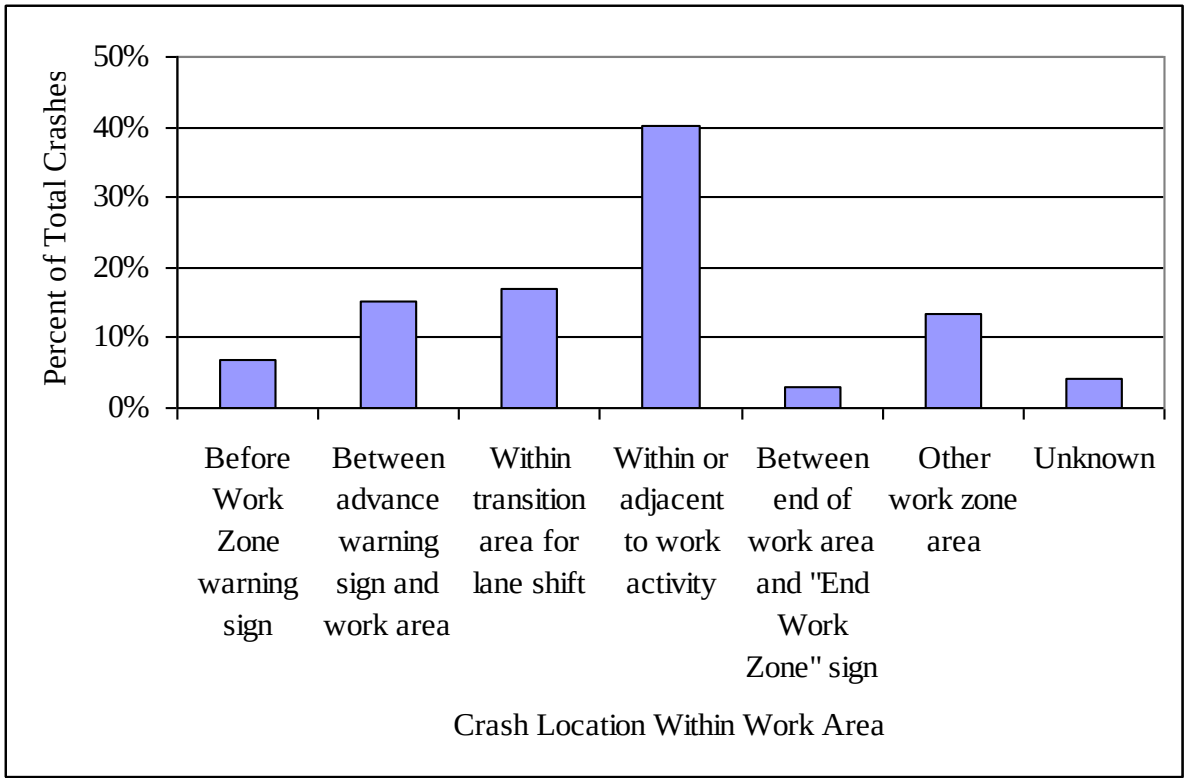

Figure 4.9 Location of Crashes Within Work Zone Component Areas – Iowa

Work zone crashes based on type of work zone are shown in Figure 4.10. The three types of major work zones are shown in Figure 1.2. The following work zone types are a subset of those major work zone categories. Results showed that most crashes occurred in lane-closure type of work zones when compared to shoulder work zones and lane-shift work zones. Other types of work zones which were not specifically described in the accident reports also contributed for almost 20% of the crashes.

Figure 4.10 Work Zone Crashes Based on Type of Work Zone – Iowa

At the time of crashes, nearly 36% of workers were involved in the work zones as shown in Figure 4.11. Noninvolvement of workers indicates the crash might have happened at a time when work zones were idle or not active.

Figure 4.11 Worker Involvement at the Time of Crash – Iowa

4.1.4 Vehicle Related Factors

For a given crash, there could be more than one contributing factor. Hence, each vehicle in a crash might have more than one maneuvering profile before the crash; therefore, the cases in this category are more than the total number of crashes. Types of vehicle maneuvers at the time of work zone crashes are shown in Figure 4.12. Results showed most of the vehicles were going straight and following the road (54.6%) at the time of crashes. A predominant percentage of crashes (17.9%) occurred when the vehicles were stopped or when they were slowing down due to the traffic, when compared to the crashes that occurred when the vehicles were making left or right turns.

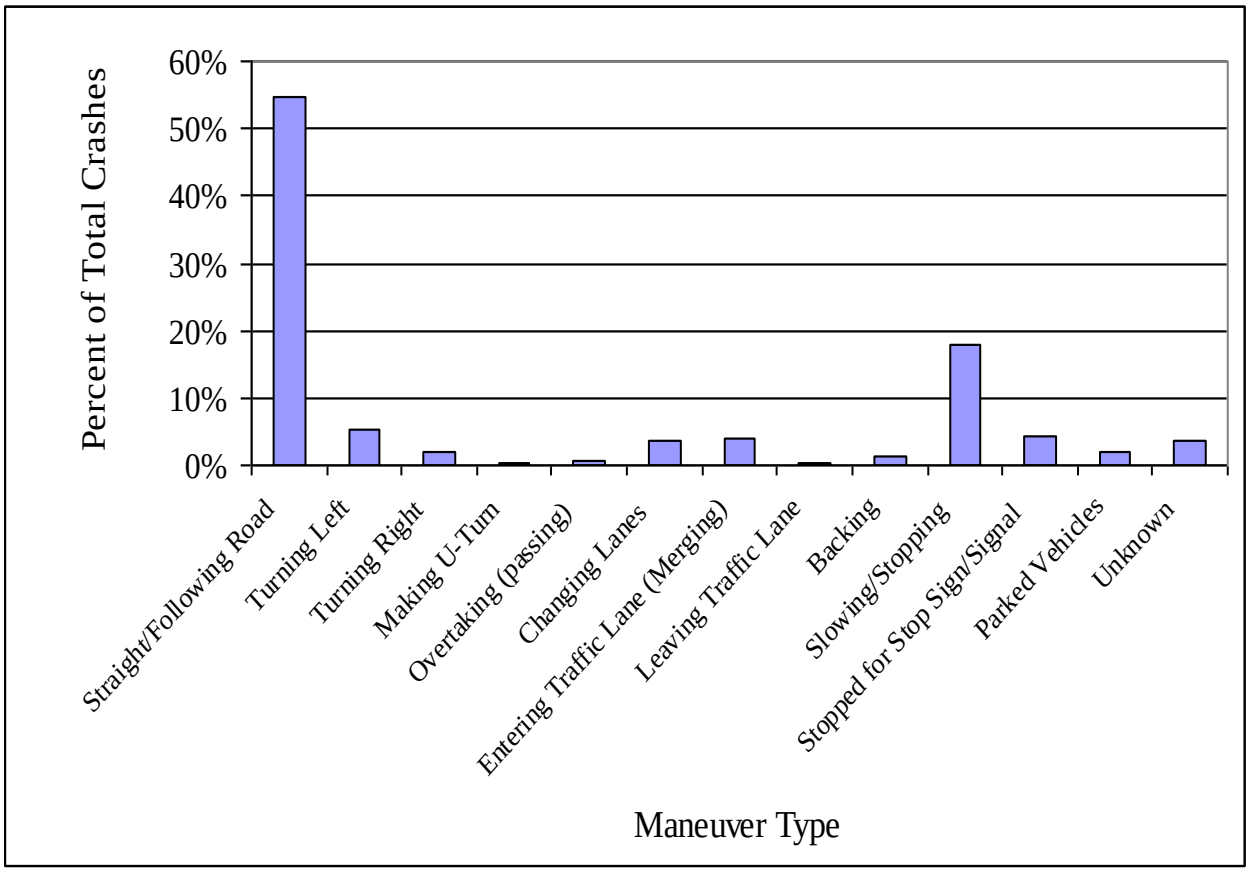

Figure 4.12 Work Zone Crashes Based on Vehicle Maneuvering before Crashes – Iowa

Work zone crashes based on number of vehicles involved in crashes are shown in Figure 4.13. Results showed crashes involving two vehicles were more predominant than single-vehicle crashes and crashes involving three or more vehicles.

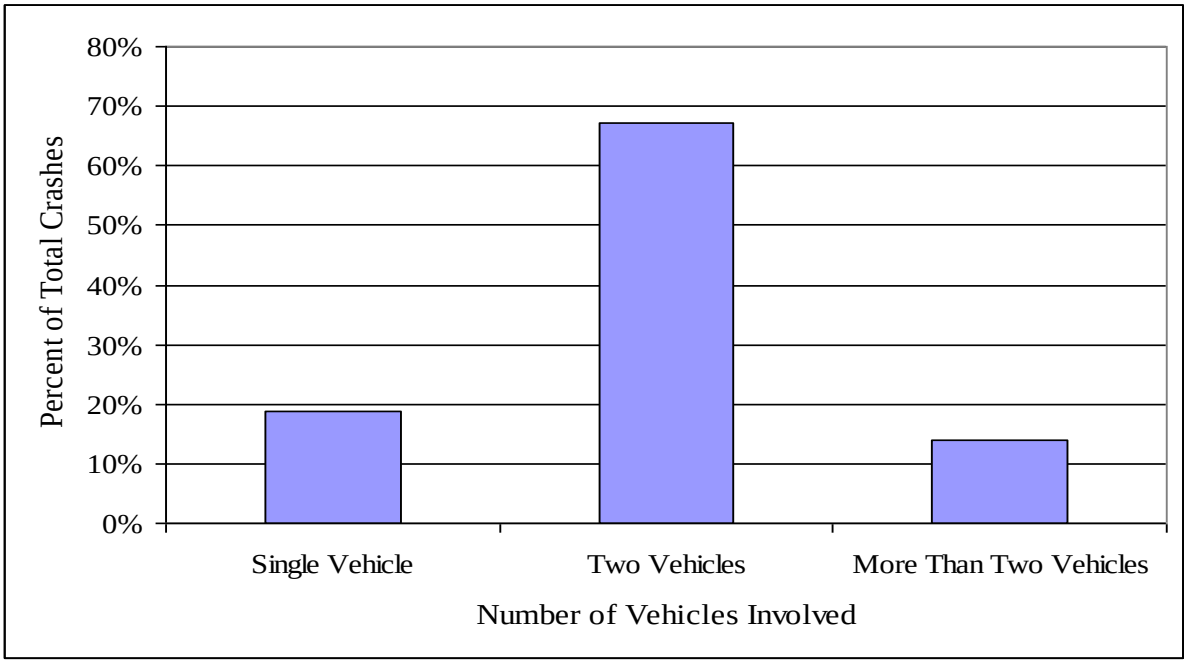

Figure 4.13 Work Zone Crashes Based on Number of Vehicles Involved – Iowa

Large trucks are involved in fewer crashes within work zones when compared to passenger cars, but their involvement rate in fatal accidents is almost twice that of passenger cars. Work zone crashes based on type of vehicle involved in a crash are shown in Figure 4.14. Although the results are not possible to be normalized, they showed a majority of work zone crashes (53.47%) involved passenger cars. Nearly 10% of work zone crashes involved trucks – either a single unit or combination truck.

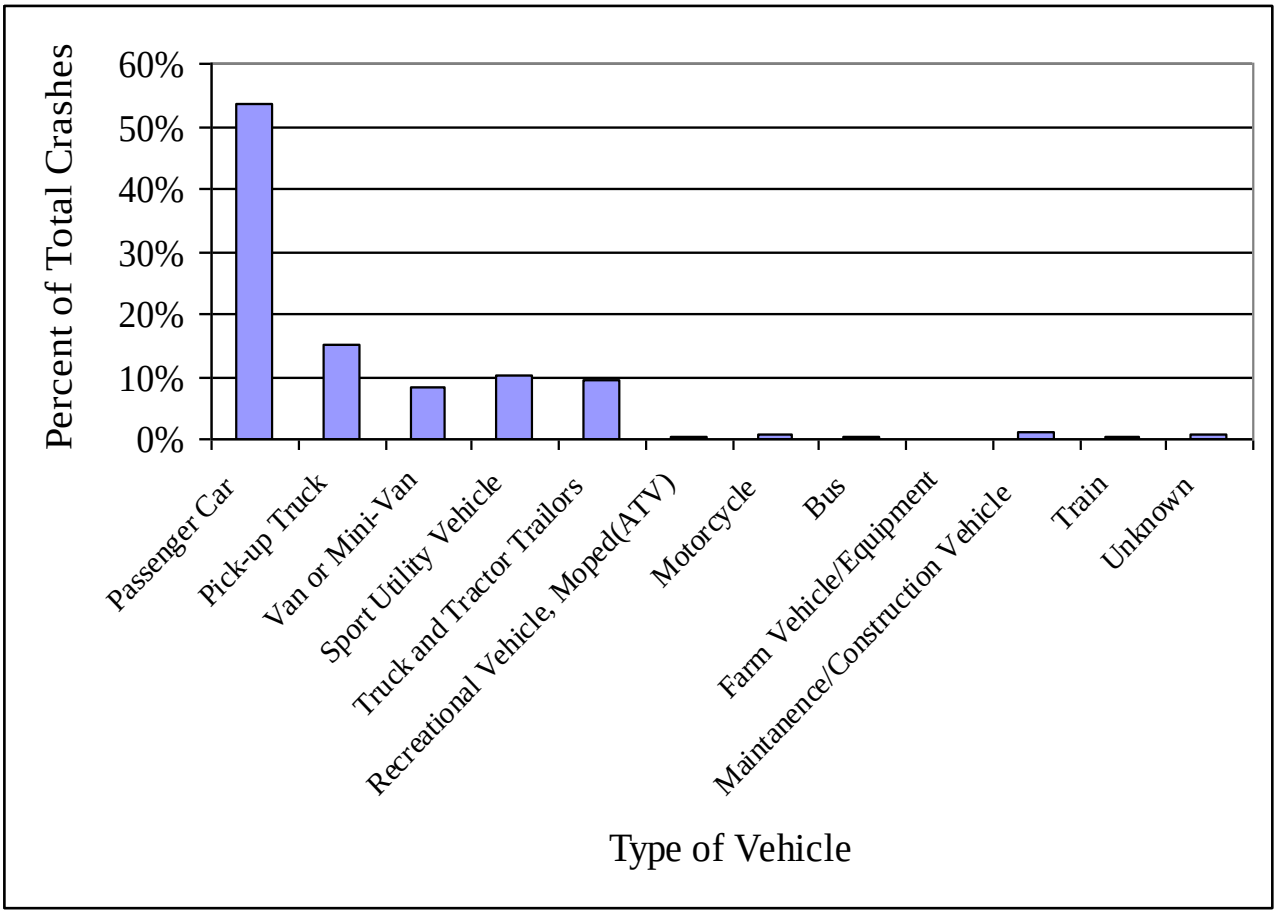

Figure 4.14 Work Zone Crashes Based on Type of Vehicle Involved In Crash – Iowa

4.1.5 Driver Related Contributing Factors

The driver plays a key role in work zone crashes. Work zone crashes based on ages of drivers involved in crashes are shown in Figure 4.15. Different age categories were defined for the analysis as follows. Age greater than or equal to 65 years was considered as older population, and age between 64 to 25 years was considered as middle aged. Age below 25 years was considered as younger population, but in the case of younger drivers, age below 15 years was not considered in the data set since these drivers not in a position to have a valid driver's license and therefore their behavior could be different from other young drivers. Analysis of work zone

crashes based on driver's age showed that young drivers were more involved in work zone crashes when compared to middle-aged and older drivers.

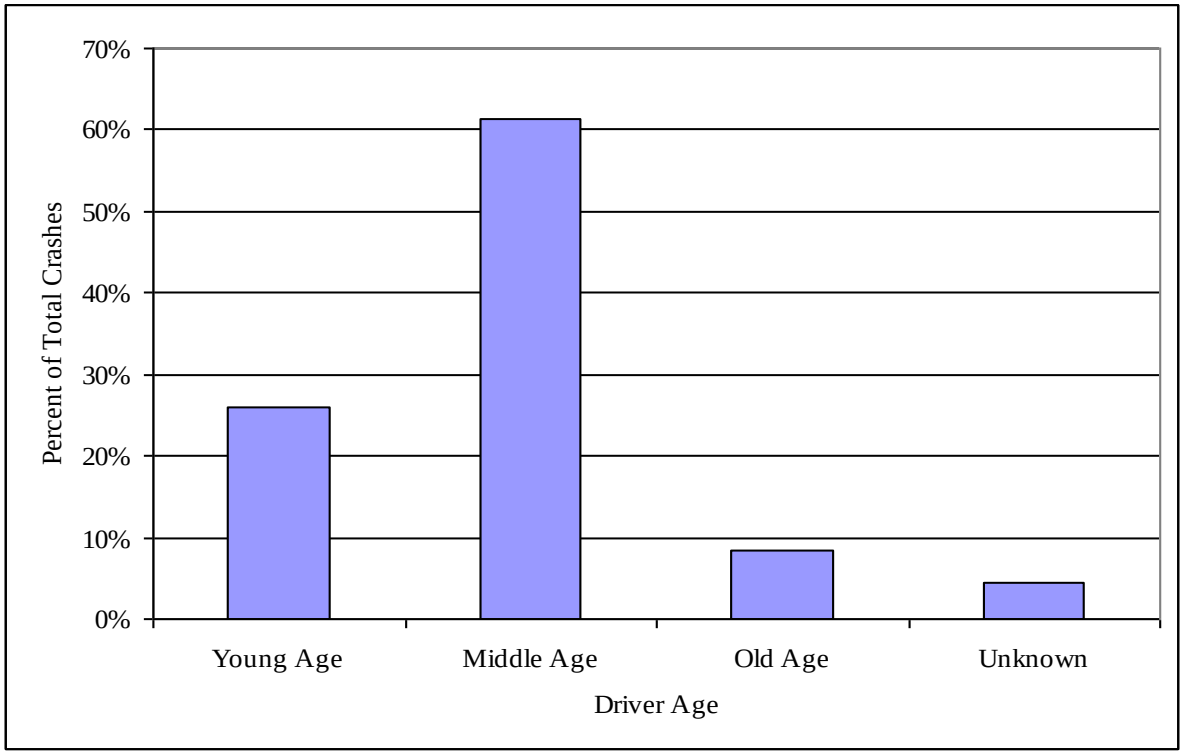

Figure 4.15 Work Zone Crashes Based on Ages of Drivers Involved – Iowa

Similarly, work zone crashes based on driver gender are shown in Figure 4.16. Results showed that female drivers were less likely to be involved in work zone crashes compared to male drivers.

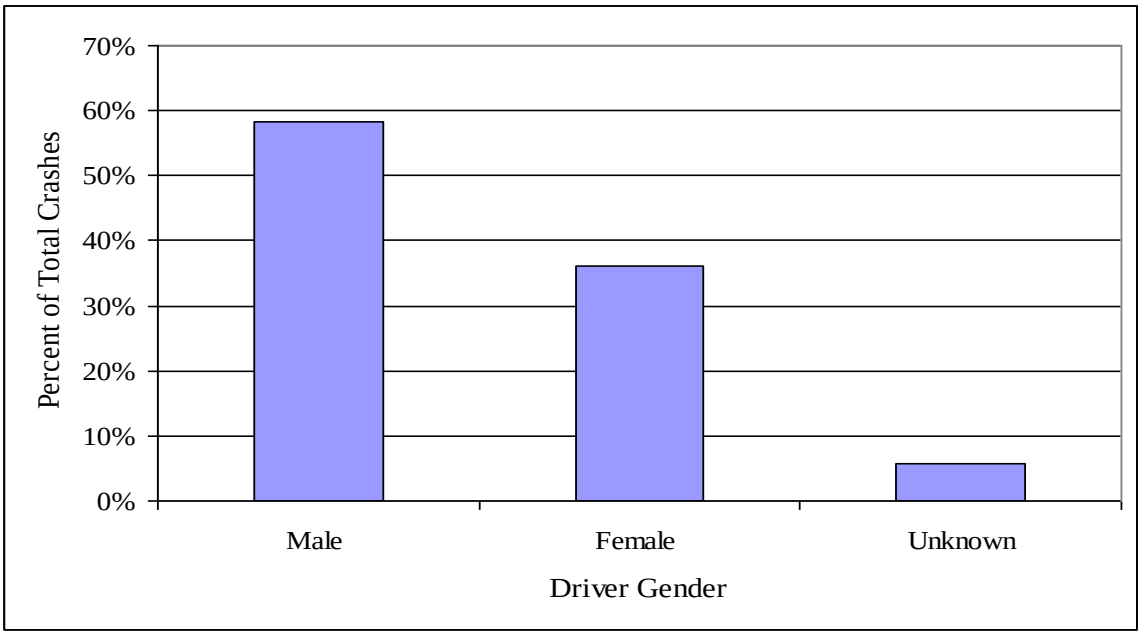

Figure 4.16 Work Zone Crashes Based on Gender of Drivers Involved – Iowa

Work zone crashes based on driver-contributing factors are shown in Figure 4.17. For a given crash, there could be more than one contributing factor and, as a result, the summation of contributing factors was greater than the actual number of crashes occurred. Results showed that most work zone crashes involved drivers driving with no improper driving. Major contributing improper driving actions include following too close, losing control, failing to yield right of way, running traffic signals, and driving too fast for conditions.

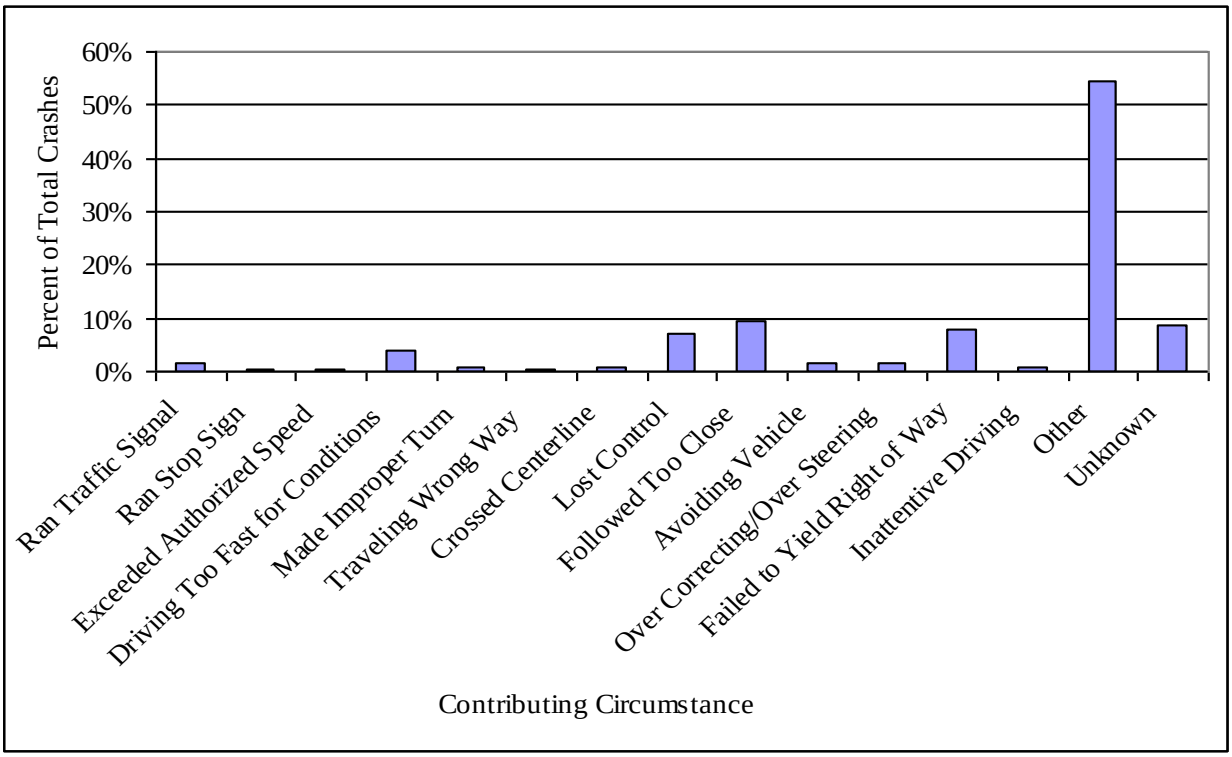

Figure 4.17 Work Zone Crashes Based on Driver-Contributing Factors – Iowa

Work zone crashes based on alcohol involvement of the driver are shown in Figure 4.18. Results showed that 21% of work zone crashes were involved by drunken drivers.

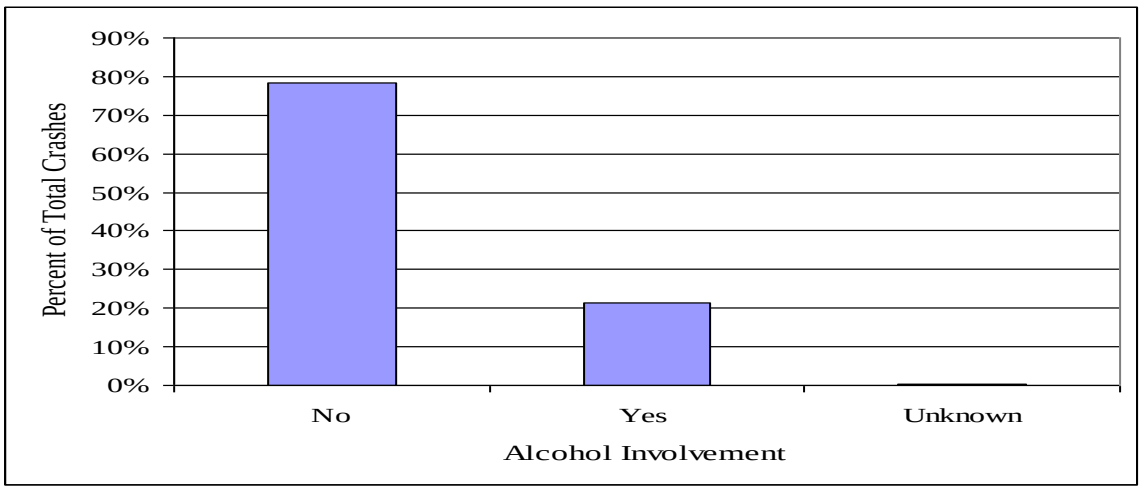

Figure 4.18 Work Zone Crashes Based on Alcohol Involvement of Driver – Iowa

4.2 Combined Work Zone Crash Characteristics for Five States

This section discusses the combined work zone crash characteristics for the five states, Iowa, Kansas, Missouri, Nebraska, and Wisconsin, for the period 2002-2006, examining all common variables for all five states. Detailed work zone crash characteristics of all five states are presented in Appendix A. A total of 44,004 crashes were selected for analysis out of 44,678 from the database. The remaining crashes were excluded due to incompleteness of information.

Crashes occurring under different environmental conditions such as light conditions, weather conditions, and road surface conditions were analyzed to identify characteristics of work zone crashes as shown in Table 4.3. Based on the total, a majority of crashes occurred during daylight conditions (75.3%) with no adverse weather conditions (68.9%) and on a dry road surface (84.2%). Detailed weather-related crash characteristics for all the five states are presented in Appendix A. The high frequency of work zone crashes in Missouri does not show lack of proper action being taken at the work zone areas. Similarly, the lower frequency of crashes in Nebraska does not necessarily imply that this state provides the most safe work zone conditions compared to other four states. As these frequencies are not compared to a common base value, such comparison of these parameters between states does not signify valid results. Possibly there could be exposure-related factors such as number of vehicles passing through the work zones, length and duration of work zone, active and inactive times of work zones, etc., which may explain the situation more clearly. Lack of these details in the data sets limited the study from not considering the exposure data. However, more significant results were obtained by combining the five state's data in all categories for the same five-year period.

Table 4.3 Environmental-Related Work Zone Crash Characteristics for the Combined States

Description	Iowa		Kansas		Missouri		Nebraska		Wisconsin		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Light Condition												
Daylight	2,915	79.0%	6,617	73.1%	14,792	76.5%	2,064	71.7%	6,753	74.7%	33,141	75.3%
Dawn or Dusk	99	2.7%	331	3.7%	0	0.0%	123	4.3%	268	3.0%	821	1.9%
Lighted	380	10.3%	1,062	11.7%	2,163	11.2%	339	11.8%	1,157	12.8%	5,101	11.6%
Dark	273	7.4%	1,010	11.2%	2,105	10.9%	327	11.4%	824	9.1%	4,539	10.3%
Unknown	22	0.6%	32	0.4%	280	1.4%	25	0.9%	43	0.5%	402	0.9%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Weather Condition												
Clear	2,154	58.4%	7,986	88.2%	12,996	67.2%	2,058	71.5%	5,133	56.7%	30,327	68.9%
Cloudy	1,124	30.5%	0	0.0%	4,356	22.5%	531	18.5%	2,894	32.0%	8,905	20.2%
Rain	308	8.3%	762	8.4%	1,055	5.5%	119	4.1%	722	8.0%	2,966	6.7%
Snow	26	0.7%	115	1.3%	139	0.7%	73	2.5%	144	1.6%	497	1.1%
Winds	22	0.6%	77	0.9%	0	0.0%	19	0.7%	21	0.2%	139	0.3%
Unknown/Other	55	1.5%	112	1.2%	794	4.1%	78	2.7%	131	1.4%	1,170	2.7%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Surface Condition												
Dry	3,034	82.2%	7,762	85.7%	16,514	85.4%	2,346	81.5%	7,397	81.8%	37,053	84.2%
Wet	419	11.4%	985	10.9%	2,417	12.5%	299	10.4%	1,106	12.2%	5,226	11.9%
Ice	17	0.5%	132	1.5%	83	0.4%	94	3.3%	49	0.5%	375	0.9%
Snow	37	1.0%	76	0.8%	143	0.7%	83	2.9%	144	1.6%	483	1.1%
Unknown/Other	182	4.9%	97	1.1%	183	0.9%	56	1.9%	349	3.9%	867	2.0%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%

Crash-related work zone characteristics are shown in Table 4.4. Crash statistics showed a majority of the work zones crashes in the five states are PDO crashes. However, nearly 296 persons died in work zones for the five-year period studied and 27.2% of the total work zone crashes led to injury crashes. Collision with other moving vehicles is one of the most predominant with 73.3% of total work zone crashes. Out of the collisions with another vehicle, rear-end collision (42.7%) was the most frequent type of crash in work zones followed by angle (14.4%) collision. This might be due to reduced traffic lanes creating more congestion in work zones, which tends to increase interaction between the vehicles possibly leading to rear-end

collisions. Results showed that drunken drivers were involved in nearly one-fourth (21.3%) of the work zone crashes, which might tend to increase crash severity. Detailed crash characteristics of each state are presented in Appendix A.

Table 4.4 Crash-Related Work Zone Characteristics of the Combined States

Description	Iowa		Kansas		Missouri		Nebraska		Wisconsin		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Crash Severity												
Fatal	26	0.7%	70	0.8%	100	0.5%	41	1.4%	59	0.7%	296	0.7%
Injury	1,259	34.1%	2,112	23.3%	4,342	22.5%	1,183	41.1%	3,059	33.8%	11,955	27.2%
PDO	2,404	65.2%	6,870	75.9%	14,898	77.0%	1,654	57.5%	5,927	65.5%	31,753	72.2%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Crash Class												
Overturn	90	2.4%	269	3.0%	273	1.4%	187	6.5%	196	2.2%	1,015	2.3%
Parked Motor Vehicle	102	2.8%	255	2.8%	529	2.7%	29	1.0%	184	2.0%	1,099	2.5%
Animal	14	0.4%	528	5.8%	112	0.6%	111	3.9%	33	0.4%	798	1.8%
Vehicle in Transit	2,738	74.2%	6,359	70.2%	14,676	75.9%	2,079	72.2%	6,422	71.0%	32,274	73.3%
Fixed Object	319	8.6%	1,124	12.4%	2,558	13.2%	260	9.0%	1,248	13.8%	5,509	12.5%
Other	426	11.5%	517	5.7%	1,192	6.2%	212	7.4%	962	10.6%	3,309	7.5%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Collision Manner												
Head On	48	1.3%	87	1.0%	185	1.0%	14	0.5%	126	1.4%	460	1.0%
Rear End	1,796	48.7%	3,741	41.3%	8,571	44.3%	1,145	39.8%	3,547	39.2%	18,800	42.7%
Angle	145	3.9%	1,481	16.4%	2,693	13.9%	380	13.2%	1,652	18.3%	6,351	14.4%
Sideswipe	589	16.0%	824	9.1%	2,966	15.3%	353	12.3%	1,227	13.6%	5,959	13.5%
No Collision	714	19.4%	75	0.8%	4,100	21.2%	798	27.7%	2,405	26.6%	8,092	18.4%
Unknown/Other	397	10.8%	2,844	31.4%	825	4.3%	188	6.5%	88	1.0%	4,342	9.9%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Alcohol Involvement												
No	2,893	78.4%	8,668	95.8%	18,245	94.3%	2,739	95.2%	8,480	93.8%	41,025	78.4%
Yes	785	21.3%	384	4.2%	631	3.3%	139	4.8%	565	6.2%	2,504	21.3%
Unknown	11	0.3%	0	0.0%	464	2.4%	0	0.0%	0	0.0%	475	0.3%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%

It is very important to analyze the area within a work zone, and type of work zone, where most of the crashes occurred. As only the Iowa and Nebraska data sets had these work zone-

related details, the analyzed characteristics of these variables for the given two states are shown in Table 4.5. Results showed that in these two states, the majority of the crashes occurred in a lane-closure (37%) type of work zone. In terms of location within work zone areas, the highest proportion (47.6) of crashes occurred in the activity area supporting *(6, 8, 9, 10)* where the actual work was done.

Table 4.5 Location and Type of Work Zone Characteristics for the Combined States

Description	Iowa		Nebraska		Total	
	No.	%	No.	%	No.	%
Within Work Zone Area						
Advance Warning Area	251	6.8%	112	3.9%	363	5.5%
Between Advance Warning Sign and Work Area	563	15.3%	418	14.5%	981	14.9%
Transition Area	627	17.0%	513	17.8%	1,140	17.4%
Activity Area	1,486	40.3%	1,642	57.1%	3,128	47.6%
Termination Area	109	3.0%	175	6.1%	284	4.3%
Unknown or Other	653	17.7%	18	0.6%	671	10.2%
Total	3,689	100%	2,878	100%	6,567	100%
Work Zone Type						
Lane Closure	1,567	42.5%	862	30.0%	2,429	37.0%
Lane Shift/Crossover/Head-to-Head Traffic	442	12.0%	540	18.8%	982	15.0%
Work on Shoulder or Median	554	15.0%	630	21.9%	1,184	18.0%
Intermittent or Moving Work	185	5.0%	384	13.3%	569	8.7%
Other Type of Work Zone	739	20.0%	439	15.3%	1,178	17.9%
Unknown	202	5.5%	23	0.8%	225	3.4%
Total	3,689	100%	2878	100%	6,567	100%

Speed limits are meant for the safety of road users. Work zone crash characteristics based on road-related factors are shown in Table 4.6. Generally, work zone areas tend to have speed limits lower than normal posted speed limits based on type of work, and results showed most of

the work zone crashes involved lack of maintenance of work zone-posted speed limits. The highest proportion of work zone crashes (26.1%) occurred where speed limits were 51-60 mph followed by 31- 40 mph.

Table 4.6 Road-Related Characteristics for the Combined States

Description	Iowa		Kansas		Missouri		Nebraska		Wisconsin		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Speed Limit												
0 - 20 mph	57	1.5%	245	2.7%	348	1.8%	256	8.9%	179	2.0%	1,085	2.5%
21 - 30 mph	700	19.0%	1,413	15.6%	2,580	13.3%	330	11.5%	1,534	17.0%	6,557	14.9%
31 - 40 mph	748	20.3%	1,901	21.0%	4,199	21.7%	597	20.7%	2,198	24.3%	9,643	21.9%
41 - 50 mph	374	10.1%	1,111	12.3%	4,766	24.6%	584	20.3%	1,615	17.9%	8,450	19.2%
51 - 60 mph	1,440	39.0%	2,318	25.6%	4,356	22.5%	553	19.2%	2,767	30.6%	11,434	26.0%
61 - 70 mph	266	7.2%	1,774	19.6%	1,659	8.6%	220	7.6%	565	6.2%	4,484	10.2%
71 - 80 mph	0	0.0%	0	0.0%	0	0.0%	220	7.6%	187	2.1%	407	0.9%
Unknown	104	2.8%	290	3.2%	1,432	7.4%	118	4.1%	0	0.0%	1,944	4.4%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Traffic Control												
None	3,545	48.0%	1,570	12.7%	3,580	14.2%	NA	NA	9,825	61.6%	18,520	30.4%
Stop or Yield	479	6.5%	848	6.8%	1,587	6.3%	NA	NA	1,300	8.2%	4,214	6.9%
Signals	1,100	14.9%	1,895	15.3%	3,570	14.2%	NA	NA	2,842	17.8%	9,407	15.4%
Flasher	65	0.9%	56	0.5%	0	0.0%	NA	NA	86	0.5%	207	0.3%
Flagman	64	0.9%	199	1.6%	908	3.6%	NA	NA	444	2.8%	1,615	2.7%
No Passing Zone	23	0.3%	641	5.2%	2,220	8.8%	NA	NA	0	0.0%	2,884	4.7%
Center/Edge Line	0	0.0%	6,170	49.8%	0	0.0%	NA	NA	0	0.0%	6,170	10.1%
Warning Sign	1,814	24.6%	0	0.0%	0	0.0%	NA	NA	641	4.0%	2,455	4.0%
Unknown/ Other	290	3.9%	1,018	8.2%	13,299	52.8%	NA	NA	808	5.1%	15,415	25.3%
Total	7,380	100%	12,397	100%	25,164	100%	NA	NA	15,946	100%	60,887	100%

NA – Not Available

The efficiency of reducing speed limits within work zones depends upon the type of traffic control used. Based on total crashes, a majority (30.4%) of them occurred at places where there were no traffic control within work zones followed by work zones with the presence of

traffic signals. Type of traffic controls used in work zones at the time crash for Nebraska was not available in the database.

Crash information helps researchers to reconstruct the scene of a crash, and then make crashes more understandable. Descriptive information about the crashes is shown in Table 4.7. This included vehicle maneuvers before the crash, vehicle body type, and number of vehicles involved.

As a result of construction and maintenance work activity on highways, lane widths were reduced to less than normal width, which increases the interaction between vehicles leading to multiple-vehicle crashes. Results showed the majority (65.8%) of the work zone crashes are multiple-vehicle crashes. These multiple-vehicle crashes occurred when the vehicles were going straight (60.2%) in work zones. Critical maneuvers such as left turns, right turns, and u-turns in work zones contribute to a small percentage of crashes, but a predominant percent (21.2%) of crashes occurred when the vehicles are slowing and stopped in traffic due to work activity. Based on the data availability, vehicle body type was categorized into three types such as automobile, light-duty vehicles, and heavy-duty vehicles. More than 50% of work zone crashes involved passenger cars, as the major portion of traffic consists of passenger cars. Although it was not possible to normalize the results, they showed that a majority of work zone crashes involved passenger cars. In addition to passenger cars, light-duty vehicles such as pickup trucks, vans, and SUVs contributed to the second highest percentage of work zone crashes. In terms of heavy-duty vehicles such as trucks, these require additional consideration in work zones as their characteristics are different from other vehicles. According to the Federal Highway Administration (FHWA), almost 30% of work zone crashes involved trucks. They are involved in fewer crashes in work zones when compared to passenger cars, but their involvement rate in

fatal accidents is almost twice that of passenger cars. Analysis showed that 10.3% of work zone crashes involved heavy-duty vehicles and a small percentage involved other vehicles such as motorcycles, farm equipment, ATVs, etc. The vehicle body type variable was incomplete in the data obtained from Nebraska Department of Roads. Detailed explanations of types of vehicles involved in a crash were presented in Appendix A.

Table 4.7 Vehicle-Related Work Zone Characteristics for the Combined States

Description	Iowa		Kansas		Missouri		Nebraska		Wisconsin		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Vehicle Maneuvering												
Going Straight	4,027	54.6%	8,531	50.9%	27,364	71.0%	3,227	59.3%	7,526	46.9%	50,675	60.2%
Turning Left	383	5.2%	889	5.3%	1,031	2.7%	409	7.5%	1,225	7.6%	3,937	4.7%
Turning Right	158	2.1%	381	2.3%	504	1.3%	101	1.9%	561	3.5%	1,705	2.0%
Making U-Turn	26	0.4%	63	0.4%	46	0.1%	22	0.4%	58	0.4%	215	0.3%
Overtaking	43	0.6%	159	0.9%	256	0.7%	67	1.2%	158	1.0%	683	0.8%
Changing Lanes	267	3.6%	593	3.5%	708	1.8%	176	3.2%	585	3.6%	2,329	2.8%
Backing	104	1.4%	303	1.8%	397	1.0%	43	0.8%	344	2.1%	1,191	1.4%
Slowing or Stopping	1,323	17.9%	2,125	12.7%	1,571	4.1%	0	0.0%	2,554	15.9%	7,573	9.0%
Stopped in Traffic	315	4.3%	2,547	15.2%	4,655	12.1%	1,137	20.9%	1,596	9.9%	10,250	12.2%
Merging	293	4.0%	339	2.0%	0	0.0%	73	1.3%	386	2.4%	1,091	1.3%
Parked	146	2.0%	31	0.2%	74	0.2%	4	0.1%	286	1.8%	541	0.6%
Unknown	295	4.0%	797	4.8%	1,925	5.0%	181	3.3%	767	4.8%	3,981	4.7%
Total	7,380	100%	16,758	100%	38,531	100%	5,440	100%	16,046	100%	84,155	100%
Crash Type												
Single Vehicle	691	18.7%	2,631	29.1%	3,626	18.7%	772	26.8%	2,174	24.0%	9,894	22.5%
Two Vehicles	2,483	67.3%	5,420	59.9%	13,438	69.5%	1,751	60.8%	5,855	64.7%	28,947	65.8%
>Two Vehicles	515	14.0%	1,001	11.1%	2,276	11.8%	355	12.3%	1,016	11.2%	5,163	11.7%
Total	3,689	100%	9,052	100%	19,340	100%	2,878	100%	9,045	100%	44,004	100%
Vehicle Body Type												
Automobile	3,946	53.5%	8,775	52.4%	18,855	48.9%	NA	NA	11,220	69.9%	42,796	54.4%
Motor Cycle	52	0.7%	119	0.7%	205	0.5%	NA	NA	221	1.4%	597	0.8%
Light-Duty Vehicle	2,471	33.5%	6,324	37.7%	13,667	35.5%	NA	NA	2,115	13.2%	24,577	31.2%
Heavy Duty Vehicle	685	9.3%	1,257	7.5%	4,422	11.5%	NA	NA	1,781	11.1%	8,145	10.3%
Unknown/Other	226	3.1%	283	1.7%	1,382	3.6%	NA	NA	709	4.4%	2,600	3.3%
Total	7,380	100%	16,758	100%	38,531	100%	NA	NA	16,046	100%	78,715	100%

NA – Not Available

The driver plays a key role in involvement in a crash, and identification of driver contribution to crashes is highly important in suggesting possible countermeasures. Work zone crashes based on driver-contributing circumstances is shown in Table 4.8. For a given crash, there could be more than one contributing factor and as a result, the summation of contributing factors is greater than the actual number of crashes occurring. Results showed the majority (63.6%) of work zone crashes involved males aged 25 to 64 years. This may be due to males tending to drive more than females. Older age people were involved in a small but predominant percent (7.8%) of work zone crashes.

Of all work zone crashes considered for the five states, inattentive driving (21%) in work zones was the leading cause of crash occurrence. This might be due to the fact that most of the drivers were unaware of the general problems associated with work zones. Among other factors, following too close was responsible for 16.6% of total work zone crashes, which might be due to interruption of regular traffic flows caused by closed lanes in work zone areas. Generally, work zones tend to have reduced speed limits based on the type of work, and drivers' maintaining those speed limits is very important in work zones. Driving too fast for conditions and exceeding posted speed limits were other predominant contributing factors in work zone crashes. Other variable contributing factors include improper lane change, improper backing, improper passing, improper or no turn signal, etc. These contributed to a total 29% of work zone crashes.

Table 4.8 Driver-Related Work Zone Characteristics for the Combined States

Description	Iowa		Kansas		Missouri		Nebraska		Wisconsin		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Driver Age												
Young Age	1,911	25.9%	4,924	29.5%	8,209	21.3%	1,424	26.2%	3,827	23.9%	20,295	24.1%
Middle Age	4,523	61.3%	10,462	62.6%	25,059	65.0%	3,418	62.8%	10,073	62.8%	53,535	63.6%
Old Age	615	8.3%	1,330	8.0%	2,847	7.4%	458	8.4%	1,305	8.1%	6,555	7.8%
Unknown	331	4.5%	0	0.0%	2,416	6.3%	140	2.6%	841	5.2%	3,728	4.4%
Total	7,380	100%	16,716	100%	38,531	100%	5,440	100%	16,046	100%	84,113	100%
Driver Gender												
Male	4,170	56.5%	9,837	58.8%	22,318	57.9%	3,299	60.6%	NA	NA	39,624	58.2%
Female	2,890	39.2%	6,456	38.6%	13,564	35.2%	1,985	36.5%	NA	NA	24,895	36.6%
Unknown	320	4.3%	423	2.5%	2,649	6.9%	156	2.9%	NA	NA	3,548	5.2%
Total	7,380	100%	16,716	100%	38,531	100%	5,440	100%	NA	NA	68,067	100%
Driver Contributing Circumstance												
Disregarded Traffic Controls	140	1.9%	513	5.0%	331	1.7%	91	3.5%	340	3.1%	1,415	2.8%
Exceeded Posted Speed Limit	37	0.5%	111	1.1%	455	2.3%	17	0.6%	246	2.2%	866	1.7%
Driving Too Fast for Conditions	295	4.0%	926	9.0%	3,038	15.3%	102	3.9%	874	8.0%	5,235	10.2%
Made Improper Turn	67	0.9%	244	2.4%	394	2.0%	14	0.5%	223	2.0%	942	1.8%
Following Too Close	713	9.7%	1,763	17.1%	4,397	22.1%	339	12.9%	1,265	11.5%	8,477	16.6%
Inattention	68	0.9%	4,183	40.6%	4,292	21.6%	234	8.9%	1,961	17.9%	10,738	21.0%
Failed to Yield Right of Way	593	8.0%	759	7.4%	1,725	8.7%	195	7.4%	1,486	13.5%	4,758	9.3%
Other	4,839	65.6%	1,772	17.2%	4,710	23.7%	1,552	59.1%	2,009	18.3%	14,882	29.1%
Unknown	628	8.5%	26	0.3%	514	2.6%	83	3.2%	2,578	23.5%	3,829	7.5%
Total	7,380	100%	10,297	100%	19,856	100%	2,627	100%	10,982	100%	51,142	100%

NA – Not Available

4.3 Test of Independence Results

Test of independence was carried out for all variables considered in this study. Results showed crash severity had dependency with all variables considered except for surface conditions of the road. The p-value for all these variables was less than 0.01, which shows the respective parameters are dependent. Calculated Chi-Square values for different categories,

along with their respective degrees of freedom, are presented in Table 4.9. Also, results showed crash severity had a significant relationship with number of vehicles involved in the crash and body type of vehicles involved in the crash; whereas, crash severity had a less significant relationship with some other factors like light conditions, road surface type, and gender of the driver.

Table 4.9 Dependency Relation of Crash Severity with Different Variables

Category	Degree of Freedom	Chi-Square Calculated	Table Value	P-Value	Statistical Significance
Light Conditions	2	74.7	6	P < 0.01	Yes
Weather Conditions	8	215.05	15.51	P < 0.01	Yes
Posted Speed Limit	12	431.55	21.03	P < 0.01	Yes
Surface Condition of Road	4	6.3	9.5	P > 0.01	No
Road Surface Type	4	31	9.5	P < 0.01	Yes
Traffic Controls	12	173.4	21	P < 0.01	Yes
Driver Gender	2	59	6	P < 0.01	Yes
Day of Crash	12	65.6	21	P < 0.01	Yes
Age of Driver	12	34.9	21	P < 0.01	Yes
Vehicle Maneuver Before Crash	10	199	18.3	P < 0.01	Yes
Alcohol Involvement	2	478.3	6	P < 0.01	Yes
Number of Vehicles Involved	4	1148	9.5	P < 0.01	Yes
Manner of Collision	10	726.9	18.3	P < 0.01	Yes
Vehicle Body Type	14	1056.2	23.7	P < 0.01	Yes
Driver Contributing Circumstances	22	795.7	33.9	P < 0.01	Yes

4.4 Ordered Probit Model Analysis

The ordered probit modeling technique was used to identify risk factors associated with injury severity of work zone crashes. Out of the two states having work zone crash-related details recorded before 2006, the Iowa work zone crash database was used for modeling because of the detailed information about work zone variables in its electronic database when compared to the

Nebraska data set. In addition, this study considered each individual injury severity resulting from the crash, which was categorized into five levels: fatal, incapacitating, non-incapacitating, possible, and property damage only. Severity of a crash was identified based on the highest injury severity sustained by an involved person due to the crash. For example, if at least one fatality resulted from a crash, then it was defined as a fatal crash; and when there was at least one incapacitating injury but no fatalities, then it was defined as an incapacitating injury crash and so on.

The variable selection process was based on both prior knowledge from previous studies and on the presumption that a particular factor would be significant towards injury severity. Thus, the selected candidate vector was comprised of many explanatory variables, some of which may or may not be critical in assessing injury severity. The ordered probit model was developed to assess the injury severity of work zone crashes by considering nearly 38 explanatory variables using statistical modeling software, SAS version 9.1 *(43)*. The response variable was taken as injury severity (fatal, incapacitating, non-incapacitating, possible injury, no injury). The predicted variables, variable names, description about how variables were determined, and corresponding mean values for the five years of Iowa data are shown in Table 4.10.

As the selection criteria for the variables to be included in the model, a 95% confidence level was used in which the probability should be less than 0.05. Co-linearity of individual variables was also checked before considering variables into the model, and if such relationship existed, one of the two correlated variables was discarded based on the lowest mean value criterion.

Table 4.10 Description of Variables Considered in the Severity Model

Variables	Variable Name	Description	Mean
First Harmful Event	Overturn	If overturn/rollover=1, otherwise=0	0.01
	Fixedobj	If collided with fixed object=1, otherwise=0	0.06
Manner of Collision	Headon	If it is a head-on collision=1, otherwise=0	0.01
	Broad	If it is a broadside collision=1, otherwise=0	0.1
	Sideswipe_same	If it is a sideswipe-same direction=1, otherwise=0	0.14
	Sideswipe_opp	If it is a sideswipe-opposite direction=1, otherwise=0	0.01
Location of First Harm	Onrdway	If a crash occurred on roadway=1, otherwise=0	0.95
Weather Conditions	Weathercond	If a work zone crash occurred under no adverse weather conditions =1, otherwise=0	0.58
Light Conditions	Lightcond	If a crash occurred in day light conditions=1, otherwise=0	0.82
Surface Conditions	Surfcond	If crash occurred on dry road conditions of road=1, otherwise=0	0.85
Type of Roadway	Intersectn	If a crash occurred at intersection =1, otherwise=0	0.32
Traffic Controls	Trafcntrl	If no traffic controls present =1, otherwise=0	0.48
Location within Work Zone	WZ_Loc1	If crash occurred before work zone warning sign=1, otherwise=0	0.08
	WZ_Loc2	If crash occurred in advance warning area=1, otherwise=0	0.17
	WZ_Loc3	If crash occurred in transition area =1, otherwise=0	0.18
	WZ_Loc4	If crash occurred in activity area =1, otherwise=0	0.42
	WZ_Loc5	If crash occurred in termination area=1, otherwise=0	0.03
Work Zone Type	WZ_type2	If it is lane shift/crossover work zone type=1, otherwise=0	0.12
	WZ_type3	If the work is on shoulder or median=1, otherwise=0	0.16
	WZ_type8	If it is an other type of work zone=1, otherwise=0	0.19
Workers	Workers	If workers are present=1, otherwise=0	0.38
Occupant Protection	Occprotect	If occupant protection is used =1, otherwise=0	0.95
Airbag	Airbag_1	If airbag is not deployed=1, otherwise=0	0.72
Vehicle Configuration	Ligdtyveh	If it is a light-duty vehicle=1, otherwise=0	0.55
	Truck	If it is a truck (> 3 Axles) =1, otherwise=0	0.09
Vehicle Action	Critmaneu	If the vehicle is making left/right turn=1, otherwise=0	0.07
	Passing	If the vehicle is overtaking/passing=1, otherwise=0	0.01
	Merging	If the vehicle is changing lanes/merging=1, otherwise=0	0.08
	Stopped	If the vehicle is stopped/slowed in traffic=1, otherwise=0	0.23
Driver Age	Youngage	If the driver age is in between 0-24 years=1, otherwise=0	0.27
Driver Gender	Drivgender	If the driver is male=1, otherwise=0	0.59
Driver-Contributing Circumstances	DrivCC_1	If the driver exceeded posted speed limit=1, otherwise=0	0.05
	DrivCC_2	If the driver is following too close=1, otherwise=0	0.1
	DrivCC_3	If the driver is taking other action=1, otherwise=0	0.49
Posted Speed Limit	Speedlimit	Posted speed limit in mph	45.31

Model results are presented in Table 4.11 for work zone crashes. The likelihood ratio index (LRI) is presented for the model along with Estrella values and log likelihood values. The likelihood ratio index value for the injury severity model is 0.1267. Thus, the injury severity model for work zone crashes has a better capability of explaining injury severity. In this model, significant variables are denoted by an asterisk (*). Past studies *(33, 34)* based on ordered probit modeling have shown the goodness of fit value is typically low. In the model developed by Ma and Kockelman *(34),* it was around 0.05 and in the models developed by Kockelman and Kweon *(33)* the highest LRI value was around 0.08. Many other studies in the past had similar results. Therefore, the reliability of the overall model can be considered as acceptable.

Variables considered in this analysis can be broadly classified under four sections: driver related, crash related, roadway related, and environment related. Thus, the discussion of model results is also presented under the same sections for better understanding.

A positive estimated coefficient in the model implies increasing injury severity with increasing values of the explanatory variables. Independent variables from each category that were significantly contributing to injury severity are discussed in the following sections.

Work Zone Related

None of the work zone-related variables (location of crash within work zone areas and work zone types) were significant except the variable (WZ_type8) “other work zone” type. This implies if a crash occurs in an other work zone type (exact name of work zone was not specified in the database), severity of the resulting crash is going to be less, since the variable had a negative estimated parameter.

Table 4.11 Parameter Estimates of Selected Variables

Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|
Intercept	2.535957	0.207631	12.21	<.0001
Overturn	-0.62822	0.144738	-4.34	<.0001*
Fixedobj	-0.249555	0.103922	-2.4	0.0163*
Headon	-0.510623	0.162692	-3.14	0.0017*
Broad	-0.102719	0.07925	-1.3	0.1949
Sideswipe_same	0.491945	0.085065	5.78	<.0001*
Sideswipe_opp	-0.285423	0.186144	-1.53	0.1252
Onrdway	0.424076	0.105473	4.02	<.0001*
Weathercond	0.122153	0.047372	2.58	0.0099*
Lightcond	-0.005181	0.060819	-0.09	0.9321
Surfcond	-0.01884	0.066643	-0.28	0.7774
Intersectn	-0.145374	0.053422	-2.72	0.0065*
Trafcntrl	0.045306	0.046406	0.98	0.3289
WZ_Loc1	0.030489	0.107723	0.28	0.7772
WZ_Loc2	0.061595	0.086252	0.71	0.4751
WZ_Loc3	0.124856	0.088054	1.42	0.1562
WZ_Loc4	0.072204	0.132212	0.55	0.5850
WZ_Loc5	0.088682	0.074674	1.19	0.2350
WZ_type2	-0.057789	0.070798	-0.82	0.4144
WZ_type3	0.096443	0.06856	1.41	0.1595
WZ_type8	-0.21211	0.063343	-3.35	0.0008*
Workers	-0.03381	0.047143	-0.72	0.4733
Occprotect	-0.913787	0.088484	-10.33	<.0001*
Airbag_1	0.639337	0.04923	12.99	<.0001*
Ligdtyveh	0.101087	0.049271	2.05	0.0402*
Truck	0.834399	0.102663	8.13	<.0001*
Critmaneu	0.210727	0.095955	2.2	0.0281*
Passing	-0.871643	0.250026	-3.49	0.0005*
Merging	0.140812	0.095137	1.48	0.1388
Stopped	0.068576	0.05943	1.15	0.2485
Youngage	0.158399	0.052115	3.04	0.0024*
Drivgender	0.233336	0.046134	5.06	<.0001*
DrivCC_1	0.052207	0.102294	0.51	0.6098
DrivCC_2	0.567017	0.097047	5.84	<.0001*
DrivCC_3	-0.102133	0.054379	-1.88	0.0604
Speedlimit	0.013828	0.001967	7.03	<.0001*
_Limit2	0.910437	0.092537	9.84	<.0001
_Limit3	1.742421	0.097744	17.83	<.0001
_Limit4	2.451284	0.099206	24.71	<.0001
Estrella	0.2076			
Adjusted Estrella	0.1886			
McFadden's LRI	0.1250			
AIC	5788			
Log Likelihood	-2855			

* ***Variables are significant at 0.05 levels***

Driver Related

The positive estimated parameter statistically significant at a 95% confidence level for the variable 'Youngage' indicates crashes involving young age drivers increase the propensity of more injury severity in work zone crashes. The variable associated with gender 'Drivgender' has a positive estimate, indicating when male drivers are involved in crashes there is a tendency for high injury severity compared to female drivers involved in crashes. This could be due to the fact that males tend to drive more, compared to females, which increases their chances of being involving in a crash.

Whether occupant protection at the time of a crash was used or not was also investigated by including an indicator variable 'Occprotect.' Results showed that occupant protection usage has reduced injury severity. The nondeployment of airbags at the time of a crash increased injury severity of the crash since the variable 'Airbag_1'has a positive estimated coefficient.

When driver-contributing circumstances were analyzed, the variable 'DrivCC_2' showed a positive estimated coefficient. This indicates when the drivers are following too close to each other; there is a tendency towards having high injury severity. A careful observation of estimates gives more specific details about how far this affects injury severity.

Roadway Related

According to the model estimates, work zone crashes occurring on roadways (Onrdway) have a tendency towards high severe injuries, whereas intersection-related work zone crashes have an opposite effect on injury severity.

High injury severities on roadway crashes could be due to higher speed limits and lack of facilities available on the roadside such as guard rails, shoulder lanes, lighting, etc. However, at intersections, speeds are a little lower with better facilities, due to which the chances are lower

for such type of crashes. Speed is one of the most important parameters capable of generating different levels of injury severity. Speed limit variable "Spdlimit" was included in the model specification to evaluate its effect on injury severity of work zone crashes. Results indicated speed has a proportional relationship with injury severity by which if speed increases injury severity increases.

Crash Related

Among different types of vehicles involved in work zone crashes, the variable trucks (Truck) and light-duty vehicles (Ligdtyveh) such as pickup trucks, vans, and SUV's indicate statistically significant influence towards injury severity in work zone crashes. This implies when trucks and light duty vehicles are involved in work zone crashes, injury severity of those crashes is expected to be high. Trucks had a higher positive estimated parameter than light-duty vehicles which indicates a higher probability of a high severity crash if a truck is involved in a crash than light-duty vehicles. This might be due to the fact that trucks occupy more space in work zones, leading to multiple-vehicle collisions which end in high injury severity.

When the vehicle is taking a left turn or right turn before the crash, the resulting crash leads to increased injury severity, as the variable 'Critmaneu' has a positive estimated parameter. However, when the vehicle is passing another vehicle before the crash, the probability of injury severity is less, as the variable "passing" showed a negative estimated parameter.

In case of multiple-vehicle collisions, sideswipe collision (Sideswipe_same) in the same direction results in more severe injuries to vehicle occupants than head-on collisions. This might be because in work zones, reduced traffic lane widths will increase the interaction between the vehicles travelling in the same direction, which tends to result in more sideswipe collisions. Reduced injury severity in the case of head-on collisions might be because work zones were

present in urban areas where there are low speed limits. Similarly, the variables "overturn" and "collision with fixed object" showed a decreasing injury severity, as the usage of seat belts and deployment of airbags might have reduced injury severity.

Environment Related

The variable related to weather conditions (Clearweacond) had a positive estimated parameter. This shows that, when a crash occurs in clear weather conditions, severity of the crash could be expected to be more, compared to crashes that occur in adverse weather conditions. It doesn't show that all work zone crashes occurring under clear weather conditions are more severe. This variable can be better explained once details such as number of vehicles passing through work zones in daytime and nighttime, length of work zone, active and idle times of work zones etc. are known. This was not possible in this study due to limitations in the electronic data set.

4.5 Recommended Countermeasure Ideas

Safety in work zones is a major concern and therefore any countermeasure suggested could help to reduce crashes in these areas. This present study can be extended to a more elaborate level by conducting a more detailed statewide study of each state's different work zone crash characteristics so as to obtain more reliable results which may lead to more productive countermeasures. Study of police reports and understanding crash scenarios and exposure data will also help to a great extent.

Among extensive research done in the past to develop countermeasures for different crash scenarios, only the ones which suited this study were selected and are presented in this section.

Results showed rear-end collisions of vehicles to be the predominant collision crash type in work zones when compared to other collisions. Different authors recommended various countermeasures such as Advanced Traffic Information Systems (ATIS) *(7),* which warn drivers approaching work zones about the risk scenario of the upcoming work zones and suggest they chose an alternative route so as to reduce traffic and risk of collisions. Collisions may be partially prevented by proper application of traffic control devices, such as flaggers, combination of cones, flashing arrows, and flagmen *(18),* and by other techniques to enhance the visibility of work sites *(15).* In an effort to reduce the frequency of rear-end collisions, a series of work zone signs were deployed in Indiana with the objective of reducing motorists' speeds in work zone areas. Rear-end crashes might also be reduced by effectively controlling and enforcing safe headways between consecutive vehicles using a headway detector controlled by intelligent algorithms to send instant warning messages to changeable message signs, especially when a platoon has heavy vehicles *(12).*

In driver-contributory causes, inattentive driving by the driver was the leading contributory cause of all work zone crashes. Attention of the driver in work zones is very important and drivers can be alerted by using temporary rumble strips or other raised pavement markings which have both physical vibration and visual impacts effective in alerting drivers to drive cautiously. Some highly visible warning devices such as flashing lights may also be effective in warning inattentive drivers *(12).* The second leading cause of work zone crashes was following too close. Proper installation of a Changeable Message Sign (CMS) warns drivers approaching work zones about the upcoming risk scenario such as time delay expected, length of the work zone, etc. This will encourage the drivers to choose alternate routes which will reduce traffic congestion and subsequently, may reduce following too close. Several other

countermeasure ideas, presented Table 4.13, could be implemented under poor visibility conditions in order to warn inattentive or distracted drivers and also reduce the intensity of rear-end crashes.

Table 4.12 Countermeasure Ideas for Poor Visibility Conditions

Characteristic	Countermeasure	Reference
Poor Visibility Conditions	Light Emitting Diode (LED) Road Work Signs	*Takemoto et al. (20)*
	Roboflaggger	*Tom (27)*
	Emergency Warning Lights for Maintenance Vehicles	*Christianson et al. (21)*
	Fluorescent Yello-Green Background for Vehicle-Mounted Work Zone Signs	*Kamyab and Brandon (24)*

The issue of drivers exceeding speed limits could be mitigated using techniques such as automated speed photo-radar enforcement, van-enabled photo enforcement, or simpler methods like flashing beacons, police presence, etc. These are described in Table 4.14. Reducing the speed of approaching vehicles also decreases frequency of rear-end collisions.

Table 4.13 Speed-Reduction Countermeasure Ideas

Characteristic	Countermeasure	Reference
Speed Limit	Van-enabled photo enforcement to keep speeds down in work zones	*Tom (27)*
	A speed-activated sign triggers a flashing beacon when a predetermined speed threshold is exceeded	*Mattox et al. (22)*
	Police presence, enhanced fines, changeable message signs, radar-activated horn system, display license plate number, speed of speeding vehicle, intrusion alarm	*Vicki and Jonathan (23)*
	Construction zone traffic fines' panel sign	*Huebschman et al. (26)*
	Automated speed photo-radar enforcement	*Medina et al. (32)*
	Lane-width reduction, law enforcement, changeable message signs, rumble strips, flashing beacons	*Benekohal et al. (31)*
	Use of Police in Work Zones	*Arnold (24)*
	Changeable message sign with radar unit	*Garber and Woo (18)*

Based on the study, a number of countermeasures can be suggested to improve safety in work zones. In general, implementation of these countermeasures is a lengthy process with several stages such as planning, designing, implementation, and output evaluation. All steps require financing and each improvement will be associated with a certain amount of cost plus benefits. However, these cost-associated issues are beyond the scope of this research study and thus, no costs were considered when suggesting countermeasures to improve safety in work zones.

In order to improve awareness, education programs about work zones might help to improve safety in these areas to some extent. Similarly, introduction of best practices such as seat belt usage, being in the same lane within work zones, maintaining the work zone speed limit, avoiding drunken driving, etc. will improve the safety of drivers in work zones.

CHAPTER 5 - SUMMARY AND CONCLUSIONS

Crash data obtained from the SWZDI region states through the years 2002 to 2006 were analyzed with the intention of identifying characteristics and risk factors associated with work zone crashes. In the first stage, detailed characteristic analysis of work zone crashes was carried out for all five states under several categories such as environmental-related, roadway-related, location and type of work zone-related, crash-related, vehicle-related, and driver-related factors. Characteristics were first identified separately for each of the five states: Iowa, Kansas, Missouri, Nebraska, and Wisconsin. The data from the five states were then combined together for the five-year period, and characteristics of the work zone crashes in the SWZDI region were identified and presented. However, combining work zone crash data from different states was a challenging task as each state uses a different crash reporting form and variable definitions. In the second stage, a statistical analysis was done for the Iowa data set to identify risk factors associated with work zone crashes. Results from these two categories are briefly described in the following sections**.**

5.1 Characteristic Conclusions

According to analysis results, in all five states, most of the work zone crashes occurred under clear environmental conditions. Multiple-vehicle crashes were more predominant in work zone crashes when compared to crashes involving a single vehicle. A majority of the work zone crashes led to PDO crashes and a few but noticeable percentage of fatal crashes occurred in work zones. At the time of occurrence of a crash, a majority of vehicles involved were going straight or following the road. Further, a predominant percentage of vehicles were stopped in traffic or

slowing down for a signal. Passenger cars were more involved in work zone crashes when compared to light-duty and heavy-duty vehicles. Rear-end was the most predominant type of collision in work zone areas when compared to other collisions. As of 2006, only two states have tracked work zone-related variables such as type of work zone and location of crash within work zone areas. Results showed that nearly 50% of work zone crashes occurred in the activity area of the work zone *(6, 7, 8, 9,)* where the actual work goes on. The safest zone within work zones was before the work zone warning sign, i.e., advance warning area which warns the traffic what to expect ahead. The lane-closure work zone type was the one where the highest percentage of crashes occurred, followed by work on the shoulder or median type of work zone. While analyzing the characteristics of driver-contributory factors leading to work zone crashes in the SWZDI region, inattentive driving and following too close for conditions were some of the factors contributing to work zone crashes. Male drivers aged between 25 to 64 years were more involved in work zone crashes when compared to female drivers, as they might be the ones who drive more.

5.2 Modeling Conclusions

In order to identify risk factors associated with work zone crashes, the ordered probit model was developed for the Iowa work zone crash data set for the period 2002-2006. The objective of this type of modeling was to see the combined effect of variables contributing to higher injury severity.

Based on the study, work zone crashes involving trucks, light-duty vehicles following too close, non-deployment of airbags, sideswipe collision of same-direction vehicles, crashes occurring on roadways, posted speed limits and crashes occurring while vehicles were taking left/right turns in a work zone area showed a higher propensity for severe injuries. Work zone

crashes involving male drivers had a tendency for higher injury severities compared to female drivers. Middle-age drivers were more prone to severe injuries than old age and young age drivers. Injury severity was high in crashes occurring on on-roadway work zone areas. Vehicles colliding sideways while travelling in the same direction showed significant results with respect to higher injury severity when compared to head-on collisions. Compared to other vehicle types, involvement of trucks in work zone crashes tended to have high injury severity. Further, it was found that vehicles following too close in work zone areas tended to increase the injury severity of the occupants. Finally, it can be concluded the study has found many important parameters where occupants are at risk in work zone areas, and these findings can be used in the future to improve safety in work zones.

Finally, in order to get better results and findings, motor vehicle accident report forms in all five states need to be modified to facilitate work zone crash investigations at more precise levels. For instance, traffic control devices listed in the thesis do not include temporary traffic control devices such as channelization devices and temporary lighting devices commonly used in work zones. As a result, police usually either classifies temporary work zone traffic control devices as "other" or do not record them. Revisions should also be considered for other sections such as crash locations within work zones (advance warning area, transition area, activity area, or termination area) and pedestrian identification (regular pedestrian or construction worker). Descriptions of the work zone including construction work types, length of the work zone, and status of the work zone (active or inactive) at the crash time should also be included in accident reports. This type of exposure data related to work zones would help to identify more behavioral factors, which would help to improve safety in work zones.

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APPENDIX A - DETAILED CRASH CHARACTERISTICS FOR INDIVIDUAL STATES

Table A.1 Detailed Work Zone Crash Characteristics – Iowa

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Light Conditions	Daylight	447	586	659	633	590	2,915	79.4%	78.3%	78.9%	77.2%	81.6%	79.0%
	Dusk	6	13	14	12	9	54	1.1%	1.7%	1.7%	1.5%	1.2%	1.5%
	Dawn	10	8	6	13	8	45	1.8%	1.1%	0.7%	1.6%	1.1%	1.2%
	Dark Street Lights On	53	73	87	90	62	365	9.4%	9.8%	10.4%	11%	8.6%	9.9%
	Dark No Street Lights	42	60	63	63	45	273	7.5%	8.0%	7.5%	7.7%	6.2%	7.4%
	Unknown	5	8	6	9	9	37	0.9%	1.1%	0.7%	1.1%	1.2%	1.0%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weather Conditions	Clear	363	453	438	496	404	2,154	64.5%	60.6%	52.5%	60.5%	55.9%	58.4%
	Partly Cloudy	90	125	178	143	136	672	16.0%	16.7%	21.3%	17.4%	18.8%	18.2%
	Cloudy	57	87	108	102	98	452	10.1%	11.6%	12.9%	12.4%	13.6%	12.3%
	Fog, Smoke, Mist	20	15	30	14	21	100	3.6%	2.0%	3.6%	1.7%	2.9%	2.7%
	Rain	21	52	59	45	50	227	3.7%	7.0%	7.1%	5.5%	6.9%	6.2%
	Snow, Sleet, Hail, Freezing rain	3	6	8	6	9	32	0.5%	0.8%	1.0%	0.7%	1.2%	0.9%
	Severe Winds, Blowing Sand, Soil, Dirt	3	8	6	4	1	22	0.5%	1.1%	0.7%	0.5%	0.1%	0.6%
	Unknown	6	2	8	10	4	34	1.1%	0.3%	1.0%	1.2%	0.6%	0.9%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Surface Conditions	Dry	478	617	671	667	601	3,034	84.9%	82.5%	80.4%	81.3%	83.1%	82.2%
	Wet	52	88	112	87	80	419	9.2%	11.8%	13.4%	10.6%	11.1%	11.4%
	Ice, Snow, Slush	1	13	16	17	7	54	0.2%	1.7%	1.9%	2.1%	1.0%	1.5%
	Sand, Mud, Dirt, Oil, Gravel	14	14	19	19	16	82	2.5%	1.9%	2.3%	2.3%	2.2%	2.2%
	Water (Standing, Moving)	0	2	4	3	2	11	0.0%	0.3%	0.5%	0.4%	0.3%	0.3%
	Unknown	18	14	13	27	17	89	3.2%	1.9%	1.6%	3.3%	2.4%	2.4%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Crash Type	Single Vehicle	95	143	131	181	141	691	16.9%	19.1%	15.7%	22.1%	19.5%	18.7%
	Two Vehicles	373	513	581	526	490	2,483	66.3%	68.6%	69.6%	64.1%	67.8%	67.3%
	Multi-Vehicle	95	92	123	113	92	515	16.9%	12.3%	14.7%	13.8%	12.7%	14.0%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Crash Severity	Fatal	6	7	6	6	1	26	1.1%	0.9%	0.7%	0.7%	0.1%	0.7%
	Injury	213	237	251	294	264	1,259	37.8%	31.7%	30.1%	35.9%	36.5%	34.1%
	PDO	344	504	578	520	458	2,404	61.1%	67.4%	69.2%	63.4%	63.3%	65.2%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Drug/Alcohol Involved	No	451	576	670	649	547	2,893	80.1%	77.0%	80.2%	79.1%	75.7%	78.4%
	Yes	109	170	162	169	175	785	19.4%	22.7%	19.4%	20.6%	24.2%	21.3%
	Unknown	3	2	3	2	1	11	0.5%	0.3%	0.4%	0.2%	0.1%	0.3%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Day of Accident	Sunday	37	61	61	52	49	260	6.6%	8.2%	7.3%	6.3%	6.8%	7.0%
	Monday	73	122	117	136	107	555	13.0%	16.3%	14.0%	16.6%	14.8%	15.0%
	Tuesday	87	118	138	131	116	590	15.5%	15.8%	16.5%	16.0%	16.0%	16.0%
	Wednesday	93	126	139	148	124	630	16.5%	16.8%	16.6%	18.0%	17.2%	17.1%
	Thursday	107	118	154	142	135	656	19.0%	15.8%	18.4%	17.3%	18.7%	17.8%
	Friday	95	121	142	139	130	627	16.9%	16.2%	17.0%	17.0%	18.0%	17.0%
	Saturday	71	82	84	72	62	371	12.6%	11.0%	10.1%	8.8%	8.6%	10.1%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Work Zone Type	Lane Closure	250	315	360	327	315	1,567	44.4%	42.1%	43.1%	39.9%	43.6%	42.5%
	Lane Shift/Crossover/Head-To-Head Traffic	65	97	85	111	84	442	11.5%	13.0%	10.2%	13.5%	11.6%	12.0%
	Work on Shoulder or Median	73	108	140	127	106	554	13.0%	14.4%	16.8%	15.5%	14.7%	15.0%
	Intermittent or Moving Work	35	27	44	44	35	185	6.2%	3.6%	5.3%	5.4%	4.8%	5.0%
	Other Type of Work Zone	116	153	165	163	142	739	20.6%	20.5%	19.8%	19.9%	19.6%	20.0%
	Unknown	24	48	41	48	41	202	4.3%	6.4%	4.9%	5.9%	5.7%	5.5%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Work Zone Locations	Before Work Zone Warning Sign	38	38	59	54	62	251	6.7%	5.1%	7.1%	6.6%	8.6%	6.8%
	Between Advance Warning Sign and Work Area	98	109	135	108	113	563	17.4%	14.6%	16.2%	13.2%	15.6%	15.3%
	Within Transition Area for Lane Shift	90	141	144	137	115	627	16.0%	18.9%	17.2%	16.7%	15.9%	17.0%
	Within or Adjacent To Work Activity	210	292	337	347	300	1,486	37.3%	39.0%	40.4%	42.3%	41.5%	40.3%
	Between End Of Work Area And "End Work Zone" Sign	23	26	16	24	20	109	4.1%	3.5%	1.9%	2.9%	2.8%	3.0%
	Other Work Zone Area	82	95	117	108	94	496	14.6%	12.7%	14.0%	13.2%	13.0%	13.4%
	Unknown	22	47	27	42	19	157	3.9%	6.3%	3.2%	5.1%	2.6%	4.3%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Workers	Yes	213	271	279	308	287	1,358	37.8%	36.2%	33.4%	37.6%	39.7%	36.8%
	No	298	405	477	443	381	2,004	52.9%	54.1%	57.1%	54.0%	52.7%	54.3%
	Unknown	52	72	79	69	55	327	9.2%	9.6%	9.5%	8.4%	7.6%	8.9%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Collision With Other Motor Vehicle	Non-Collision	97	145	135	189	148	714	17.2%	19.4%	16.2%	23.0%	20.5%	19.4%
	Head On	8	7	7	16	10	48	1.4%	0.9%	0.8%	2.0%	1.4%	1.3%
	Rear End	286	345	427	378	360	1,796	50.8%	46.1%	51.1%	46.1%	49.8%	48.7%
	Angle-Side Impact	20	38	20	37	30	145	3.6%	5.1%	2.4%	4.5%	4.1%	3.9%
	Broadside	57	76	97	71	61	362	10.1%	10.2%	11.6%	8.7%	8.4%	9.8%
	Sideswipe: Same Direction	82	121	130	104	104	541	14.6%	16.2%	15.6%	12.7%	14.4%	14.7%
	Sideswipe: Opposite Direction	8	6	11	17	6	48	1.4%	0.8%	1.3%	2.1%	0.8%	1.3%
	Unknown	5	10	8	8	4	35	0.9%	1.3%	1.0%	1.0%	0.6%	0.9%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Location of First Harmful Event	On Roadway	517	676	784	750	668	3,395	91.8%	90.4%	93.9%	91.5%	92.4%	92.0%
	Shoulder	18	35	27	35	26	141	3.2%	4.7%	3.2%	4.3%	3.6%	3.8%
	Median	3	9	6	2	4	24	0.5%	1.2%	0.7%	0.2%	0.6%	0.7%
	Roadside	14	19	11	20	16	80	2.5%	2.5%	1.3%	2.4%	2.2%	2.2%
	Outside Trafficway	4	7	5	8	7	31	0.7%	0.9%	0.6%	1.0%	1.0%	0.8%
	Unknown/ Not Reported	7	2	2	5	2	18	1.2%	0.3%	0.2%	0.6%	0.3%	0.5%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Limit	0 - 20 mph	8	11	13	13	12	57	1.4%	1.5%	1.6%	1.6%	1.7%	1.5%
	21 - 30 mph	120	175	140	133	132	700	21.3%	23.4%	16.8%	16.2%	18.3%	19.0%
	31 - 40 mph	98	119	202	171	158	748	17.4%	15.9%	24.2%	20.9%	21.9%	20.3%
	41 - 50 mph	40	83	65	97	89	374	7.1%	11.1%	7.8%	11.8%	12.3%	10.1%
	51 - 60 mph	214	277	339	326	284	1,440	38.0%	37.0%	40.6%	39.8%	39.3%	39.0%
	61 - 70 mph	66	62	48	51	39	266	11.7%	8.3%	5.7%	6.2%	5.4%	7.2%
	71 - 80 mph	0	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	> 80 mph	0	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unknown	17	21	28	29	9	104	3.0%	2.8%	3.4%	3.5%	1.2%	2.8%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Accident Class (First Harmful Event)	Overturn/Rollover	13	23	20	18	16	90	2.3%	3.1%	2.4%	2.2%	2.2%	2.4%
	Jackknife	2	3	0	0	2	7	0.4%	0.4%	0.0%	0.0%	0.3%	0.2%
	Other Non-Collision	9	16	11	26	22	84	1.6%	2.1%	1.3%	3.2%	3.0%	2.3%
	Non-Motorist	3	5	5	9	10	32	0.5%	0.7%	0.6%	1.1%	1.4%	0.9%
	Vehicle in Traffic	424	550	645	579	540	2,738	75.3%	73.5%	77.2%	70.6%	74.7%	74.2%
	Vehicle in/from Other Roadway	21	22	23	26	24	116	3.7%	2.9%	2.8%	3.2%	3.3%	3.1%
	Parked Motor Vehicle	12	20	28	26	16	102	2.1%	2.7%	3.4%	3.2%	2.2%	2.8%
	Animal	2	1	6	3	2	14	0.4%	0.1%	0.7%	0.4%	0.3%	0.4%
	Other Non-Fixed Object	16	18	18	26	26	104	2.8%	2.4%	2.2%	3.2%	3.6%	2.8%
	Bridge/Bridge Rail/Overpass	2	8	6	1	6	23	0.4%	1.1%	0.7%	0.1%	0.8%	0.6%
	Culvert	1	2	0	4	2	9	0.2%	0.3%	0.0%	0.5%	0.3%	0.2%
	Ditch/Embankment	13	13	9	11	13	59	2.3%	1.7%	1.1%	1.3%	1.8%	1.6%
	Curb/Island/Raised Median	2	6	8	5	4	25	0.4%	0.8%	1.0%	0.6%	0.6%	0.7%
	Guardrail	4	7	3	5	3	22	0.7%	0.9%	0.4%	0.6%	0.4%	0.6%
	Concrete Barrier	7	16	25	24	15	87	1.2%	2.1%	3.0%	2.9%	2.1%	2.4%
	Tree	1	2	1	1	1	6	0.2%	0.3%	0.1%	0.1%	0.1%	0.2%
	Poles (Utility, Light etc.)	6	3	6	3	3	21	1.1%	0.4%	0.7%	0.4%	0.4%	0.6%
	Sign Post	5	5	5	8	2	25	0.9%	0.7%	0.6%	1.0%	0.3%	0.7%
	Impact Attenuator	1	2	1	5	1	10	0.2%	0.3%	0.1%	0.6%	0.1%	0.3%
	Other Fixed Object	16	21	9	34	11	91	2.8%	2.8%	1.1%	4.1%	1.5%	2.5%
	Unknown	3	5	6	6	4	24	0.5%	0.7%	0.7%	0.7%	0.6%	0.7%
	Total	563	748	835	820	723	3,689	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Traffic Controls	None	528	681	872	794	670	3,545	44.7%	46.0%	51.5%	49.9%	46.7%	48.0%
	Traffic Signals	152	241	260	227	220	1,100	12.9%	16.3%	15.3%	14.3%	15.3%	14.9%
	Flashing Traffic Control Signal	11	10	14	14	16	65	0.9%	0.7%	0.8%	0.9%	1.1%	0.9%
	Stop and Yield Signs	66	122	86	106	99	479	5.6%	8.2%	5.1%	6.7%	6.9%	6.5%
	No Passing Zone	0	4	6	8	5	23	0.0%	0.3%	0.4%	0.5%	0.3%	0.3%
	Warning Signs	33	35	28	27	24	147	2.8%	2.4%	1.7%	1.7%	1.7%	2.0%
	Traffic Director	0	0	26	26	12	64	0.0%	0.0%	1.5%	1.6%	0.8%	0.9%
	Work Zone Signs	334	331	335	330	337	1,667	28.3%	22.4%	19.8%	20.7%	23.5%	22.6%
	Unknown/Other	56	56	67	59	52	290	4.7%	3.8%	4.0%	3.7%	3.6%	3.9%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Age	Young Age	333	381	415	411	371	1,911	28.2%	25.7%	24.5%	25.8%	25.9%	25.9%
	Middle Age	670	923	1,070	973	887	4,523	56.8%	62.4%	63.2%	61.2%	61.8%	61.3%
	Old Age	115	119	124	144	113	615	9.7%	8.0%	7.3%	9.1%	7.9%	8.3%
	Unknown	62	57	85	63	64	331	5.3%	3.9%	5.0%	4.0%	4.5%	4.5%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Gender	Male	671	859	940	877	823	4,170	56.9%	58.0%	55.5%	55.1%	57.4%	56.5%
	Female	450	564	671	652	553	2,890	38.1%	38.1%	39.6%	41.0%	38.5%	39.2%
	Unknown	59	57	83	62	59	320	5.0%	3.9%	4.9%	3.9%	4.1%	4.3%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Driver Contributing Circumstances	Ran Traffic Signal	20	25	28	15	14	102	1.7%	1.7%	1.7%	0.9%	1.0%	1.4%
	Ran Stop Sign	2	11	6	10	9	38	0.2%	0.7%	0.4%	0.6%	0.6%	0.5%
	Exceeded Authorized Speed	6	7	6	14	4	37	0.5%	0.5%	0.4%	0.9%	0.3%	0.5%
	Driving Too Fast for Conditions	56	46	76	55	62	295	4.7%	3.1%	4.5%	3.5%	4.3%	4.0%
	Made Improper Turn	14	15	10	15	13	67	1.2%	1.0%	0.6%	0.9%	0.9%	0.9%
	Traveling Wrong Way or Wrong Side of Road	8	7	8	9	8	40	0.7%	0.5%	0.5%	0.6%	0.6%	0.5%
	Crossed Centerline	4	8	6	12	15	45	0.3%	0.5%	0.4%	0.8%	1.0%	0.6%
	Lost Control	69	104	118	116	103	510	5.8%	7.0%	7.0%	7.3%	7.2%	6.9%
	Followed Too Close	111	151	179	128	144	713	9.4%	10.2%	10.6%	8.0%	10.0%	9.7%
	Avoiding Vehicle, Object in Roadway	12	27	18	35	20	112	1.0%	1.8%	1.1%	2.2%	1.4%	1.5%
	Over Correcting/Over Steering	3	6	4	7	7	27	0.3%	0.4%	0.2%	0.4%	0.5%	0.4%
	Operating Vehicle in an Aggressive Manner	19	16	24	19	14	92	1.6%	1.1%	1.4%	1.2%	1.0%	1.2%
	Failed to Yield Right of Way	98	130	131	126	108	593	8.3%	8.8%	7.7%	7.9%	7.5%	8.0%
	Inattentive Driving	4	16	9	25	14	68	0.3%	1.1%	0.5%	1.6%	1.0%	0.9%
	Other	599	809	932	877	796	4,013	50.8%	54.7%	55.0%	55.1%	55.5%	54.4%
	Unknown	155	102	139	128	104	628	13.1%	6.9%	8.2%	8.0%	7.2%	8.5%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Vehicle Body Type	Passenger Car	635	833	903	837	738	3,946	53.8%	56.3%	53.3%	52.6%	51.4%	53.5%
	Four-Tire Light Truck (Pickup, Panel)	162	214	270	227	231	1,104	13.7%	14.5%	15.9%	14.3%	16.1%	15.0%
	Van or Mini-Van	100	116	150	131	124	621	8.5%	7.8%	8.9%	8.2%	8.6%	8.4%
	Sport Utility Vehicle	97	117	178	192	162	746	8.2%	7.9%	10.5%	12.1%	11.3%	10.1%
	Single-Unit Truck (2-Axle,6-Tire)	23	25	23	34	14	119	1.9%	1.7%	1.4%	2.1%	1.0%	1.6%
	Single-Unit Truck (>= 3-Axle)	14	13	36	23	23	109	1.2%	0.9%	2.1%	1.4%	1.6%	1.5%
	Truck and Trailer(s)	22	20	18	5	4	69	1.9%	1.4%	1.1%	0.3%	0.3%	0.9%
	Truck Tractor (Bobtail)	3	1	4	1	1	10	0.3%	0.1%	0.2%	0.1%	0.1%	0.1%
	Tractor/Semi-trailer	60	85	54	84	77	360	5.1%	5.7%	3.2%	5.3%	5.4%	4.9%
	Other Heavy Truck (Cannot Classify)	5	7	4	2	0	18	0.4%	0.5%	0.2%	0.1%	0.0%	0.2%
	Motor Home/Recreational Vehicle	5	4	4	17	4	34	0.4%	0.3%	0.2%	1.1%	0.3%	0.5%
	Motorcycle	6	9	14	1	22	52	0.5%	0.6%	0.8%	0.1%	1.5%	0.7%
	School Bus (Seats>15)	3	3	3	0	3	12	0.3%	0.2%	0.2%	0.0%	0.2%	0.2%
	Other Bus	4	1	2	1	3	11	0.3%	0.1%	0.1%	0.1%	0.2%	0.1%
	Farm Vehicle/Equipment	1	1	2	5	3	12	0.1%	0.1%	0.1%	0.3%	0.2%	0.2%
	Maintenance/Construction Vehicle	13	19	18	11	12	73	1.1%	1.3%	1.1%	0.7%	0.8%	1.0%
	Train	4	1	1	10	0	16	0.3%	0.1%	0.1%	0.6%	0.0%	0.2%
	Other	10	6	5	1	8	30	0.8%	0.4%	0.3%	0.1%	0.6%	0.4%
	Unknown	13	5	5	9	6	38	1.1%	0.3%	0.3%	0.6%	0.4%	0.5%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.1 Detailed Work Zone Crash Characteristics – Iowa (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total%
Vehicle Maneuver Before Crash	Straight/Following Road	666	817	895	857	792	4,027	56.4%	55.2%	52.8%	53.9%	55.2%	54.6%
	Turning Left	58	75	69	90	91	383	4.9%	5.1%	4.1%	5.7%	6.3%	5.2%
	Turning Right	26	45	36	27	24	158	2.2%	3.0%	2.1%	1.7%	1.7%	2.1%
	Making U-Turn	5	4	4	6	7	26	0.4%	0.3%	0.2%	0.4%	0.5%	0.4%
	Overtaking (Passing)	11	10	10	9	3	43	0.9%	0.7%	0.6%	0.6%	0.2%	0.6%
	Changing Lanes	34	46	65	66	56	267	2.9%	3.1%	3.8%	4.1%	3.9%	3.6%
	Entering Traffic Lane (Merging)	37	79	77	57	43	293	3.1%	5.3%	4.5%	3.6%	3.0%	4.0%
	Leaving Traffic Lane	4	10	7	7	4	32	0.3%	0.7%	0.4%	0.4%	0.3%	0.4%
	Backing	11	27	29	21	16	104	0.9%	1.8%	1.7%	1.3%	1.1%	1.4%
	Slowing/Stopping	213	228	337	278	267	1,323	18.1%	15.4%	19.9%	17.5%	18.6%	17.9%
	Stopped for Stop Sign/Signal	52	50	66	78	69	315	4.4%	3.4%	3.9%	4.9%	4.8%	4.3%
	Legally Parked, Illegally Parked Vehicles	15	29	42	35	25	146	1.3%	2.0%	2.5%	2.2%	1.7%	2.0%
	Unknown	48	60	57	60	38	263	4.1%	4.1%	3.4%	3.8%	2.6%	3.6%
	Total	1,180	1,480	1,694	1,591	1,435	7,380	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Light Conditions	Daylight	1,225	1,367	1,561	1,049	1,415	6,617	73.8%	71.0%	71.7%	73.3%	76.1%	73.1%
	Dawn	29	40	36	17	37	159	1.7%	2.1%	1.7%	1.2%	2.0%	1.8%
	Dusk	26	47	45	28	26	172	1.6%	2.4%	2.1%	2.0%	1.4%	1.9%
	Dark Street Lights On	171	231	265	188	207	1,062	10.3%	12.0%	12.2%	13.1%	11.1%	11.7%
	Dark No Street Lights	193	232	266	146	173	1,010	11.6%	12.1%	12.2%	10.2%	9.3%	11.2%
	Unknown	15	7	5	3	2	32	0.9%	0.4%	0.2%	0.2%	0.1%	0.4%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weather Conditions	No Adverse Conditions	1,474	1,716	1,847	1,272	1,677	7,986	88.8%	89.2%	84.8%	88.9%	90.2%	88.2%
	Rain, Mist, Drizzle	113	136	235	108	133	725	6.8%	7.1%	10.8%	7.5%	7.2%	8.0%
	Sleet	6	4	3	1	9	23	0.4%	0.2%	0.1%	0.1%	0.5%	0.3%
	Snow	16	12	38	23	6	95	1.0%	0.6%	1.7%	1.6%	0.3%	1.0%
	Fog	10	13	8	4	2	37	0.6%	0.7%	0.4%	0.3%	0.1%	0.4%
	Smoke	0	1	0	0	0	1	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
	Strong Winds	14	19	16	8	11	68	0.8%	1.0%	0.7%	0.6%	0.6%	0.8%
	Blowing Dust, Sand, etc.	4	0	3	0	2	9	0.2%	0.0%	0.1%	0.0%	0.1%	0.1%
	Freezing Rain	4	3	5	3	4	19	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
	Rain & Fog	0	0	2	0	3	5	0.0%	0.0%	0.1%	0.0%	0.2%	0.1%
	Rain & Wind	4	4	11	4	9	32	0.2%	0.2%	0.5%	0.3%	0.5%	0.4%
	Sleet & Fog	0	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Snow & Winds	6	11	1	2	0	20	0.4%	0.6%	0.0%	0.1%	0.0%	0.2%
	Other	8	5	9	6	4	32	0.5%	0.3%	0.4%	0.4%	0.2%	0.4%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Road Surface Condition	Dry	1,427	1,671	1,797	1,215	1,652	7,762	86.0%	86.9%	82.5%	84.9%	88.8%	85.7%
	Wet	166	193	305	154	167	985	10.0%	10.0%	14.0%	10.8%	9.0%	10.9%
	Snow, Ice	40	41	54	47	26	208	2.4%	2.1%	2.5%	3.3%	1.4%	2.3%
	Mud, Sand & Debris	15	13	15	10	9	62	0.9%	0.7%	0.7%	0.7%	0.5%	0.7%
	Other	11	6	7	5	6	35	0.7%	0.3%	0.3%	0.3%	0.3%	0.4%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Surface Type	Concrete	593	691	932	569	820	3,605	35.7%	35.9%	42.8%	39.8%	44.1%	39.8%
	Blacktop	1,004	1,161	1,188	826	998	5,177	60.5%	60.3%	54.5%	57.7%	53.7%	57.2%
	Gravel	30	35	30	19	16	130	1.8%	1.8%	1.4%	1.3%	0.9%	1.4%
	Dirt	11	18	13	2	18	62	0.7%	0.9%	0.6%	0.1%	1.0%	0.7%
	Brick	12	8	4	6	5	35	0.7%	0.4%	0.2%	0.4%	0.3%	0.4%
	Other	9	11	11	9	3	43	0.5%	0.6%	0.5%	0.6%	0.2%	0.5%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Character	Straight and Level	1,159	1,344	1,448	1,012	1,256	6,219	69.9%	69.9%	66.5%	70.7%	67.5%	68.7%
	Straight on Grade	316	366	449	257	394	1,782	19.0%	19.0%	20.6%	18.0%	21.2%	19.7%
	Straight on Hillcrest	25	24	37	23	24	133	1.5%	1.2%	1.7%	1.6%	1.3%	1.5%
	Curved and Level	76	95	113	70	86	440	4.6%	4.9%	5.2%	4.9%	4.6%	4.9%
	Curved on Grade	68	88	116	62	92	426	4.1%	4.6%	5.3%	4.3%	4.9%	4.7%
	Curved at Hillcrest	3	1	3	1	4	12	0.2%	0.1%	0.1%	0.1%	0.2%	0.1%
	Other	12	6	12	6	4	40	0.7%	0.3%	0.6%	0.4%	0.2%	0.4%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Construction/ Maintenance Zone	Construction Zone	1,449	1,733	2,000	1,272	1,736	8,190	87.3%	90.1%	91.8%	88.9%	93.3%	90.5%
	Maintenance Zone	186	161	162	131	124	764	11.2%	8.4%	7.4%	9.2%	6.7%	8.4%
	Utility Zone	24	30	16	28	0	98	1.4%	1.6%	0.7%	2.0%	0.0%	1.1%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100%	100%	100%	100%	100%	100%
Alcohol Involved	No	1,591	1,837	2,073	1,377	1,790	8,668	95.9%	95.5%	95.2%	96.2%	96.2%	95.8%
	Yes	68	87	105	54	70	384	4.1%	4.5%	4.8%	3.8%	3.8%	4.2%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100%	100%	100%	100%	100%	100%
Crash Severity	Fatal	16	13	20	7	14	70	1.0%	0.7%	0.9%	0.5%	0.8%	0.8%
	Injury	401	422	509	328	452	2,112	24.2%	21.9%	23.4%	22.9%	24.3%	23.3%
	PDO	1,242	1,489	1,649	1,096	1,394	6,870	74.9%	77.4%	75.7%	76.6%	74.9%	75.9%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100%	100%	100%	100%	100%	100%
Accident Class	Other Non-Collision	47	36	50	41	34	208	2.8%	1.9%	2.3%	2.9%	1.8%	2.3%
	Overturned	66	65	54	34	50	269	4.0%	3.4%	2.5%	2.4%	2.7%	3.0%
	Other Motor Vehicle	1,114	1,358	1,537	990	1,360	6,359	67.1%	70.6%	70.6%	69.2%	73.1%	70.2%
	Parked Motor Vehicle	63	44	59	45	44	255	3.8%	2.3%	2.7%	3.1%	2.4%	2.8%
	Animal	111	127	128	77	85	528	6.7%	6.6%	5.9%	5.4%	4.6%	5.8%
	Fixed Object	194	234	277	191	228	1,124	11.7%	12.2%	12.7%	13.3%	12.3%	12.4%
	Other	64	60	73	53	59	243	3.9%	3.1%	3.4%	3.7%	3.2%	3.4%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100%	100%	100%	100%	100%	100%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Crash Location	On Roadway: On-Intersection	905	1,026	1,182	803	1,096	5,012	54.6%	53.3%	54.3%	56.1%	58.9%	55.4%
	Intersection	236	257	291	167	224	1,175	14.2%	13.4%	13.4%	11.7%	12.0%	13.0%
	Intersection Related	212	240	230	190	209	1,081	12.8%	12.5%	10.6%	13.3%	11.2%	11.9%
	Parking Lot or Driveway Access	75	95	63	50	46	329	4.5%	4.9%	2.9%	3.5%	2.5%	3.6%
	Interchange Area	161	202	273	137	186	959	9.7%	10.5%	12.5%	9.6%	10.0%	10.6%
	On Crossover & Parking Lot	1	5	3	1	1	11	0.1%	0.3%	0.1%	0.1%	0.1%	0.1%
	Off Roadway: Roadside	55	83	111	70	72	391	3.3%	4.3%	5.1%	4.9%	3.9%	4.3%
	Median	14	15	24	12	25	90	0.8%	0.8%	1.1%	0.8%	1.3%	1.0%
	Other	0	1	1	1	1	4	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Collision with Other Motor Vehicle	Head On	17	16	15	17	22	87	1.0%	0.8%	0.7%	1.2%	1.2%	1.0%
	Rear End	642	757	924	580	838	3,741	38.7%	39.3%	42.4%	40.5%	45.1%	41.3%
	Angle-Side Impact	307	337	347	224	266	1,481	18.5%	17.5%	15.9%	15.7%	14.3%	16.4%
	Sideswipe: Opposite Direction	20	24	16	12	20	92	1.2%	1.2%	0.7%	0.8%	1.1%	1.0%
	Sideswipe: Same Direction	80	166	184	124	178	732	4.8%	8.6%	8.4%	8.7%	9.6%	8.1%
	Backed Into	28	30	35	23	25	141	1.7%	1.6%	1.6%	1.6%	1.3%	1.6%
	Other	16	26	14	9	10	75	1.0%	1.4%	0.6%	0.6%	0.5%	0.8%
	Unknown	549	568	643	442	501	2,703	33.1%	29.5%	29.5%	30.9%	26.9%	29.9%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Crash Type	Single Vehicle	535	556	622	430	488	2,631	32.2%	28.9%	28.6%	30.0%	26.2%	29.1%
	Two Vehicles	959	1,204	1,288	846	1,123	5,420	57.8%	62.6%	59.1%	59.1%	60.4%	59.9%
	More Than Two Vehicles	165	164	268	155	249	1,001	9.9%	8.5%	12.3%	10.8%	13.4%	11.1%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Limit	0 - 20 mph	53	47	80	30	35	245	3.2%	2.4%	3.7%	2.1%	1.9%	2.7%
	21 - 30 mph	313	259	353	221	267	1,413	18.9%	13.5%	16.2%	15.4%	14.4%	15.6%
	31 - 40 mph	302	390	449	325	435	1,901	18.2%	20.3%	20.6%	22.7%	23.4%	21.0%
	41 - 50 mph	233	290	230	188	170	1,111	14.0%	15.1%	10.6%	13.1%	9.1%	12.3%
	51 - 60 mph	460	569	669	327	293	2,318	27.7%	29.6%	30.7%	22.9%	15.8%	25.6%
	61 - 70 mph	248	266	332	311	617	1,774	14.9%	13.8%	15.2%	21.7%	33.2%	19.6%
	Unknown	50	103	65	29	43	290	3.0%	5.4%	3.0%	2.0%	2.3%	3.2%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Day Of Accident	Sunday	128	189	212	118	135	782	7.7%	9.8%	9.7%	8.2%	7.3%	8.6%
	Monday	260	262	302	219	253	1,296	15.7%	13.6%	13.9%	15.3%	13.6%	14.3%
	Tuesday	254	297	300	230	293	1,374	15.3%	15.4%	13.8%	16.1%	15.8%	15.2%
	Wednesday	285	275	356	208	310	1,434	17.2%	14.3%	16.3%	14.5%	16.7%	15.8%
	Thursday	240	308	327	234	320	1,429	14.5%	16.0%	15.0%	16.4%	17.2%	15.8%
	Friday	299	328	390	255	350	1,622	18.0%	17.0%	17.9%	17.8%	18.8%	17.9%
	Saturday	193	265	291	167	199	1,115	11.6%	13.8%	13.4%	11.7%	10.7%	12.3%
	Total	1,659	1,924	2,178	1,431	1,860	9,052	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Vehicle Body Type	Automobile	1,839	1,820	2,067	1,272	1,777	8,775	61.59%	52.12%	50.76%	48.35%	49.68%	52.36%
	Motorcycle	24	22	33	15	25	119	0.80%	0.63%	0.81%	0.57%	0.70%	0.71%
	Motor Scooter or Moped	0	1	1	1	1	4	0.00%	0.03%	0.02%	0.04%	0.03%	0.02%
	Van	256	238	337	193	295	1,319	8.57%	6.82%	8.28%	7.34%	8.25%	7.87%
	Pickup Truck	594	674	769	487	621	3,145	19.89%	19.30%	18.89%	18.51%	17.36%	18.77%
	Sport Utility Vehicle	3	410	508	396	543	1,860	0.10%	11.74%	12.48%	15.05%	15.18%	11.10%
	Camper or RV	5	5	4	0	4	18	0.17%	0.14%	0.10%	0.00%	0.11%	0.11%
	Farm Equipment	3	1	4	3	4	15	0.10%	0.03%	0.10%	0.11%	0.11%	0.09%
	Single Large Truck	79	88	102	88	89	446	2.65%	2.52%	2.50%	3.34%	2.49%	2.66%
	Truck and Trailer(s)	11	9	16	12	23	71	0.37%	0.26%	0.39%	0.46%	0.64%	0.42%
	Tractor-Trailer(s)	110	172	178	127	153	740	3.68%	4.93%	4.37%	4.83%	4.28%	4.42%
	School Bus	8	6	5	5	6	30	0.27%	0.17%	0.12%	0.19%	0.17%	0.18%
	Transit Bus	5	4	1	2	1	13	0.17%	0.11%	0.02%	0.08%	0.03%	0.08%
	Train	1	1	0	2	1	5	0.03%	0.03%	0.00%	0.08%	0.03%	0.03%
	Emergency Vehicles	0	1	2	2	1	6	0.00%	0.03%	0.05%	0.08%	0.03%	0.04%
	Unknown/Other	48	40	45	26	33	192	1.61%	1.15%	1.11%	0.99%	0.92%	1.15%
	Total	2,986	3,492	4,072	2,631	3,577	16,758	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Vehicle Maneuver Before Crash	Straight/Following Road	1,527	1,787	2,115	1,322	1,780	8,531	51.1%	51.2%	51.9%	50.2%	49.8%	50.9%
	Left Turn	201	201	181	147	159	889	6.7%	5.8%	4.4%	5.6%	4.4%	5.3%
	Right Turn	62	102	88	52	77	381	2.1%	2.9%	2.2%	2.0%	2.2%	2.3%
	U-Turn	12	17	11	10	13	63	0.4%	0.5%	0.3%	0.4%	0.4%	0.4%
	Changing Lanes, Overtaking	117	159	183	117	176	752	3.9%	4.6%	4.5%	4.4%	4.9%	4.5%
	Avoiding Maneuver	102	113	110	67	117	509	3.4%	3.2%	2.7%	2.5%	3.3%	3.0%
	Merging	62	75	85	53	64	339	2.1%	2.1%	2.1%	2.0%	1.8%	2.0%
	Backing	72	62	68	48	53	303	2.4%	1.8%	1.7%	1.8%	1.5%	1.8%
	Stopped Awaiting Turn	66	79	72	60	55	332	2.2%	2.3%	1.8%	2.3%	1.5%	2.0%
	Stopped in Traffic	370	442	593	338	472	2,215	12.4%	12.7%	14.6%	12.8%	13.2%	13.2%
	Parking	7	5	8	7	4	31	0.2%	0.1%	0.2%	0.3%	0.1%	0.2%
	Disabled in Roadway	2	8	7	8	2	27	0.1%	0.2%	0.2%	0.3%	0.1%	0.2%
	Slowing or Stopping	330	399	494	352	550	2,125	11.1%	11.4%	12.1%	13.4%	15.4%	12.7%
	Unknown/Other	56	43	57	50	55	261	1.9%	1.2%	1.4%	1.9%	1.5%	1.6%
	Total	2,986	3,492	4,072	2,631	3,577	16,758	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Vehicle Damage	None	145	169	204	123	150	791	4.9%	4.8%	5.0%	4.7%	4.2%	4.7%
	Damage (minor)	931	1,042	1,222	769	947	4,911	31.2%	29.8%	30.0%	29.2%	26.5%	29.3%
	Functional	1,022	1,307	1,460	975	1,369	6,133	34.2%	37.4%	35.9%	37.1%	38.3%	36.6%
	Disabling	690	795	960	600	879	3,924	23.1%	22.8%	23.6%	22.8%	24.6%	23.4%
	Destroyed	126	116	136	108	140	626	4.2%	3.3%	3.3%	4.1%	3.9%	3.7%
	Other	72	63	90	56	92	373	2.4%	1.8%	2.2%	2.1%	2.6%	2.2%
	Total	2,986	3,492	4,072	2,631	3,577	16,758	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Traffic Controls	None	364	333	366	252	255	1,570	16.1%	12.4%	11.9%	13.1%	10.3%	12.7%
	Office/Flagger	36	43	52	33	35	199	1.6%	1.6%	1.7%	1.7%	1.4%	1.6%
	Traffic Signal	340	403	473	287	392	1,895	15.0%	15.0%	15.4%	15.0%	15.9%	15.3%
	Stop Sign	149	151	172	116	128	716	6.6%	5.6%	5.6%	6.0%	5.2%	5.8%
	Flasher & Yield Sign	29	54	47	27	31	188	1.3%	2.0%	1.5%	1.4%	1.3%	1.5%
	RR Crossing Signal	8	3	6	6	1	24	0.4%	0.1%	0.2%	0.3%	0.0%	0.2%
	No Passing Zone	143	161	159	85	93	641	6.3%	6.0%	5.2%	4.4%	3.8%	5.2%
	Center/Edge Lines	984	1,317	1,521	968	1,380	6,170	43.4%	49.1%	49.6%	50.4%	55.9%	49.8%
	Unknown/Other	212	215	270	145	152	994	9.4%	8.0%	8.8%	7.6%	6.2%	8.0%
	Total	2,265	2,680	3,066	1,919	2,467	12,397	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Age	Young Age	885	1,022	1,203	761	1,053	4,924	29.7%	29.4%	29.6%	29.0%	29.5%	29.5%
	Middle Age	1,825	2,175	2,537	1,685	2,240	10,462	61.3%	62.5%	62.5%	64.3%	62.7%	62.6%
	Old Age	268	285	321	176	280	1,330	9.0%	8.2%	7.9%	6.7%	7.8%	8.0%
	Total	2,978	3,482	4,061	2,622	3,573	16,716	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Gender	Male	1,746	2,059	2,391	1,551	2,090	9,837	58.6%	59.1%	58.9%	59.2%	58.5%	58.8%
	Female	1,155	1,339	1,552	1,011	1,399	6,456	38.8%	38.5%	38.2%	38.6%	39.2%	38.6%
	Unknown	77	84	118	60	84	423	2.6%	2.4%	2.9%	2.3%	2.4%	2.5%
	Total	2,978	3,482	4,061	2,622	3,573	16,716	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Driver Contributing Circumstances Category	Under the Influence of Illegal Drugs	7	10	4	4	10	35	0.4%	0.5%	0.2%	0.3%	0.5%	0.3%
	Under the Influence of Alcohol	52	77	97	49	64	339	2.8%	3.6%	3.7%	3.1%	3.0%	3.3%
	Failed to Yield Right of Way	159	163	189	109	139	759	8.6%	7.5%	7.3%	7.0%	6.5%	7.4%
	Disregarded Traffic Signs, Signals, Markings	95	105	139	70	104	513	5.1%	4.9%	5.4%	4.5%	4.9%	5.0%
	Exceeded Posted Speed Limit	27	13	27	21	23	111	1.5%	0.6%	1.0%	1.3%	1.1%	1.1%
	Too Fast for Conditions	149	198	276	144	159	926	8.0%	9.2%	10.6%	9.2%	7.5%	9.0%
	Made Improper Turn	38	60	50	38	58	244	2.0%	2.8%	1.9%	2.4%	2.7%	2.4%
	Wrong Side or Wrong Way	20	22	13	9	22	86	1.1%	1.0%	0.5%	0.6%	1.0%	0.8%
	Followed too Closely	254	357	454	281	417	1,763	13.7%	16.5%	17.5%	18.0%	19.6%	17.1%
	Improper Lane Change	62	87	112	70	126	457	3.3%	4.0%	4.3%	4.5%	5.9%	4.4%
	Improper Backing	30	20	30	21	28	129	1.6%	0.9%	1.2%	1.3%	1.3%	1.3%
	Improper Passing	17	23	21	11	18	90	0.9%	1.1%	0.8%	0.7%	0.8%	0.9%
	Improper or No Signal	3	0	7	0	3	13	0.2%	0.0%	0.3%	0.0%	0.1%	0.1%
	Improper Parking	2	0	3	2	2	9	0.1%	0.0%	0.1%	0.1%	0.1%	0.1%
	Fell Asleep	28	19	16	16	29	108	1.5%	0.9%	0.6%	1.0%	1.4%	1.0%
	Inattention	797	835	950	587	761	3,930	43.0%	38.7%	36.7%	37.6%	35.7%	38.2%
	Did Not Comply-License Restrictions	10	17	19	9	8	63	0.5%	0.8%	0.7%	0.6%	0.4%	0.6%

Table A.2 Detailed Work Zone Crash Characteristics – Kansas (Contd..)

Driver Contributing Circumstances	Other Distractions	19	20	34	15	18	106	1.0%	0.9%	1.3%	1.0%	0.8%	1.0%
	Avoidance or Evasive Action	59	67	67	52	74	319	3.2%	3.1%	2.6%	3.3%	3.5%	3.1%
	Too Slow for Traffic	7	5	3	4	7	26	0.4%	0.2%	0.1%	0.3%	0.3%	0.3%
	Ill or Medical Condition	12	11	11	12	7	53	0.6%	0.5%	0.4%	0.8%	0.3%	0.5%
	Distraction-Mobile (cell)Phone	0	5	6	9	3	23	0.0%	0.2%	0.2%	0.6%	0.1%	0.2%
	Distraction-Other Electronic Devices	0	2	9	2	3	16	0.0%	0.1%	0.3%	0.1%	0.1%	0.2%
	Aggressive /Antagonistic Driving	0	2	12	6	14	34	0.0%	0.1%	0.5%	0.4%	0.7%	0.3%
	Reckless /Careless Driving	0	34	34	19	32	119	0.0%	1.6%	1.3%	1.2%	1.5%	1.2%
	Unknown	7	7	9	3	0	26	0.4%	0.3%	0.3%	0.2%	0.0%	0.3%
	Total	1,854	2,159	2,592	1,563	2,129	10,297	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Day of Week	Sunday	390	334	219	184	247	1,374	8.1%	7.5%	6.3%	5.8%	7.2%	7.1%
	Monday	688	681	530	436	427	2,762	14.2%	15.2%	15.3%	13.8%	12.5%	14.3%
	Tuesday	782	748	582	547	552	3,211	16.2%	16.7%	16.9%	17.4%	16.1%	16.6%
	Wednesday	783	767	561	581	587	3,279	16.2%	17.2%	16.2%	18.5%	17.1%	17.0%
	Thursday	832	722	598	532	559	3,243	17.2%	16.1%	17.3%	16.9%	16.3%	16.8%
	Friday	862	752	630	563	668	3,475	17.8%	16.8%	18.2%	17.9%	19.5%	18.0%
	Saturday	501	465	331	305	385	1,987	10.4%	10.4%	9.6%	9.7%	11.2%	10.3%
	unknown	1	3	3	1	1	9	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Accident Severity	Fatal	26	21	22	15	16	100	0.5%	0.5%	0.6%	0.5%	0.5%	0.5%
	Injury	1,090	1,014	781	677	780	4,342	22.5%	22.7%	22.6%	21.5%	22.8%	22.5%
	PDO	3,723	3,437	2,651	2,457	2,630	14,898	76.9%	76.9%	76.8%	78.0%	76.8%	77.0%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Number of Vehicles	Single Vehicle	943	824	656	560	643	3,626	19.5%	18.4%	19.0%	17.8%	18.8%	18.7%
	Two Vehicles	3,313	3,074	2,418	2,229	2,404	13,438	68.5%	68.7%	70.0%	70.8%	70.2%	69.5%
	Multiple Vehicles	583	574	380	360	379	2,276	12.0%	12.8%	11.0%	11.4%	11.1%	11.8%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lights Conditions	Daylight	3,657	3,464	2,660	2,468	2,543	14,792	75.6%	77.5%	77.0%	78.4%	74.2%	76.5%
	Dark - Streetlights On	524	485	392	355	407	2,163	10.8%	10.8%	11.3%	11.3%	11.9%	11.2%
	Dark - Streetlights Off	43	39	33	19	35	169	0.9%	0.9%	1.0%	0.6%	1.0%	0.9%
	Dark - No Streetlights	541	416	320	267	392	1,936	11.2%	9.3%	9.3%	8.5%	11.4%	10.0%
	Indeterminate	74	68	49	40	49	280	1.5%	1.5%	1.4%	1.3%	1.4%	1.4%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Road Surface	Concrete	1,318	1,232	821	809	847	5,027	27.2%	27.5%	23.8%	25.7%	24.7%	26.0%
	Asphalt/Bituminous	3,029	2,834	2,292	2,100	2,332	12,587	62.6%	63.4%	66.4%	66.7%	68.1%	65.1%
	Brick, Gravel & Sand	37	30	34	25	20	146	0.8%	0.7%	1.0%	0.8%	0.6%	0.8%
	Multi Surface	235	174	109	116	149	783	4.9%	3.9%	3.2%	3.7%	4.3%	4.0%
	Unknown	220	202	198	99	78	797	4.5%	4.5%	5.7%	3.1%	2.3%	4.1%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Conditions	Dry	4,056	3,747	2,877	2,772	3,062	16,514	83.8%	83.8%	83.3%	88.0%	89.4%	85.4%
	Wet	681	606	502	321	307	2,417	14.1%	13.6%	14.5%	10.2%	9.0%	12.5%
	Snow, Ice, Slush	57	76	41	29	23	226	1.2%	1.7%	1.2%	0.9%	0.7%	1.2%
	Mud, Standing & Moving Water	11	4	6	5	6	32	0.2%	0.1%	0.2%	0.2%	0.2%	0.2%
	Unknown	34	39	28	22	28	151	0.7%	0.9%	0.8%	0.7%	0.8%	0.8%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weather Conditions	Clear	3,130	2,987	2,199	2,250	2,430	12,996	64.7%	66.8%	63.7%	71.5%	70.9%	67.2%
	Cloudy	1,119	958	839	656	784	4,356	23.1%	21.4%	24.3%	20.8%	22.9%	22.5%
	Rain	327	277	213	118	120	1,055	6.8%	6.2%	6.2%	3.7%	3.5%	5.5%
	Snow, Sleet	51	58	19	26	16	170	1.1%	1.3%	0.6%	0.8%	0.5%	0.9%
	Freezing, Fog	29	29	23	19	15	115	0.6%	0.6%	0.7%	0.6%	0.4%	0.6%
	Unknown	183	163	161	80	61	648	3.8%	3.6%	4.7%	2.5%	1.8%	3.4%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Type 1	Straight	3,913	3,624	2,858	2,700	2,863	15,958	80.9%	81.0%	82.7%	85.7%	83.6%	82.5%
	Curve	729	652	409	358	491	2,639	15.1%	14.6%	11.8%	11.4%	14.3%	13.6%
	Unknown	197	196	187	91	72	743	4.1%	4.4%	5.4%	2.9%	2.1%	3.8%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Road Type 2	Level	3,201	3,050	2,357	2,094	2,305	13,007	66.2%	68.2%	68.2%	66.5%	67.3%	67.3%
	Hill/Grade	1,253	1,119	822	875	942	5,011	25.9%	25.0%	23.8%	27.8%	27.5%	25.9%
	Crest	143	80	66	69	82	440	3.0%	1.8%	1.9%	2.2%	2.4%	2.3%
	Unknown	242	223	209	111	97	882	5.0%	5.0%	6.1%	3.5%	2.8%	4.6%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Accident Type	Animal, Bicyclist	34	32	17	10	19	112	0.7%	0.7%	0.5%	0.3%	0.6%	0.6%
	Fixed Object	693	596	447	390	432	2,558	14.3%	13.3%	12.9%	12.4%	12.6%	13.2%
	Other Object	177	154	149	114	158	752	3.7%	3.4%	4.3%	3.6%	4.6%	3.9%
	Pedestrian, Train	24	27	26	24	27	128	0.5%	0.6%	0.8%	0.8%	0.8%	0.7%
	Motor Vehicle in Transport	3,641	3,436	2,587	2,420	2,592	14,676	75.2%	76.8%	74.9%	76.8%	75.7%	75.9%
	Motor Vehicle on Other Roadway	5	8	8	6	8	35	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%
	Parked Motor Vehicle	122	106	114	101	86	529	2.5%	2.4%	3.3%	3.2%	2.5%	2.7%
	Non-Collision Overturn	76	67	50	36	44	273	1.6%	1.5%	1.4%	1.1%	1.3%	1.4%
	Non-Collision Other	67	46	56	48	60	277	1.4%	1.0%	1.6%	1.5%	1.8%	1.4%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
On/Off Roadway	On Roadway	4,013	3,746	2,857	2,668	2,906	16,190	82.9%	83.8%	82.7%	84.7%	84.8%	83.7%
	Off Roadway	826	726	597	481	520	3,150	17.1%	16.2%	17.3%	15.3%	15.2%	16.3%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
At/Not at Intersection	At Intersection	408	404	297	288	286	1,683	8.4%	9.0%	8.6%	9.1%	8.3%	8.7%
	Not At Intersection	4,431	4,068	3,157	2,861	3,140	17,657	91.6%	91.0%	91.4%	90.9%	91.7%	91.3%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Drink/Drug Involved	Yes	166	149	114	92	110	631	3.4%	3.3%	3.3%	2.9%	3.2%	3.3%
	No	4,556	4,177	3,249	3,012	3,251	18,245	94.2%	93.4%	94.1%	95.6%	94.9%	94.3%
	Unknown	117	146	91	45	65	464	2.4%	3.3%	2.6%	1.4%	1.9%	2.4%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Construction Zone Involved	Construction Zone Involved	4,416	4,086	3,008	2,690	2,957	17,157	91.3%	91.4%	87.1%	85.4%	86.3%	88.7%
	No Construction Zone Involved	423	386	446	459	469	2,183	8.7%	8.6%	12.9%	14.6%	13.7%	11.3%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Emergency Vehicle Involved	Emergency Vehicle	26	17	15	12	13	83	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%
	Not an Emergency Vehicle	4,813	4,455	3,439	3,137	3,413	19,257	99.5%	99.6%	99.6%	99.6%	99.6%	99.6%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Limit	0 - 20 mph	72	77	65	74	60	348	1.5%	1.7%	1.9%	2.3%	1.8%	1.8%
	21 - 30 mph	603	627	455	475	420	2,580	12.5%	14.0%	13.2%	15.1%	12.3%	13.3%
	31 - 40 mph	1,094	889	793	698	725	4,199	22.6%	19.9%	23.0%	22.2%	21.2%	21.7%
	41 - 50 mph	1,385	1,101	790	673	817	4,766	28.6%	24.6%	22.9%	21.4%	23.8%	24.6%
	51 - 60 mph	1,111	1,046	666	697	836	4,356	23.0%	23.4%	19.3%	22.1%	24.4%	22.5%
	61 - 70 mph	276	327	335	343	378	1,659	5.7%	7.3%	9.7%	10.9%	11.0%	8.6%
	71 - 80 mph	0	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unknown	298	405	350	189	190	1,432	6.2%	9.1%	10.1%	6.0%	5.5%	7.4%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Manner of Collision	Head On	47	43	39	30	26	185	1.0%	1.0%	1.1%	1.0%	0.8%	1.0%
	Rear End	2,094	1,997	1,502	1,434	1,544	8,571	43.3%	44.7%	43.5%	45.5%	45.1%	44.3%
	Angle	664	658	465	453	453	2,693	13.7%	14.7%	13.5%	14.4%	13.2%	13.9%
	Sideswipe: Opposite Direction	53	51	47	50	44	245	1.1%	1.1%	1.4%	1.6%	1.3%	1.3%
	Sideswipe: Same Direction	679	634	514	408	486	2,721	14.0%	14.2%	14.9%	13.0%	14.2%	14.1%
	Backed Into	110	94	81	98	77	460	2.3%	2.1%	2.3%	3.1%	2.2%	2.4%
	Non-Collision	1,071	922	745	622	740	4,100	22.1%	20.6%	21.6%	19.8%	21.6%	21.2%
	Unknown/Other	121	73	61	54	56	365	2.5%	1.6%	1.8%	1.7%	1.6%	1.9%
	Total	4,839	4,472	3,454	3,149	3,426	19,340	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Traffic Control	Stop Sign	192	256	230	176	239	1,093	2.0%	2.9%	3.4%	2.9%	3.3%	2.8%
	Electric Signal	876	780	597	646	671	3,570	9.3%	8.8%	8.9%	10.5%	9.2%	9.3%
	Yield Sign	84	118	92	87	113	494	0.9%	1.3%	1.4%	1.4%	1.5%	1.3%
	Officer/Flagman	175	179	187	189	178	908	1.8%	2.0%	2.8%	3.1%	2.4%	2.4%
	No Passing Zone	268	429	291	484	748	2,220	2.8%	4.8%	4.3%	7.9%	10.3%	5.8%
	None	850	789	631	636	674	3,580	9.0%	8.9%	9.4%	10.3%	9.2%	9.3%
	Unknown/Other	7,025	6,331	4,697	3,940	4,673	26,666	74.2%	71.3%	69.8%	64.0%	64.0%	69.2%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Age	Young Age	2,203	1,921	1,331	1,258	1,496	8,209	23.3%	21.6%	19.8%	20.4%	20.5%	21.3%
	Middle Age	6,104	5,761	4,369	4,022	4,803	25,059	64.5%	64.9%	65.0%	65.3%	65.8%	65.0%
	Old Age	618	630	523	491	585	2,847	6.5%	7.1%	7.8%	8.0%	8.0%	7.4%
	Unknown	545	570	502	387	412	2,416	5.8%	6.4%	7.5%	6.3%	5.6%	6.3%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Sex	Male	5,491	5,087	3,816	3,566	4,358	22,318	58.0%	57.3%	56.7%	57.9%	59.7%	57.9%
	Female	3,262	3,181	2,330	2,225	2,566	13,564	34.4%	35.8%	34.6%	36.1%	35.2%	35.2%
	Unknown	717	614	579	367	372	2,649	7.6%	6.9%	8.6%	6.0%	5.1%	6.9%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Contributing Circumstances	Vehicle Defects	136	104	76	67	84	467	1.4%	1.2%	1.1%	1.1%	1.2%	1.2%
	Traffic Control Inoperable or Missing	28	19	29	10	22	108	0.3%	0.2%	0.4%	0.2%	0.3%	0.3%
	Improperly Stopped on Roadway	42	26	28	30	33	159	0.4%	0.3%	0.4%	0.5%	0.5%	0.4%
	Speed-Exceeded Limit	137	109	84	64	61	455	1.4%	1.2%	1.2%	1.0%	0.8%	1.2%
	Too Fast for Conditions	747	782	542	420	547	3,038	7.9%	8.8%	8.1%	6.8%	7.5%	7.9%
	Improper Passing	83	88	67	64	88	390	0.9%	1.0%	1.0%	1.0%	1.2%	1.0%
	Violation Signal/Sign	73	83	62	52	61	331	0.8%	0.9%	0.9%	0.8%	0.8%	0.9%
	Wrong Side	32	28	34	33	19	146	0.3%	0.3%	0.5%	0.5%	0.3%	0.4%
	Following too Close	1,027	1,027	711	755	877	4,397	10.8%	11.6%	10.6%	12.3%	12.0%	11.4%
	Improper Signal	12	1	1	1	6	21	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%
	Improper Backing	80	66	58	63	65	332	0.8%	0.7%	0.9%	1.0%	0.9%	0.9%
	Improper Turn	94	93	76	62	69	394	1.0%	1.0%	1.1%	1.0%	0.9%	1.0%
	Improper Lane Usage/Change	600	523	454	401	541	2,519	6.3%	5.9%	6.8%	6.5%	7.4%	6.5%
	Wrong Way (One-Way)	7	9	2	4	3	25	0.1%	0.1%	0.0%	0.1%	0.0%	0.1%
	Improper Start from Park	5	6	3	9	9	32	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%
	Improper Parked	4	3	5	3	1	16	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
	Failed to Yield	404	404	313	271	333	1,725	4.3%	4.5%	4.7%	4.4%	4.6%	4.5%
	Alcohol	67	58	51	43	46	265	0.7%	0.7%	0.8%	0.7%	0.6%	0.7%
	Drugs	3	2	3	2	1	11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Physical Impairment	64	46	28	44	37	219	0.7%	0.5%	0.4%	0.7%	0.5%	0.6%
	Inattention	1,098	951	732	708	803	4,292	11.6%	10.7%	10.9%	11.5%	11.0%	11.1%
	None	4,612	4,272	3,252	3,003	3,536	18,675	48.7%	48.1%	48.4%	48.8%	48.5%	48.5%
	Unknown	115	182	114	49	54	514	1.2%	2.0%	1.7%	0.8%	0.7%	1.3%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Vehicle Body Type	Passenger Car	4,886	4,482	3,250	2,862	3,375	18,855	51.6%	50.5%	48.3%	46.5%	46.3%	48.9%
	Station Wagon	80	71	53	42	37	283	0.8%	0.8%	0.8%	0.7%	0.5%	0.7%
	SUV	1,002	983	821	802	913	4,521	10.6%	11.1%	12.2%	13.0%	12.5%	11.7%
	Van	750	686	518	456	566	2,976	7.9%	7.7%	7.7%	7.4%	7.8%	7.7%
	Small Bus (9-15 with driver)	25	15	25	15	31	111	0.3%	0.2%	0.4%	0.2%	0.4%	0.3%
	Bus (16 or more with driver)	25	21	23	21	91	181	0.3%	0.2%	0.3%	0.3%	1.2%	0.5%
	School Bus(< 16 with driver)	18	10	5	14	4	51	0.2%	0.1%	0.1%	0.2%	0.1%	0.1%
	School Bus (16 or more with driver)	28	19	5	17	10	79	0.3%	0.2%	0.1%	0.3%	0.1%	0.2%
	Motorcycle	40	54	35	35	41	205	0.4%	0.6%	0.5%	0.6%	0.6%	0.5%
	Motor Home or Camper	16	17	21	15	21	90	0.2%	0.2%	0.3%	0.2%	0.3%	0.2%
	Farm Implements	4	3	3	3	3	16	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Construction Equipments	52	46	50	39	58	245	0.5%	0.5%	0.7%	0.6%	0.8%	0.6%
	Other Transport Device	9	12	13	6	9	49	0.1%	0.1%	0.2%	0.1%	0.1%	0.1%
	Pickup	1,526	1,389	1,102	1,036	1,117	6,170	16.1%	15.6%	16.4%	16.8%	15.3%	16.0%
	Single-Unit Truck : 2 axles 6 tires	205	212	155	157	156	885	2.2%	2.4%	2.3%	2.5%	2.1%	2.3%
	Single-Unit Truck:3 or more axles	115	108	87	96	77	483	1.2%	1.2%	1.3%	1.6%	1.1%	1.3%
	Truck Tractor with No Units	20	23	14	16	22	95	0.2%	0.3%	0.2%	0.3%	0.3%	0.2%
	Truck Tractor with One Unit	548	603	433	439	635	2,658	5.8%	6.8%	6.4%	7.1%	8.7%	6.9%
	Truck Tractor with Two Units	23	22	22	27	39	133	0.2%	0.2%	0.3%	0.4%	0.5%	0.3%
	Other Heavy Truck	30	34	35	34	35	168	0.3%	0.4%	0.5%	0.6%	0.5%	0.4%
	Unknown/Other	68	72	55	26	56	277	0.7%	0.8%	0.8%	0.4%	0.8%	0.7%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.3 Detailed Work Zone Crash Characteristics – Missouri (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Vehicle Maneuver Before Crash	Going Straight	6,735	6,311	4,778	4,423	5,117	27,364	67.9%	68.6%	68.6%	69.8%	68.6%	68.6%
	Over Taking	62	62	28	33	71	256	0.5%	0.3%	0.2%	0.4%	0.4%	0.4%
	Making Right Turn	123	119	105	74	83	504	1.5%	1.5%	1.6%	1.4%	1.3%	1.5%
	Making Left Turn	298	252	178	153	150	1,031	3.8%	3.0%	2.9%	2.7%	2.5%	3.1%
	Making U Turn	8	15	7	8	8	46	0.0%	0.2%	0.1%	0.1%	0.2%	0.1%
	Skidding/Sliding	55	57	38	38	42	230	0.4%	0.6%	0.5%	0.5%	0.5%	0.5%
	Slowing or Stopping	365	335	246	255	370	1,571	3.6%	3.8%	4.0%	4.0%	4.9%	4.0%
	Starting in Traffic	127	108	88	85	77	485	1.1%	1.0%	1.0%	1.1%	1.0%	1.0%
	Starting from Parked	29	32	25	14	20	120	0.3%	0.4%	0.4%	0.3%	0.4%	0.3%
	Backing	85	87	79	79	67	397	1.3%	1.3%	1.5%	1.6%	1.0%	1.3%
	Stopped in Traffic	1,116	1,090	861	749	839	4,655	14.6%	15.0%	14.8%	13.8%	13.3%	14.4%
	Parked	17	14	9	17	17	74	0.3%	0.2%	0.1%	0.4%	0.3%	0.3%
	Changing Lanes	183	170	106	89	160	708	1.3%	1.3%	1.3%	1.1%	1.3%	1.3%
	Avoiding	59	62	24	26	73	244	0.7%	0.6%	0.4%	0.6%	1.0%	0.7%
	Crossover Centerline	16	13	18	17	18	82	0.1%	0.2%	0.3%	0.3%	0.2%	0.2%
	Crossing Road	12	8	8	11	12	51	0.1%	0.1%	0.2%	0.1%	0.2%	0.1%
	Unknown/Other	180	147	127	87	172	713	0.1%	0.0%	0.2%	0.0%	0.1%	0.1%
	Total	9,470	8,882	6,725	6,158	7,296	38,531	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Light Conditions	Daylight	527	484	428	342	283	2,064	71.9%	72.8%	72.4%	70.2%	70.4%	71.7%
	Dawn	17	13	12	6	8	56	2.3%	2.0%	2.0%	1.2%	2.0%	1.9%
	Dusk	15	24	11	12	5	67	2.0%	3.6%	1.9%	2.5%	1.2%	2.3%
	Dark: Street Lights On	87	69	71	63	49	339	11.9%	10.4%	12.0%	12.9%	12.2%	11.8%
	Dark: No Street Lights	75	70	66	61	55	327	10.2%	10.5%	11.2%	12.5%	13.7%	11.4%
	Unknown	12	5	3	3	2	25	1.6%	0.8%	0.5%	0.6%	0.5%	0.9%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Weather Conditions	Clear	522	490	403	357	286	2,058	71.2%	73.7%	68.2%	73.3%	71.1%	71.5%
	Cloudy	135	108	123	86	79	531	18.4%	16.2%	20.8%	17.7%	19.7%	18.5%
	Fog, Smog, Smoke	5	1	6	2	4	18	0.7%	0.2%	1.0%	0.4%	1.0%	0.6%
	Rain	30	28	29	15	17	119	4.1%	4.2%	4.9%	3.1%	4.2%	4.1%
	Sleet, Hail, Freezing Rain/Drizzle	13	14	7	3	6	43	1.8%	2.1%	1.2%	0.6%	1.5%	1.5%
	Snow	16	18	16	16	7	73	2.2%	2.7%	2.7%	3.3%	1.7%	2.5%
	Severe Crosswinds	8	2	4	3	2	19	1.1%	0.3%	0.7%	0.6%	0.5%	0.7%
	Unknown	4	4	3	5	1	17	0.5%	0.6%	0.5%	1.0%	0.2%	0.6%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Surface Type	Concrete	443	418	372	340	261	1,834	60.4%	62.9%	62.9%	69.8%	64.9%	63.7%
	Asphalt	284	242	213	146	137	1,022	38.7%	36.4%	36.0%	30.0%	34.1%	35.5%
	Brick, Gravel, Dirt	3	2	3	1	3	12	0.4%	0.3%	0.5%	0.2%	0.7%	0.4%
	Other	3	3	3	0	1	10	0.4%	0.5%	0.5%	0.0%	0.2%	0.3%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Accident Severity	Fatal	7	6	11	9	8	41	1.0%	0.9%	1.9%	1.8%	2.0%	1.4%
	Injury	323	257	242	203	158	1,183	44.1%	38.6%	40.9%	41.7%	39.3%	41.1%
	Property Damage Only	403	402	338	275	236	1,654	55.0%	60.5%	57.2%	56.5%	58.7%	57.5%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Road Surface Condition	Dry	610	537	477	390	332	2,346	83.2%	80.8%	80.7%	80.1%	82.6%	81.5%
	Wet	69	73	69	49	39	299	9.4%	11.0%	11.7%	10.1%	9.7%	10.4%
	Snow, Slush	16	21	19	20	7	83	2.2%	3.2%	3.2%	4.1%	1.7%	2.9%
	Ice	25	23	12	18	16	94	3.4%	3.5%	2.0%	3.7%	4.0%	3.3%
	Unknown/Other	13	11	14	10	8	56	1.8%	1.7%	2.4%	2.0%	2.0%	1.9%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Character	Not Stated	3	1	2	0	2	8	0.4%	0.2%	0.3%	0.0%	0.5%	0.3%
	Straight and Level	465	446	345	309	252	1,817	63.4%	67.1%	58.4%	63.4%	62.7%	63.1%
	Straight and on slope	172	141	145	93	65	616	23.5%	21.2%	24.5%	19.1%	16.2%	21.4%
	Straight and on Hilltop	17	7	11	8	11	54	2.3%	1.1%	1.9%	1.6%	2.7%	1.9%
	Curved and Level	40	41	50	46	40	217	5.5%	6.2%	8.5%	9.4%	10.0%	7.5%
	Curved and on slope	34	29	34	27	30	154	4.6%	4.4%	5.8%	5.5%	7.5%	5.4%
	Curved and on Hilltop	2	0	4	4	2	12	0.3%	0.0%	0.7%	0.8%	0.5%	0.4%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Alcohol Related	No	700	642	564	457	376	2,739	95.5%	96.5%	95.4%	93.8%	93.5%	95.2%
	Yes	33	23	27	30	26	139	4.5%	3.5%	4.6%	6.2%	6.5%	4.8%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Manner of Collision	Head On	5	1	2	6	0	14	0.7%	0.2%	0.3%	1.2%	0.0%	0.5%
	Rear End	329	285	226	164	141	1,145	44.9%	42.9%	38.2%	33.7%	35.2%	39.8%
	Angle-Side Impact	106	77	80	65	52	380	14.5%	11.6%	13.5%	13.3%	13.0%	13.2%
	Sideswipe: Opposite Direction	6	12	12	8	3	41	0.8%	1.8%	2.0%	1.6%	0.7%	1.4%
	Sideswipe: Same Direction	57	78	65	68	44	312	7.8%	11.7%	11.0%	14.0%	11.0%	10.8%
	Backed Into	9	6	5	2	1	23	1.2%	0.9%	0.8%	0.4%	0.2%	0.8%
	No Collision with Other Vehicle	181	184	150	143	140	798	24.7%	27.7%	25.4%	29.4%	34.9%	27.7%
	Unknown/Other	40	22	51	31	21	165	5.5%	3.3%	8.6%	6.4%	5.0%	5.7%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Accident Class	Animal	17	28	28	17	21	111	2.3%	4.2%	4.7%	3.5%	5.2%	3.9%
	Motor Vehicle in Transport	552	481	441	344	261	2,079	75.3%	72.3%	74.6%	70.6%	64.9%	72.2%
	Overturn/Rollover	44	41	38	34	30	187	6.0%	6.2%	6.4%	7.0%	7.5%	6.5%
	Median Barrier	15	19	12	22	20	88	2.0%	2.9%	2.0%	4.5%	5.0%	3.1%
	Highway Traffic Sign Post	11	11	10	6	6	44	1.5%	1.7%	1.7%	1.2%	1.5%	1.5%
	Work Zone Maintenance Equipment	9	7	8	3	7	34	1.2%	1.1%	1.4%	0.6%	1.7%	1.2%
	Parked Motor Vehicle	6	6	4	7	6	29	0.8%	0.9%	0.7%	1.4%	1.5%	1.0%
	Unknown/Other	79	72	50	54	51	306	10.8%	10.8%	8.5%	11.1%	12.7%	10.6%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Work Zone Location	Not Applicable	7	3	1	2	5	18	1.0%	0.5%	0.2%	0.4%	1.2%	0.6%
	Before the First Work Zone Warning Sign	27	28	21	21	15	112	3.7%	4.2%	3.6%	4.3%	3.7%	3.9%
	Advance Warning Area	133	112	75	58	40	418	18.1%	16.8%	12.7%	11.9%	10.0%	14.5%
	Transition Area	136	105	114	72	86	513	18.6%	15.8%	19.3%	14.8%	21.4%	17.8%
	Activity Area	386	375	345	302	234	1,642	52.7%	56.4%	58.4%	62.0%	58.2%	57.1%
	Termination Area	44	42	35	32	22	175	6.0%	6.3%	5.9%	6.6%	5.5%	6.1%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Type of Work Zone	Not Applicable	8	5	0	4	6	23	1.1%	0.8%	0.0%	0.8%	1.5%	0.8%
	Lane Closure	295	216	147	112	92	862	40.2%	32.5%	24.9%	23.0%	22.9%	30.0%
	Lane Shift/Crossover	115	129	114	107	75	540	15.7%	19.4%	19.3%	22.0%	18.7%	18.8%
	Work on Shoulder or Median	131	145	146	104	104	630	17.9%	21.8%	24.7%	21.4%	25.9%	21.9%
	Intermittent or Moving Work	86	78	89	73	58	384	11.7%	11.7%	15.1%	15.0%	14.4%	13.3%
	Other	98	92	95	87	67	439	13.4%	13.8%	16.1%	17.9%	16.7%	15.3%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Environmental Contributing Circumstances	None	611	542	473	393	313	2,332	83.4%	81.5%	80.0%	80.7%	77.9%	81.0%
	Weather Conditions	65	61	60	39	34	259	8.9%	9.2%	10.2%	8.0%	8.5%	9.0%
	Vision Obstruction	5	5	8	11	4	33	0.7%	0.8%	1.4%	2.3%	1.0%	1.1%
	Glare	2	6	5	5	6	24	0.3%	0.9%	0.8%	1.0%	1.5%	0.8%
	Animal in Roadway	17	26	27	15	20	105	2.3%	3.9%	4.6%	3.1%	5.0%	3.6%
	Other	15	14	10	11	13	63	2.0%	2.1%	1.7%	2.3%	3.2%	2.2%
	Unknown	18	11	8	13	12	62	2.5%	1.7%	1.4%	2.7%	3.0%	2.2%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Contributing Circumstances	None	370	389	334	311	229	1,633	50.5%	58.5%	56.5%	63.9%	57.0%	56.7%
	Road Surface Condition	60	55	54	48	41	258	8.2%	8.3%	9.1%	9.9%	10.2%	9.0%
	Debris	4	6	0	1	2	13	0.5%	0.9%	0.0%	0.2%	0.5%	0.5%
	Rut, Holes, Bumps	2	6	1	1	0	10	0.3%	0.9%	0.2%	0.2%	0.0%	0.3%
	Work Zone	253	174	179	108	108	822	34.5%	26.2%	30.3%	22.2%	26.9%	28.6%
	Worn, Travel-Polished Surface	0	0	0	0	1	1	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
	Obstruction in Roadway	5	11	11	6	4	37	0.7%	1.7%	1.9%	1.2%	1.0%	1.3%
	Traffic Control Device Inoperative, Missing, or Obscured	2	3	0	2	0	7	0.3%	0.5%	0.0%	0.4%	0.0%	0.2%
	Shoulders	6	3	2	1	6	18	0.8%	0.5%	0.3%	0.2%	1.5%	0.6%
	Non-Highway Work	2	3	0	0	3	8	0.3%	0.5%	0.0%	0.0%	0.7%	0.3%
	Other	2	4	0	2	5	13	0.3%	0.6%	0.0%	0.4%	1.2%	0.5%
	Unknown	27	11	10	7	3	58	3.7%	1.7%	1.7%	1.4%	0.7%	2.0%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Day of Accident	Sunday	55	58	67	45	32	257	7.5%	8.7%	11.3%	9.2%	8.0%	8.9%
	Monday	92	94	81	69	37	373	12.6%	14.1%	13.7%	14.2%	9.2%	13.0%
	Tuesday	106	116	72	86	44	424	14.5%	17.4%	12.2%	17.7%	10.9%	14.7%
	Wednesday	129	101	107	76	38	451	17.6%	15.2%	18.1%	15.6%	9.5%	15.7%
	Thursday	112	100	99	87	47	445	15.3%	15.0%	16.8%	17.9%	11.7%	15.5%
	Friday	140	115	86	75	58	474	19.1%	17.3%	14.6%	15.4%	14.4%	16.5%
	Saturday	97	81	79	49	30	336	13.2%	12.2%	13.4%	10.1%	7.5%	11.7%
	Unknown	2	0	0	0	116	118	0.3%	0.0%	0.0%	0.0%	28.9%	4.1%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Vehicle Maneuver Before Crash	Essentially Straight Ahead	780	772	637	565	473	3,227	54.7%	61.3%	57.5%	62.0%	64.4%	59.3%
	Backing	12	10	10	7	4	43	0.8%	0.8%	0.9%	0.8%	0.5%	0.8%
	Changing Lanes	52	37	33	34	20	176	3.6%	2.9%	3.0%	3.7%	2.7%	3.2%
	Overtaking/Passing	25	15	17	7	3	67	1.8%	1.2%	1.5%	0.8%	0.4%	1.2%
	Turning Right	19	21	22	26	13	101	1.3%	1.7%	2.0%	2.9%	1.8%	1.9%
	Turning Left	97	74	112	82	44	409	6.8%	5.9%	10.1%	9.0%	6.0%	7.5%
	Making U-Turn	6	5	6	2	3	22	0.4%	0.4%	0.5%	0.2%	0.4%	0.4%
	Entering Traffic Lane	15	20	21	12	5	73	1.1%	1.6%	1.9%	1.3%	0.7%	1.3%
	Leaving Traffic Lane	11	7	7	3	6	34	0.8%	0.6%	0.6%	0.3%	0.8%	0.6%
	Parked	1	3	0	0	0	4	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%
	Slowing or Stopped in Traffic	353	268	218	152	146	1,137	24.7%	21.3%	19.7%	16.7%	19.9%	20.9%
	Other	9	3	5	3	3	23	0.6%	0.2%	0.5%	0.3%	0.4%	0.4%
	Unknown	47	25	20	18	14	124	3.3%	2.0%	1.8%	2.0%	1.9%	2.3%
	Total	1,427	1,260	1,108	911	734	5,440	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Crash Type	Single Vehicle	174	177	148	135	138	772	23.7%	26.6%	25.0%	27.7%	34.3%	26.8%
	Two Vehicles	461	408	382	288	212	1,751	62.9%	61.4%	64.6%	59.1%	52.7%	60.8%
	Multi Vehicles	98	80	61	64	52	355	13.4%	12.0%	10.3%	13.1%	12.9%	12.3%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Limit	0 - 20 mph	90	68	41	40	17	256	12.3%	10.2%	6.9%	8.2%	4.2%	8.9%
	21 - 30 mph	112	103	44	58	13	330	15.3%	15.5%	7.4%	11.9%	3.2%	11.5%
	31 - 40 mph	122	98	191	104	82	597	16.6%	14.7%	32.3%	21.4%	20.4%	20.7%
	41 - 50 mph	157	124	130	109	64	584	21.4%	18.6%	22.0%	22.4%	15.9%	20.3%
	51 - 60 mph	150	148	112	89	54	553	20.5%	22.3%	19.0%	18.3%	13.4%	19.2%
	61 - 70 mph	22	39	38	76	45	220	3.0%	5.9%	6.4%	15.6%	11.2%	7.6%
	71 - 80 mph	78	85	35	11	11	220	10.6%	12.8%	5.9%	2.3%	2.7%	7.6%
	> 80 mph	0	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unknown	2	0	0	0	116	118	0.3%	0.0%	0.0%	0.0%	28.9%	4.1%
	Total	733	665	591	487	402	2,878	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Age	Young Age	403	337	265	234	185	1,424	28.2%	26.7%	23.9%	25.7%	25.2%	26.2%
	Middle Age	877	782	729	575	455	3,418	61.5%	62.1%	65.8%	63.1%	62.0%	62.8%
	Old Age	105	114	96	76	67	458	7.4%	9.0%	8.7%	8.3%	9.1%	8.4%
	Unknown	42	27	18	26	27	140	2.9%	2.1%	1.6%	2.9%	3.7%	2.6%
	Total	1,427	1,260	1,108	911	734	5,440	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Driver Gender	Male	844	765	689	554	447	3,299	59.1%	60.7%	62.2%	60.8%	60.9%	60.6%
	Female	537	465	398	328	257	1,985	37.6%	36.9%	35.9%	36.0%	35.0%	36.5%
	Unknown	46	30	21	29	30	156	3.2%	2.4%	1.9%	3.2%	4.1%	2.9%
	Total	1,427	1,260	1,108	911	734	5,440	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.4 Detailed Work Zone Crash Characteristics – Nebraska (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	Total %
Driver Contributing Circumstance	No Improper Driving	387	302	226	182	140	1,111	49.0%	48.6%	46.1%	43.4%	45.6%	47.1%
	Failed to Yield Right of Way	68	23	40	35	29	195	8.6%	3.7%	8.2%	8.4%	9.4%	7.8%
	Disregarded Traffic Signals	22	22	22	18	7	91	2.8%	3.5%	4.5%	4.3%	2.3%	3.6%
	Exceeded Authorized Speed Limit	8	1	4	1	3	17	1.0%	0.2%	0.8%	0.2%	1.0%	0.7%
	Driving Too Fast for Conditions	30	33	23	12	4	102	3.8%	5.3%	4.7%	2.9%	1.3%	4.1%
	Made Improper Turn	2	2	4	5	1	14	0.3%	0.3%	0.8%	1.2%	0.3%	0.6%
	Wrong Side	1	3	1	5	2	12	0.1%	0.5%	0.2%	1.2%	0.7%	0.5%
	Followed Too Closely	109	80	56	49	45	339	13.8%	12.9%	11.4%	11.7%	14.7%	13.6%
	Failure to Keep in Proper Lane	13	16	10	23	12	74	1.6%	2.6%	2.0%	5.5%	3.6%	3.0%
	Operating Vehicle in Erratic Manner	35	22	18	10	8	93	4.4%	3.5%	3.7%	2.4%	2.6%	3.7%
	Avoiding Vehicle	21	13	4	3	9	50	2.7%	2.1%	0.8%	0.7%	2.9%	2.0%
	Over Steering	5	5	1	5	7	23	0.6%	0.8%	0.2%	1.2%	2.3%	0.9%
	Visibility Obstructed	2	1	6	4	0	13	0.3%	0.2%	1.2%	1.0%	0.0%	0.5%
	Inattention	54	46	32	26	22	180	6.8%	7.4%	6.5%	6.2%	7.2%	7.2%
	Mobile Phone Distraction	2	0	0	1	0	3	0.3%	0.0%	0.0%	0.2%	0.0%	0.1%
	Distracted Other	2	8	2	5	0	17	0.3%	1.3%	0.4%	1.2%	0.0%	0.7%
	Fatigued or Asleep	6	12	6	8	2	34	0.8%	1.9%	1.2%	1.9%	0.7%	1.4%
	Operating Defective Equipment	1	1	7	3	3	15	0.1%	0.2%	1.4%	0.7%	1.0%	0.6%
	Other Improper Action	9	5	11	6	4	35	1.1%	0.8%	2.2%	1.4%	1.3%	1.4%
	Unknown	12	27	17	18	9	83	1.5%	4.3%	3.5%	4.3%	2.9%	3.3%
	Total	789	622	490	419	307	2,627	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Accident Type	Impact Attenuator	4	5	9	6	13	37	0.2%	0.3%	0.5%	0.3%	0.6%	0.4%
	Bicycle	9	5	5	7	6	32	0.5%	0.3%	0.3%	0.4%	0.3%	0.4%
	Bridge/Pier/Abutment	9	16	12	5	4	46	0.5%	0.9%	0.7%	0.3%	0.2%	0.5%
	Culvert	3	6	9	6	4	28	0.2%	0.3%	0.5%	0.3%	0.2%	0.3%
	Curb	13	17	9	16	10	65	0.7%	0.9%	0.5%	0.9%	0.5%	0.7%
	Deer	4	8	9	6	6	33	0.2%	0.4%	0.5%	0.3%	0.3%	0.4%
	Ditch	32	27	33	28	29	149	1.7%	1.5%	2.0%	1.6%	1.4%	1.6%
	Embankment	12	15	18	14	13	72	0.7%	0.8%	1.1%	0.8%	0.6%	0.8%
	Fire / Explosion	6	6	3	4	7	26	0.3%	0.3%	0.2%	0.2%	0.3%	0.3%
	Guardrail End	17	28	21	16	17	99	0.9%	1.6%	1.3%	0.9%	0.8%	1.1%
	Immersion, Jackknife, Mailbox	7	4	5	5	2	23	0.4%	0.2%	0.3%	0.3%	0.1%	0.3%
	Lump Light Support	9	3	10	4	3	29	0.5%	0.2%	0.6%	0.2%	0.1%	0.3%
	Median Barrier	40	13	43	53	78	227	2.2%	0.7%	2.6%	3.0%	3.9%	2.5%
	Vehicle in Transit	1,293	1,310	1,120	1,250	1,449	6,422	70.1%	72.8%	68.3%	71.9%	71.6%	71.0%
	Object Not Fixed	82	82	65	80	84	393	4.4%	4.6%	4.0%	4.6%	4.2%	4.3%
	Other Object Fixed	82	82	77	92	116	449	4.4%	4.6%	4.7%	5.3%	5.7%	5.0%
	Other Non-Collision	23	18	22	20	26	109	1.2%	1.0%	1.3%	1.2%	1.3%	1.2%
	Vehicle Traveling Other Roadway	5	7	3	3	1	19	0.3%	0.4%	0.2%	0.2%	0.0%	0.2%
	Overturned Vehicle	45	35	47	38	31	196	2.4%	1.9%	2.9%	2.2%	1.5%	2.2%
	Pedestrian	17	19	12	11	16	75	0.9%	1.1%	0.7%	0.6%	0.8%	0.8%
	Parked Vehicle	56	32	30	28	38	184	3.0%	1.8%	1.8%	1.6%	1.9%	2.0%
	Traffic Sign	24	17	25	13	25	104	1.3%	0.9%	1.5%	0.7%	1.2%	1.1%
	Traffic Signal	23	22	22	16	28	111	1.2%	1.2%	1.3%	0.9%	1.4%	1.2%
	Utility Pole, Train, Tree	29	23	26	17	17	112	1.6%	1.3%	1.6%	1.0%	0.8%	1.2%
	Unknown	1	0	4	0	0	5	0.1%	0.0%	0.2%	0.0%	0.0%	0.1%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Weather Conditions	Blank	9	21	6	5	4	45	0.5%	1.2%	0.4%	0.3%	0.2%	0.5%
	Clear	1,033	1,075	854	1,045	1,081	5,088	56.0%	59.7%	52.1%	60.1%	53.4%	56.3%
	Cloudy	590	545	562	517	680	2,894	32.0%	30.3%	34.3%	29.7%	33.6%	32.0%
	Rain	149	117	155	104	197	722	8.1%	6.5%	9.5%	6.0%	9.7%	8.0%
	Snow	35	23	25	40	21	144	1.9%	1.3%	1.5%	2.3%	1.0%	1.6%
	Fog / Smog / Smoke	10	7	12	2	14	45	0.5%	0.4%	0.7%	0.1%	0.7%	0.5%
	Sleet / Hail	2	3	5	4	7	21	0.1%	0.2%	0.3%	0.2%	0.3%	0.2%
	Blowing Sand / Dirt	2	0	3	5	1	11	0.1%	0.0%	0.2%	0.3%	0.0%	0.1%
	Severe Crosswinds	1	1	4	3	1	10	0.1%	0.1%	0.2%	0.2%	0.0%	0.1%
	Other	1	0	0	0	0	1	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
	Unknown	13	8	13	13	17	64	0.7%	0.4%	0.8%	0.7%	0.8%	0.7%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Accident Severity	Fatal	7	11	18	10	13	59	0.4%	0.6%	1.1%	0.6%	0.6%	0.7%
	Injury	636	639	547	587	650	3,059	34.5%	35.5%	33.4%	33.8%	32.1%	33.8%
	Property Damage Only	1,202	1,150	1,074	1,141	1,360	5,927	65.1%	63.9%	65.5%	65.7%	67.2%	65.5%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Speed Limit (mph)	0 - 20 mph	32	37	27	39	44	179	1.7%	2.1%	1.6%	2.2%	2.2%	2.0%
	20 - 30 mph	289	356	298	255	336	1,534	15.7%	19.8%	18.2%	14.7%	16.6%	17.0%
	30 - 40 mph	392	427	373	523	483	2,198	21.2%	23.7%	22.8%	30.1%	23.9%	24.3%
	40 - 50 mph	223	214	265	355	558	1,615	12.1%	11.9%	16.2%	20.4%	27.6%	17.9%
	50 - 60 mph	743	603	489	461	471	2,767	40.3%	33.5%	29.8%	26.5%	23.3%	30.6%
	60 - 70 mph	128	125	140	73	99	565	6.9%	6.9%	8.5%	4.2%	4.9%	6.2%
	70 - 80 mph	38	38	47	32	32	187	2.1%	2.1%	2.9%	1.8%	1.6%	2.1%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Driver Age	Young Age	766	775	678	761	847	3,827	23.4%	24.0%	23.7%	24.7%	23.6%	23.9%
	Middle Age	2,060	2,019	1,802	1,911	2,281	10,073	62.8%	62.6%	62.9%	61.9%	63.6%	62.8%
	Old Age	262	272	253	246	272	1,305	8.0%	8.4%	8.8%	8.0%	7.6%	8.1%
	Unknown	191	160	132	169	189	841	5.8%	5.0%	4.6%	5.5%	5.3%	5.2%
	Total	3,279	3,226	2,865	3,087	3,589	16,046	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Alcohol Involved	Yes	114	96	109	116	130	565	6.2%	5.3%	6.7%	6.7%	6.4%	6.2%
	No	1,731	1,704	1,530	1,622	1,893	8,480	93.8%	94.7%	93.3%	93.3%	93.6%	93.8%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Day of Accident	Sunday	175	151	156	135	164	781	9.5%	8.4%	9.5%	7.8%	8.1%	8.6%
	Monday	254	294	268	267	315	1,398	13.8%	16.3%	16.4%	15.4%	15.6%	15.5%
	Tuesday	271	267	238	260	316	1,352	14.7%	14.8%	14.5%	15.0%	15.6%	14.9%
	Wednesday	323	320	262	302	320	1,527	17.5%	17.8%	16.0%	17.4%	15.8%	16.9%
	Thursday	294	295	269	275	338	1,471	15.9%	16.4%	16.4%	15.8%	16.7%	16.3%
	Friday	333	304	268	295	322	1,522	18.0%	16.9%	16.4%	17.0%	15.9%	16.8%
	Saturday	195	169	178	204	248	994	10.6%	9.4%	10.9%	11.7%	12.3%	11.0%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Traffic Controls	None	2,047	1,929	1,694	1,928	2,227	9,825	62.8%	60.2%	59.6%	62.7%	62.4%	61.6%
	Stop Sign	209	238	206	213	174	1,040	6.4%	7.4%	7.3%	6.9%	4.9%	6.5%
	Traffic Control Person	101	102	80	86	75	444	3.1%	3.2%	2.8%	2.8%	2.1%	2.8%
	Traffic Signal Operation	486	542	467	598	749	2,842	14.9%	16.9%	16.4%	19.5%	21.0%	17.8%
	Traffic Signal Flashing	18	14	23	8	23	86	0.6%	0.4%	0.8%	0.3%	0.6%	0.5%
	Warning Sign	138	134	149	101	119	641	4.2%	4.2%	5.2%	3.3%	3.3%	4.0%
	Unknown/Other	202	186	156	112	152	808	6.2%	5.8%	5.5%	3.6%	4.3%	5.1%
	Yield Sign	59	58	66	28	49	260	1.8%	1.8%	2.3%	0.9%	1.4%	1.6%
	Total	3,260	3,203	2,841	3,074	3,568	15,946	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Vehicle Maneuver	Backing Up	72	64	67	66	75	344	2.2%	2.0%	2.3%	2.1%	2.1%	2.1%
	Blank	35	43	28	20	14	140	1.1%	1.3%	1.0%	0.6%	0.4%	0.9%
	Changing Lanes	128	120	100	99	138	585	3.9%	3.7%	3.5%	3.2%	3.8%	3.6%
	Going Straight	1,457	1,553	1,356	1,502	1,658	7,526	44.4%	48.1%	47.3%	48.7%	46.2%	46.9%
	Legally Parked	76	56	46	57	51	286	2.3%	1.7%	1.6%	1.8%	1.4%	1.8%
	Making Left Turn	207	290	240	228	260	1,225	6.3%	9.0%	8.4%	7.4%	7.2%	7.6%
	Merging into Traffic	98	63	69	51	105	386	3.0%	2.0%	2.4%	1.7%	2.9%	2.4%
	Negotiating Curve	46	53	76	71	72	318	1.4%	1.6%	2.7%	2.3%	2.0%	2.0%
	No Pass Zone, Illegally Parked	10	6	7	6	9	38	0.3%	0.2%	0.2%	0.2%	0.3%	0.2%
	Other	61	62	37	51	51	262	1.9%	1.9%	1.3%	1.7%	1.4%	1.6%
	Overtaking on the Left	19	25	21	16	17	98	0.6%	0.8%	0.7%	0.5%	0.5%	0.6%
	Overtaking on Right	16	16	7	8	13	60	0.5%	0.5%	0.2%	0.3%	0.4%	0.4%
	Parking Maneuver	2	4	3	0	0	9	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%
	Right Turn	100	112	118	98	133	561	3.0%	3.5%	4.1%	3.2%	3.7%	3.5%
	Slowing or Stopped	570	453	400	480	651	2,554	17.4%	14.0%	14.0%	15.5%	18.1%	15.9%
	Stopped in Traffic	371	295	277	323	330	1,596	11.3%	9.1%	9.7%	10.5%	9.2%	9.9%
	U turn	11	11	13	11	12	58	0.3%	0.3%	0.5%	0.4%	0.3%	0.4%
	Total	3,279	3,226	2,865	3,087	3,589	16,046	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Accident Location	Intersection Related	584	703	585	633	713	3,218	31.7%	39.1%	35.7%	36.4%	35.2%	35.6%
	Non-Intersection Related	1,261	1,097	1,054	1,105	1,310	5,827	68.3%	60.9%	64.3%	63.6%	64.8%	64.4%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Contributing Circumstance	Driver Condition	34	33	33	32	41	173	1.5%	1.5%	1.6%	1.5%	1.7%	1.6%
	Disregarded Traffic Control	58	81	47	69	85	340	2.6%	3.6%	2.3%	3.3%	3.5%	3.1%
	Following Too Close	271	238	211	243	302	1,265	12.1%	10.7%	10.5%	11.6%	12.6%	11.5%
	Failure to Yield	294	323	286	253	330	1,486	13.1%	14.5%	14.2%	12.1%	13.8%	13.5%
	Failure to Keep Vehicle under Control	162	124	117	194	226	823	7.2%	5.6%	5.8%	9.3%	9.4%	7.5%
	Inattentive Driving	402	402	359	393	405	1,961	17.9%	18.1%	17.8%	18.8%	16.9%	17.9%
	Improper Overtake	33	29	20	21	27	130	1.5%	1.3%	1.0%	1.0%	1.1%	1.2%
	Improper Turn	39	45	50	46	43	223	1.7%	2.0%	2.5%	2.2%	1.8%	2.0%
	Left of Center	9	18	16	16	14	73	0.4%	0.8%	0.8%	0.8%	0.6%	0.7%
	Other	120	112	101	109	139	581	5.3%	5.0%	5.0%	5.2%	5.8%	5.3%
	Exceed Speed Limit	42	49	56	36	63	246	1.9%	2.2%	2.8%	1.7%	2.6%	2.2%
	Too Fast for Conditions	200	161	190	156	167	874	8.9%	7.2%	9.4%	7.5%	7.0%	8.0%
	Blank	536	565	490	484	503	2,578	23.9%	25.4%	24.3%	23.1%	21.0%	23.5%
	Unsafe Backing	47	47	42	39	54	229	2.1%	2.1%	2.1%	1.9%	2.3%	2.1%
	Total	2,247	2,227	2,018	2,091	2,399	10,982	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Light Conditions	Day	1,392	1,374	1,241	1,277	1,469	6,753	75.4%	76.3%	75.7%	73.5%	72.6%	74.7%
	Dark	165	169	180	149	161	824	8.9%	9.4%	11.0%	8.6%	8.0%	9.1%
	Dusk	29	33	22	29	37	150	1.6%	1.8%	1.3%	1.7%	1.8%	1.7%
	Dawn	25	28	22	20	23	118	1.4%	1.6%	1.3%	1.2%	1.1%	1.3%
	Unknown	8	7	7	11	10	43	0.4%	0.4%	0.4%	0.6%	0.5%	0.5%
	Nighttime – with Street Lights	226	189	167	252	323	1,157	12.2%	10.5%	10.2%	14.5%	16.0%	12.8%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Collision Type	Angle	307	369	301	315	360	1,652	16.6%	20.5%	18.4%	18.1%	17.8%	18.3%
	Head-On Collision	20	30	27	22	27	126	1.1%	1.7%	1.6%	1.3%	1.3%	1.4%
	No Collision with Another Vehicle	488	451	481	462	523	2,405	26.4%	25.1%	29.3%	26.6%	25.9%	26.6%
	Rear End	755	674	620	710	788	3,547	40.9%	37.4%	37.8%	40.9%	39.0%	39.2%
	Sideswipe/Opposite Direction	25	34	27	27	31	144	1.4%	1.9%	1.6%	1.6%	1.5%	1.6%
	Sideswipe/Same Direction	219	218	177	190	279	1,083	11.9%	12.1%	10.8%	10.9%	13.8%	12.0%
	Unknown	31	24	6	12	15	88	1.7%	1.3%	0.4%	0.7%	0.7%	1.0%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Road Condition	Dry	1,504	1,517	1,326	1,430	1,620	7,397	81.5%	84.3%	80.9%	82.3%	80.1%	81.8%
	Ice	12	12	14	5	6	49	0.7%	0.7%	0.9%	0.3%	0.3%	0.5%
	Mud	42	31	37	36	59	205	2.3%	1.7%	2.3%	2.1%	2.9%	2.3%
	Unknown	27	26	29	30	32	144	1.5%	1.4%	1.8%	1.7%	1.6%	1.6%
	Snow	32	19	24	51	18	144	1.7%	1.1%	1.5%	2.9%	0.9%	1.6%
	Wet	228	195	209	186	288	1,106	12.4%	10.8%	12.8%	10.7%	14.2%	12.2%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Crash Type	Single Vehicle	439	404	436	411	484	2,174	23.8%	22.4%	26.6%	23.6%	23.9%	24.0%
	Two Vehicles	1,195	1,216	1,027	1,114	1,303	5,855	64.8%	67.6%	62.7%	64.1%	64.4%	64.7%
	Multiple Vehicle	211	180	176	213	236	1,016	11.4%	10.0%	10.7%	12.3%	11.7%	11.2%
	Total	1,845	1,800	1,639	1,738	2,023	9,045	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table A.5 Detailed Work Zone Crash Characteristics – Wisconsin (Contd..)

Category	Condition	2002 Count	2003 Count	2004 Count	2005 Count	2006 Count	Total	% in 2002	% in 2003	% in 2004	% in 2005	% in 2006	% in Total
Vehicle Type	Snowmobile / ATV	3	1	0	0	1	5	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
	Bicycle	11	9	5	10	8	43	0.3%	0.3%	0.2%	0.3%	0.2%	0.3%
	Blank	117	118	108	79	98	520	3.6%	3.7%	3.8%	2.6%	2.7%	3.2%
	Bus	20	19	9	13	16	77	0.6%	0.6%	0.3%	0.4%	0.4%	0.5%
	Passenger Car	2,232	2,200	1,953	2,232	2,603	11,220	68.1%	68.2%	68.2%	72.3%	72.5%	69.9%
	Emergency Vehicle	3	3	2	3	4	15	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
	Motorcycle, Moped	36	55	47	39	44	221	1.1%	1.7%	1.6%	1.3%	1.2%	1.4%
	Motor Home	3	5	6	0	0	14	0.1%	0.2%	0.2%	0.0%	0.0%	0.1%
	Miscellaneous	8	5	5	5	6	29	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
	Railway Train	2	0	0	1	3	6	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%
	Straight Truck	180	168	161	143	165	817	5.5%	5.2%	5.6%	4.6%	4.6%	5.1%
	Utility Truck	461	428	392	407	427	2,115	14.1%	13.3%	13.7%	13.2%	11.9%	13.2%
	Truck Tractor (Semi-Attached)	203	215	177	155	214	964	6.2%	6.7%	6.2%	5.0%	6.0%	6.0%
	Total	3,279	3,226	2,865	3,087	3,589	16,046	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

APPENDIX B - CRASH REPORT SAMPLE FORMS

IOWA SAMPLE CRASH REPORT FORM

Form 433002
04-07

Iowa Department of Transportation

IOWA ACCIDENT REPORT FORM

An accident occurring anywhere within the State of Iowa causing death, personal injury, or total property damage of **$1,000.00** or more must be reported on this accident report form. Failure to return this accident report form within 72 hours may result in suspension of your driving privilege. **Caution:** You must attempt to **completely** fill out this report.

Instructions

Please print or type all information. Use black or dark blue ink.

Step 1. Begin completing the "Report of Motor Vehicle Accident" form by entering accident date, day of week, time, number of vehicles, total number killed, number injured, and the total amount of damage to all vehicles and any property other than vehicles.

Step 2. Enter the information pertaining to all drivers and vehicles involved in the accident. **Important:** Be sure to include the driver's name, driver license number, and driver license state. Also include the vehicle owner's name, license plate number, and license plate state. If more than two drivers or two vehicles were involved, use an extra report form or sheet of paper making sure that the extra vehicles and drivers are numbered 3, 4, 5, etc.

If you were involved in an accident with a pedestrian, print PEDESTRIAN in the driver space provided for vehicle No. 2 and complete pedestrian information in Step 7. If you were involved in an accident with a pedalcyclist (bicycle, etc.) print 'Bike' in the driver space provided for Vehicle 2 and complete information for Non-Motorist in Step 7.

If one of the vehicles involved was parked at the time of the accident, print PARKED in the driver space and complete the vehicle owner information.

Step 3. Please use the following codes when completing the box marked "vehicle type code":

01 = Passenger Car
02 = Four-tire light truck (pick-up, panel)
03 = Van or mini-van
04 = Sport utility vehicle
05 = Single-unit truck (2-axle, 6-tire)
06 = Single-unit truck (> = 3 axles)
07 = Truck/trailer
08 = Truck tractor (bobtail)
09 = Tractor/semi-trailer
10 = Tractor/doubles
11 = Tractor/triples
12 = Other heavy truck (cannot classify)
13 = Motor home/recreational vehicle
14 = Motorcycle
15 = Moped/All-Terrain Vehicle
16 = School bus (seats > 15)
17 = Small school bus (seats 9-15)
18 = Other bus (seats > 15)
19 = Other small bus (seats 9-15)
20 = Farm vehicle/equipment
21 = Maintenance/construction vehicle
22 = Train
88 = Other (explain in narrative)
99 = Unknown

Step 4. The location of the accident is very important. Please be as specific as possible.

Step 5. To the best of your ability, complete the Accident Codes section for your own vehicle using codes provided on page 2 of this form.

Step 6. If there is damage to property other than the vehicles involved complete the property damage information.

Step 7. Injury information should be entered in the space provided. Make sure that the vehicle number in which the injured party was riding is complete, describe the nature of the injury, and check the box under the column most appropriate for the injury severity. NOTE: Include all drivers whether injured or not. The codes are:

Injury Status:
1 = Fatal
2 = Incapacitating
3 = Non-incapacitating
4 = Possible
5 = Uninjured
9 = Unknown

Occupant Protection:
1 = None used
2 = Shoulder and lap belt used
3 = Lap belt only used
4 = Shoulder belt only used
5 = Child safety seat used
6 = Helmet used
8 = Other (explain in narrative)
9 = Unknown

Airbag Deployment:
1 = Deployed front of person
2 = Deployed side of person
3 = Deployed both front/side
4 = Other deployment (explain in narrative
5 = Not deployed
6 = Not applicable
9 = Unknown

Ejection:
1 = Not ejected
2 = Partially ejected
3 = Totally ejected
4 = Not applicable (motorcycle, bicycle, etc.)
9 = Unknown

Type Non-Motorist:
1 = Pedestrian
2 = Pedalcyclist (bicycle, tricycle, unicycle, pedal car)
3 = Skater
8 = Other (explain in narrative)
9 = Unknown

Motorcycle Seating Position
01 - Motorcycle Driver
04 - Motorcycle Passenger
88 - Other (explain in narrative)

Seating Position

01	02	03
04	05	06
07	08	09

10 - Sleeper Section
11 - Enclosed Cargo Area
12 - Unenclosed Cargo Area
13 - Trailing Unit
14 - Exterior
15 - Pedestrian
16 - Pedalcyclist
17 - Pedalcyclist, passenger
88 - Other (explain in narrative)
99 - Unknown

IOWA SAMPLE CRASH REPORT FORM

Step 8. To the best of your ability, complete the accident diagram and description as briefly as possible. **Important:** If you are vehicle No. 1 in Step 2, make sure that your vehicle is vehicle No. 1 in the description and diagram. Indicate if there has been a Peace Officer investigation.

Step 9. Complete the insurance information on the back of the report. Failure to complete insurance coverage information may result in a suspension of your driving and registration privileges.

Step 10. Sign the accident report and tear at the perforated line and return accident report to:

Iowa Department of Transportation
Office of Driver Services
P.O. Box 9235
Des Moines, IA 50306-9235

ACCIDENT CODES *(See Step 5)*

A LOCATION OF ACCIDENT *(Where did first damage or injury event occur)*

1 = On Roadway
2 = Shoulder
3 = Median
4 = Roadside (ditch)
5 = Grassy Area between exit ramp and roadway
6 = Outside Trafficway
9 = Unknown

B MANNER OF CRASH/COLLISION

1 = Non-collision
2 = Head-on
3 = Rear-end
4 = Angle, oncoming left turn
5 = Broadside
6 = Sideswipe, same direction
7 = Sideswipe, opposite direction
9 = Unknown

C VEHICLE ACTION

01 = Movement essentially straight
02 = Turning left
03 = Turning right
04 = Making U-turn
05 = Overtaking/passing
06 = Changing lanes
07 = Entering traffic lane (merging)
08 = Leaving traffic lane
09 = Backing
10 = Slowing/stopping
11 = Stopped for stop sign/signal
12 = Legally Parked
13 = Illegally Parked / Unattended
88 = Other (explain in narrative
99 = Unknown

D FIRST HARMFUL EVENT

Non-collision events:
11 = Overturn/rollover
12 = Jackknife
13 = Other non-collision (explain in narrative)
Collision with:
20 = Non-motorist (see non-motorist type)
21 = Vehicle in traffic
22 = Vehicle in/from other roadway
23 = Parked motor vehicle
24 = Railway vehicle/train
25 = Animal
26 = Other non-fixed object (explain in narrative)
Collision with fixed object:
30 = Bridge/bridge rail/ overpass
31 = Underpass/structure support
32 = Culvert
33 = Ditch/Embankment
34 = Curb/island/raised median
35 = Guardrail
36 = Concrete barrier (median or right side)
37 = Tree
38 = Poles (utility, light, etc.)
39 = Sign post
40 = Mailbox
41 = Impact attenuator
42 = Other fixed object (explain in narrative)

E TYPE OF ROADWAY JUNCTION/FEATURE

Non-intersection:
01 = No special feature
02 = Bridge/overpass/ underpass
03 = Railroad crossing
04 = Business drive
05 = Farm/residential drive
06 = Alley intersection
07 = Crossover in median
08 = Other non-intersection (explain in narrative)
Intersection:
11 = Four-way intersection
12 = T-intersection
13 = Y-intersection
14 - Five-leg or more
15 - Offset four-way intersection
16 = Intersection with ramp
17 = On-ramp merge area
18 = Off-ramp diverge area
19 = On-ramp
20 = Off-ramp
21 = With bike/pedestrian path
22 = Other intersection (explain in narrative)
99 = Unknown

F TRAFFIC CONTROLS

01 = No controls present
02 = Traffic signals
03 = Flashing traffic control signal
04 = Stop signs
05 = Yield signs
06 = No Passing Zone (marked)
07 = Warning sign
08 = School zone signs
09 = Railway crossing device
10 = Traffic director
11 = Workzone signs
88 = Other control (explain in narrative)
99 = Unknown

G LIGHT CONDITIONS

1 = Daylight
2 = Dusk
3 = Dawn
4 = Dark, roadway lighted
5 = Dark, roadway not lighted
6 = Dark, unknown roadway lighting
9 = Unknown

H WEATHER CONDITIONS *(up to two)*

01 = Clear
02 = Partly cloudy
03 = Cloudy
04 = Fog, smoke
05 = Mist
06 = Rain
07 = Sleet, hail, freezing rain
08 = Snow
09 = Severe winds
10 = Blowing sand, soil, dirt, snow
88 = Other (explain in narrative)
99 = Unknown

I SURFACE CONDITIONS

1 = Dry
2 = Wet
3 = Ice
4 = Snow
5 = Slush
6 = Sand, mud, dirt, oil, gravel
7 = Water (standing, moving)
8 = Other (explain in narrative)
9 = Unknown

J VISION OBSCURED

01 = Not obscured
02 = Trees/crops
03 = Buildings
04 = Embankment
05 = Sign/billboard
06 = Hillcrest
07 = Parked vehicles
08 = Moving vehicles
09 = Person/object in or on vehicle
10 = Blinded by sun or headlights
11 = Frosted windows/ windshield
12 = Blowing snow
13 = Fog/smoke/dust
88 = Other (explain in narrative)
99 = Unknown

K DRIVER CONDITION

1 = Apparently normal
2 = Physical impairment
3 = Emotional (e.g., depressed, angry, disturbed)
4 = Illness
5 = Asleep, fainted, fatigued, etc.
6 = Under the influence of alcohol/drugs/ medications
8 = Other (explain in narrative)
9 = Unknown

L CONTRIBUTING CIRCUMSTANCES Driver *(up to two)*

01 = Ran traffic signal
02 = Ran stop sign
03 = Exceeded authorized speed
04 = Driving too fast for conditions
05 = Made improper turn
06 = Traveling wrong way or on wrong side of road
07 = Crossed centerline
08 = Lost Control
09 = Followed too close
10 = Swerved to avoid; vehicle, object, non-motorist, or animal in roadway
11 = Over correcting/over steering
12 = Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner

Failed to yield right-of-way:
13 = From stop sign
14 = From yield sign
15 = Making left turn
16 = Making right turn on red signal
17 = From driveway
18 = From parked position
19 = To pedestrian
20 = At uncontrolled intersection
21 = Other (explain in narrative)

Inattentive/distracted by:
22 = Passenger
23 = Use of phone or other device
24 = Fallen object
25 = Fatigued/asleep

Other
26 = Vision obstructed
27 = Other improper action
28 = No improper action
99 = Unknown

IOWA SAMPLE CRASH REPORT FORM

Form 433002
04-07

Iowa Department of Transportation

REPORT OF MOTOR VEHICLE ACCIDENT

See instructions on completing *(please print or type)*

Did accident occur on private property? ☐ Yes ☐ No

Step 1.

Accident Date (Mo/Day/Year)	Day of Week	Time ☐ AM ☐ PM	Number of Vehicles	Total Killed	Total Injured	Total Estimated Damage $

Step 2.

DRIVER	NO. 1 (YOUR VEHICLE)				NO. 2 (OTHER VEHICLE)			
	Date of Birth	Sex	Dr.Lic. State	Driver License No. as Printed on License	Date of Birth	Sex	Dr.Lic. State	Driver License No. as Printed on License
	Last Name of Driver 1	First Name	Middle Initial		Last Name of Driver 2	First Name	Middle Initial	
	Number and Street	City	State	Zip Code	Number and Street	City	State	Zip Code
OWNER	Last Name of Owner 1	First Name	Middle Initial		Last Name of Owner 2	First Name	Middle Initial	
	Number and Street	City	State	Zip Code	Number and Street	City	State	Zip Code
VEHICLE	No. of Occupants	Plate Number	State of Registration	Year	No. of Occupants	Plate Number	State of Registration	Year
	V.I.N.	Est. Cost of Repairs			V.I.N.	Est. Cost of Repairs		
	Vehicle Year & Make	Step 3. Vehicle Type Code			Vehicle Year & Make	Step 3. Vehicle Type Code		

Step 4. LOCATION OF ACCIDENT

County	Accident occurred within corporate limits of (city)

If accident occurred outside of city limits, describe distance to city _____ miles ☐ N ☐ NE ☐ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW of nearest city _____

Name of Road, Street or Highway _____ At Intersection with _____

Note: Unless accident occurred at an intersection which is completely described above, use the space below to give the exact location from a milepost or definable intersection, bridge or railroad crossing, using two distances and directions if necessary.

Feet ____ or Miles ____ ☐ N ☐ NE ☐ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW and Feet ____ or Miles ____ ☐ N ☐ NE ☐ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW of

Milepost Number _____ Or Definable Intersection, bridge, or railroad crossing _____

Step 5. Accident Codes *(on page 2)* For your own vehicle

A Location of Accident ☐	B Manner of Crash ☐	C Vehicle Action ☐☐	D First Harmful Event ☐☐
E Type of Roadway Junction/Feature ☐☐	F Traffic Controls ☐☐	G Light Conditions ☐	H Weather Conditions ☐☐ ☐☐
I Surface Conditions ☐	J Vision Obscured ☐☐	K Driver Condition ☐	L Contributing Circumstances ☐☐ ☐☐

Step 6.

Identify Damaged Property Other Than Vehicles	Owner	Amount of Damage

Step 7. Injury Section: Fill Out Space Below For Every Person Injured Or Killed In The Accident *(Attach additional sheets if necessary)*

Name & Address	In Vehicle Number	Date of Birth	Gender	Describe Injuries	Insert Correct Code *(See Step 7 of Instructions)* Injury Status	Occupant Protection	Airbag Deployment	Ejection	Type Non-Motorist	Seating Position	Date of Death

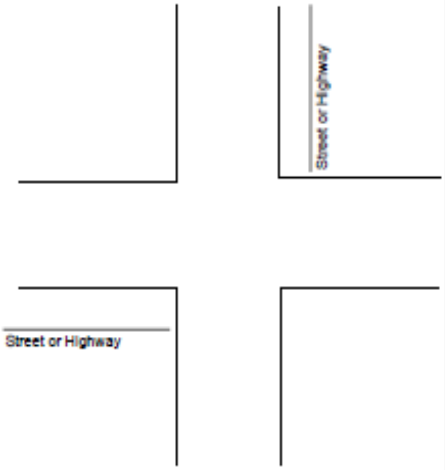
IOWA SAMPLE CRASH REPORT FORM

Step 8.

Indicate On This Diagram What Happened
Use one of these outlines to sketch the scene of your accident, writing in street or highway names or numbers.

INDICATE NORTH BY ARROW

Initial Travel Direction
(prior to coded Vehicle Action)
1 - North
2 - East
3 - South
4 - West
9 - Unknown



Original Direction of Travel: *(Example: Vehicle going north then turning left, code 'N' for Original Direction of Travel)*

Vehicle 1 _____ Vehicle 2 _____

_____ Street or Highway

Description

_____

_____

_____

_____

_____

_____

_____

Did Peace Officer investigate? ☐ Yes ☐ No Department _____

If you did not have automobile liability insurance coverage for this accident, please check this box ☐.

If you had automobile liability insurance coverage for this accident, please complete insurance information below:

Failure To Complete Insurance Coverage Information Requested Below May Result In A Suspension Of Your Driving And/Or Registration Privileges.

Step 9.

Name of Insurance Company **(Not Agent)** Providing Insurance To Cover Your Liability For Damage Or Injury To Others:

_____

Name of Agent Who Sold Policy _____

Agent Address _____

Policy No. _____ Policy Period: From _____ To _____

V.I.N. No. _____

Name of Driver _____

Name of Owner _____

Name of Policyholder _____

Step 10.

Date	Signature of Driver of Vehicle No. 1	If Signed By Person Other Than Driver, Give Reason

IMPORTANT: This accident should also be reported directly to your insurance company. Failure to report may jeopardize your automobile liability insurance.

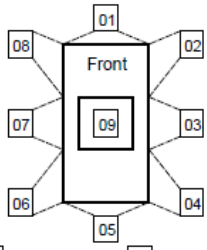
IOWA SAMPLE CRASH REPORT FORM

Driver / Vehicle Characteristics

Initial Travel Direction
(prior to coded Vehicle Action)
1 - North
2 - East
3 - South
4 - West
9 - Unknown

Vehicle Action
01 - Movement essentially straight
02 - Turning left
03 - Turning right
04 - Making U-turn
05 - Overtaking/passing
06 - Changing lanes
07 - Entering traffic lane (merging)
08 - Leaving traffic lane
09 - Backing
10 - Slowing/stopping
11 - Stopped for stop sign/signal
12 - Legally parked
13 - Illegally parked/Unattended
88 - Other (explain in narrative)
99 - Unknown

Point of Initial Impact
Most Damaged Area



Extent of Damage
1 - None
2 - Minor damage
3 - Functional damage
4 - Disabling damage
5 - Severe, vehicle totalled
9 - Unknown

Underride/Override
1 - None
2 - Underride, compartment intrusion
3 - Underride, no compartment intrusion
4 - Underride, compartment intrusion unknown
5 - Override, moving vehicle
6 - Override, parked/stationary vehicle
9 - Unknown

Traffic Controls
01 - No controls present
02 - Traffic signals
03 - Flashing traffic control signal
04 - Stop signs
05 - Yield signs
06 - No Passing Zone (marked)
07 - Warning sign
08 - School zone signs
09 - Railway crossing device
10 - Traffic director
11 - Work Zone signs
88 - Other control (explain in narrative)
99 - Unknown

Vehicle Configuration
01 - Passenger car
02 - Four-tire light truck (pick-up, panel)
03 - Van or mini-van
04 - Sport utility vehicle
05 - Single-unit truck (2-axle, 6-tire)
06 - Single-unit truck (> = 3 axles)
07 - Truck/trailer
08 - Truck tractor (bobtail)
09 - Tractor/semi-trailer
10 - Tractor/doubles
11 - Tractor/triples
12 - Other heavy truck (cannot classify)
13 - Motor home/recreational vehicle
14 - Motorcycle
15 - Moped/ All-Terrain Vehicle
16 - School bus (seats > 15)
17 - Small school bus (seats 9-15)
18 - Other bus (seats > 15)
19 - Other small bus (seats 9-15)
20 - Farm vehicle/equipment
21 - Maintenance/construction vehicle
22 - Train
88 - Other (explain in narrative)
99 - Unknown

Cargo Body Type
01 - Not applicable

Truck Cargo Type:
02 - Van/enclosed box
03 - Dump truck (grain, gravel)
04 - Cargo tank
05 - Flatbed
06 - Concrete mixer
07 - Auto transporter
08 - Garbage/refuse
09 - Other truck cargo type (explain in narrative)

Trailer Type:
10 - Small utility (one axle)
11 - Large utility (2+ axles)
12 - Boat
13 - Camper
14 - Large mobile home
15 - Oversize load
16 - Towed vehicle
17 - Pole
18 - Other trailer type (explain in narrative)
99 - Unknown

Vehicle Defect
01 - None
02 - Brakes
03 - Steering
04 - Blowout
05 - Other tire defect (explain in narrative)
06 - Wipers
07 - Trailer hitch
08 - Exhaust
09 - Headlights
10 - Tail lights
11 - Turn signal
12 - Suspension
88 - Other (explain in narrative)
99 - Unknown

Driver Condition
1 - Apparently normal
2 - Physical impairment
3 - Emotional (e.g. depressed, angry, disturbed)
4 - Illness
5 - Asleep, fainted, fatigued, etc.
6 - Under the influence of alcohol/drugs/medications
8 - Other (explain in narrative)
9 - Unknown

Vision Obscured
01 - Not obscured
02 - Trees/crops
03 - Buildings
04 - Embankment
05 - Sign/billboard
06 - Hillcrest
07 - Parked vehicles
08 - Moving vehicles
09 - Person/object in or on vehicle
10 - Blinded by sun or headlights
11 - Frosted windows/windshield
12 - Blowing snow
13 - Fog/smoke/dust
88 - Other (explain in narrative)
99 - Unknown

Contributing Circumstances, Driver (up to two)
01 - Ran traffic signal
02 - Ran stop sign
03 - Exceeded authorized speed
04 - Driving too fast for conditions
05 - Made improper turn
06 - Travelling wrong way or on wrong side of road
07 - Crossed centerline
08 - Lost control
09 - Followed too close
10 - Swerved to avoid: vehicle, object, non-motorist, or animal in roadway
11 - Over correcting/over steering
12 - Operating vehicle in an erratic, reckless, careless, negligent, or aggressive manner

Failed to yield right-of-way:
13 - From stop sign
14 - From yield sign
15 - Making left turn
16 - Making right turn on red signal
17 - From driveway
18 - From parked position
19 - To pedestrian
20 - At uncontrolled intersection
21 - Other (explain in narrative)

Inattentive/distracted by:
22 - Passenger
23 - Use of phone or other device
24 - Fallen object
25 - Fatigued/asleep

Other (explain in narrative):
26 - Vision obstructed
27 - Other improper action
28 - No improper action

99 - Unknown

Emergency Vehicles

Emergency Vehicle Type
1 - Not applicable
2 - Police
3 - Fire
4 - Ambulance
5 - Towing
6 - Military
7 - Maintenance
9 - Unknown

Emergency Status
1 - Yes, in emergency
2 - No, not in emergency
3 - Not applicable
9 - Unknown

Hazardous Materials Released? (Cargo Only)

1 - Yes
2 - No
3 - Not applicable
9 - Unknown

Iowa Department of Transportation

INVESTIGATING OFFICER'S REPORT OF MOTOR VEHICLE ACCIDENT CODE SHEET

Form 433014
01-01

Work Zone Related?

Location
1 - Before work zone warning sign
2 - Between advance warning sign and work area
3 - Within transition area for lane shift
4 - Within or adjacent to work activity
5 - Between end of work area and "End Work Zone" sign
8 - Other work zone area (explain in narrative)
9 - Unknown

Type
1 - Lane closure
2 - Lane shift/crossover/ head-to-head traffic
3 - Work on shoulder or median
4 - Intermittent or moving work
8 - Other type of work zone (explain in narrative)
9 - Unknown

Workers Present?
1 - Yes
2 - No
9 - Unknown

IOWA SAMPLE CRASH REPORT FORM

Accident Environment

Location of First Harmful Event
1 - On Roadway
2 - Shoulder
3 - Median
4 - Roadside
5 - Gore
6 - Outside trafficway
9 - Unknown

Manner of Crash/Collision
1 - Non-collision
2 - Head-on
3 - Rear-end
4 - Angle, oncoming left turn
5 - Broadside
6 - Sideswipe, same direction
7 - Sideswipe, opposite direction
9 - Unknown

Light Conditions
1 - Daylight
2 - Dusk
3 - Dawn
4 - Dark, roadway lighted
5 - Dark, roadway not lighted
6 - Dark, unknown roadway lighting
9 - Unknown

Weather Conditions (up to two)
01 - Clear
02 - Partly cloudy
03 - Cloudy
04 - Fog, smoke
05 - Mist
06 - Rain
07 - Sleet, hail, freezing rain
08 - Snow
09 - Severe winds
10 - Blowing sand, soil, dirt, snow
88 - Other (explain in narrative)
99 - Unknown

Surface Conditions
1 - Dry
2 - Wet
3 - Ice
4 - Snow
5 - Slush
6 - Sand, mud, dirt, oil, gravel
7 - Water (standing, moving)
8 - Other (explain in narrative)
9 - Unknown

Roadway Characteristics

Contributing Circumstances, Environment
1 - None apparent
2 - Weather conditions
3 - Physical obstruction
4 - Pedestrian action
5 - Glare
6 - Animal in roadway
7 - Previous accident
8 - Other (explain in narrative)
9 - Unknown

Contributing Circumstances, Roadway
01 - None apparent
02 - Road surface condition
03 - Debris
04 - Ruts, holes, bumps
05 - Work Zone (construction, maintenance, utility)
06 - Worn, travel-polished surface
07 - Obstruction in roadway
08 - Traffic control device inoperative, missing, obscured
09 - Shoulders (none, low, soft, high)
10 - Non-highway work
11 - Non-contact vehicle
99 - Unknown

Type of Roadway Junction/ Feature
Non-intersection:
01 - No special feature
02 - Bridge/overpass/underpass
03 - Railroad crossing
04 - Business drive
05 - Farm/residential drive
06 - Alley intersection
07 - Crossover in median
08 - Other non-intersection (explain in narrative)
Intersection:
11 - Four-way intersection
12 - T - intersection
13 - Y - intersection
14 - Five-leg or more
15 - Offset four-way intersection
16 - Intersection with ramp
17 - On-ramp merge area
18 - Off-ramp diverge area
19 - On-ramp
20 - Off-ramp
21 - With bike/pedestrian path
22 - Other intersection (explain in narrative)
99 - Unknown

Harmful Events

Sequence of Events
Most Harmful Event
First Harmful Event

Pre-crash events:
01 - Ran off road, right
02 - Ran off road, straight
03 - Ran off road, left
04 - Crossed centerline/median
05 - Animal or object in roadway
06 - Evasive action (swerve, panic braking, etc.)
07 - Downhill runaway
08 - Cargo/equipment loss or shift
09 - Equipment failure (tires, brakes, etc.)
10 - Separation of units

Non-collision events:
11 - Overturn/rollover
12 - Jackknife
13 - Other non-collision (explain in narrative)

Collision with:
20 - Non-motorist (see non-motorist type)
21 - Vehicle in traffic
22 - Vehicle in/from other roadway
23 - Parked motor vehicle
24 - Railway vehicle/train
25 - Animal
26 - Other non-fixed object (explain in narrative)

Collision with fixed object:
30 - Bridge/bridge rail/overpass
31 - Underpass/structure support
32 - Culvert
33 - Ditch/embankment
34 - Curb/island/raised median
35 - Guardrail
36 - Concrete barrier (median or right side)
37 - Tree
38 - Poles (utility, light, etc.)
39 - Sign post
40 - Mailbox
41 - Impact attenuator
42 - Other fixed object (explain in narrative)

Misc. events:
50 - Fire/explosion
51 - Immersion
52 - Hit and run
99 - Unknown

Injury/Protective Devices

Injury Status
1 - Fatal
2 - Incapacitating
3 - Non-incapacitating
4 - Possible
5 - Uninjured
9 - Unknown

Occupant Protection
1 - None used
2 - Shoulder and lap belt used
3 - Lap belt only used
4 - Shoulder belt only used
5 - Child safety seat used
6 - Helmet used
8 - Other (explain in narrative)
9 - Unknown

Airbag Deployment
1 - Deployed front of person
2 - Deployed side of person
3 - Deployed both front/side
4 - Other deployment (explain in narrative)
5 - Not deployed
6 - Not applicable
9 - Unknown

Airbag Switch Status
1 - Switch in ON position
2 - Switch in OFF position
3 - No ON/OFF switch present
9 - Unknown

Ejection
1 - Not ejected
2 - Partially ejected
3 - Totally ejected
4 - Not applicable (motorcycle, bicycle, etc.)
9 - Unknown

Ejection Path
1 - Not ejected/not applicable
2 - Through front windshield
3 - Through side window/door
4 - Through roof
5 - Through back window/tailgate
9 - Unknown

Trapped
1 - Not trapped
2 - Freed by non-mechanical means
3 - Extricated by mechanical means
9 - Unknown

Non-Motorist

Type
1 - Pedestrian
2 - Pedalcyclist (bicycle, tricycle, unicycle, pedal car)
3 - Skater
8 - Other (explain in narrative)
9 - Unknown

Location (prior to impact)
1 - Marked crosswalk at intersection
2 - At intersection, no crosswalk
3 - Non-intersection crosswalk
4 - Driveway access crosswalk
8 - Other non-intersection (explain in narrative)
9 - Unknown

Action
1 - Entering or crossing roadway
2 - Walking, running, jogging, playing, cycling
3 - Working
4 - Pushing vehicle
5 - Approaching or leaving vehicle
6 - Playing or working on vehicle
7 - Standing
8 - Other (explain in narrative)
9 - Unknown

Condition
1 - Apparently normal
2 - Physical impairment
3 - Emotional (e.g. depressed, angry, disturbed)
4 - Illness
5 - Asleep, fainted, fatigued, etc.
6 - Under the influence of alcohol/drugs/medications
8 - Other (explain in narrative)
9 - Unknown

Safety Equipment
1 - Helmet
2 - Reflective clothing
3 - Lighting
4 - None
8 - Other (explain in narrative)
9 - Unknown

Contributing Circumstances
01 - Improper crossing
02 - Darting
03 - Lying or sitting in roadway
04 - Failure to yield right of way
05 - Not visible (dark clothing)
06 - Inattentive (talking, eating, etc.)
07 - Failure to obey traffic signs, signals, or officer
08 - Wrong side of road
88 - Other (explain in narrative)
99 - Unknown

KANSAS SAMPLE CRASH REPORT FORM

☐ FATAL
☒ INJURY
☐ PDO over $1000
☐ PDO under $1000
☐ PRIVATE PROPERTY

STATE OF KANSAS
MOTOR VEHICLE ACCIDENT REPORT
DOT FORM NO. 850
Rev. 1-2005

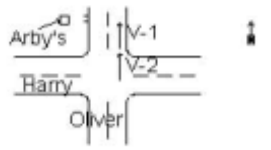
EXAMPLE #3

☐ Amended
☐ Hit & Run Accident
☐ KDOT Property Damage
☐ KDOT Construction Zone

Milepost	COUNTY	On Road	Speed Limit	CITY	Photos By	Local Case Number	Page of
	SG	Oliver St.	30	WICHITA		AC-206-04	1 of 2

Distance	FMI	Dir.	☒ FROM ☐ AT Road	Speed Limit	Investigating Dept.	Investigating Officer /Badge Number	Reviewed By
40.000	F	NN	Harry St.		WICHITA POLICE DEPT.	Jack Davis 610	

COLLISION DIAGRAM (Show Unit Movements, Roads)



Describe pre-crash movement or action and direction of vehicles and pedestrians by traffic unit number.
V-1 (NB) was yielding to traffic (SB) to make a left turn; V-2 (NB) unable to stop in time, rear ending V-1.

Date of Accident: 06/10/2004

TIME Occurred	DAY	TIME Notified	DAY	TIME Arrived	DAY
16:16	TH	16:18	TH	16:25	TH

Object Damaged and nature of damage (Show location in diagram)

Name and Address of object owner

ON Road	Crtl Sec.	Sec. Milepost	AT Road	Distance	Unit	Dir.	Latitude	Longitude	STATE USE ONLY

County	City Code	Agency Code	Distance N/M	Reference Road 1	Distance E/M	Reference Road 2	Coder	Func. Class

Unit	☒ Driver ☐ Ped	NAME (Last, First and Initial)	Phone ☐ Work ☒ Home	Color	YEAR	MAKE	MODEL & BODY STYLE	MC CCs
01		Wake Jonathan M	(620) 785-9130	BLU	2002	DODG	VIP 2D	

Driver/Ped ADDRESS (Number, Street, City, State, Zip Code)	STATE	LICENSE PLATE #	Exp. Yr	Removed By:
2815 Harrison Wichita KS 67890	KS	2FST4U	2004	Dave's Wrecker Serv.

DRIVER'S LICENSE STATE and NUMBER	CDL?	DATE OF BIRTH	SEX	VEHICLE IDENTIFICATION NUMBER	Odometer
St KS No 511238766		02/09/1980	M	1CXTJ6K1M23TWA432	10,021

Registered OWNER FULL NAME ("Same" if Driver)	Phone ☐ Work ☐ Home	TOTAL occupants in this vehicle	Fire?	Insurance Company
		1		Exotic Auto Ins.

OWNER Address ("Same" if Driver)	Special Data Area	Direction of Travel	Policy Number
		NN	478-153662

Special Conditions for unit above: ☐ 1 Hit & Run ☐ 2 Non-Contact ☐ 3 Stolen ☐ 4 Legally parked ☐ 5 Police pursuit ☐ 6 Driverless ☒ 7 Towed away

Unit	☒ Driver ☐ Ped	NAME (Last, First and Initial)	Phone ☒ Work ☐ Home	Color	YEAR	MAKE	MODEL & BODY STYLE	MC CCs
02		Casa Roberto S	(612) 775-5116	GRN	2001	KWDT	TK AR	

Driver/Ped ADDRESS (Number, Street, City, State, Zip Code)	STATE	LICENSE PLATE #	Exp. Yr	Removed By:
12123 SW 86th Topeka KS 66617	KS	QRS 117	2004	owner

DRIVER'S LICENSE STATE and NUMBER	CDL?	DATE OF BIRTH	SEX	VEHICLE IDENTIFICATION NUMBER	Odometer
St KS No 510488219	Y	09/02/1947	M	WCCO12TWTJ34WIQ4733	126,687

Registered OWNER FULL NAME ("Same" if Driver)	Phone ☐ Work ☐ Home	TOTAL occupants in this vehicle	Fire?	Insurance Company
Transland Trucking		2		Farm State Ins.

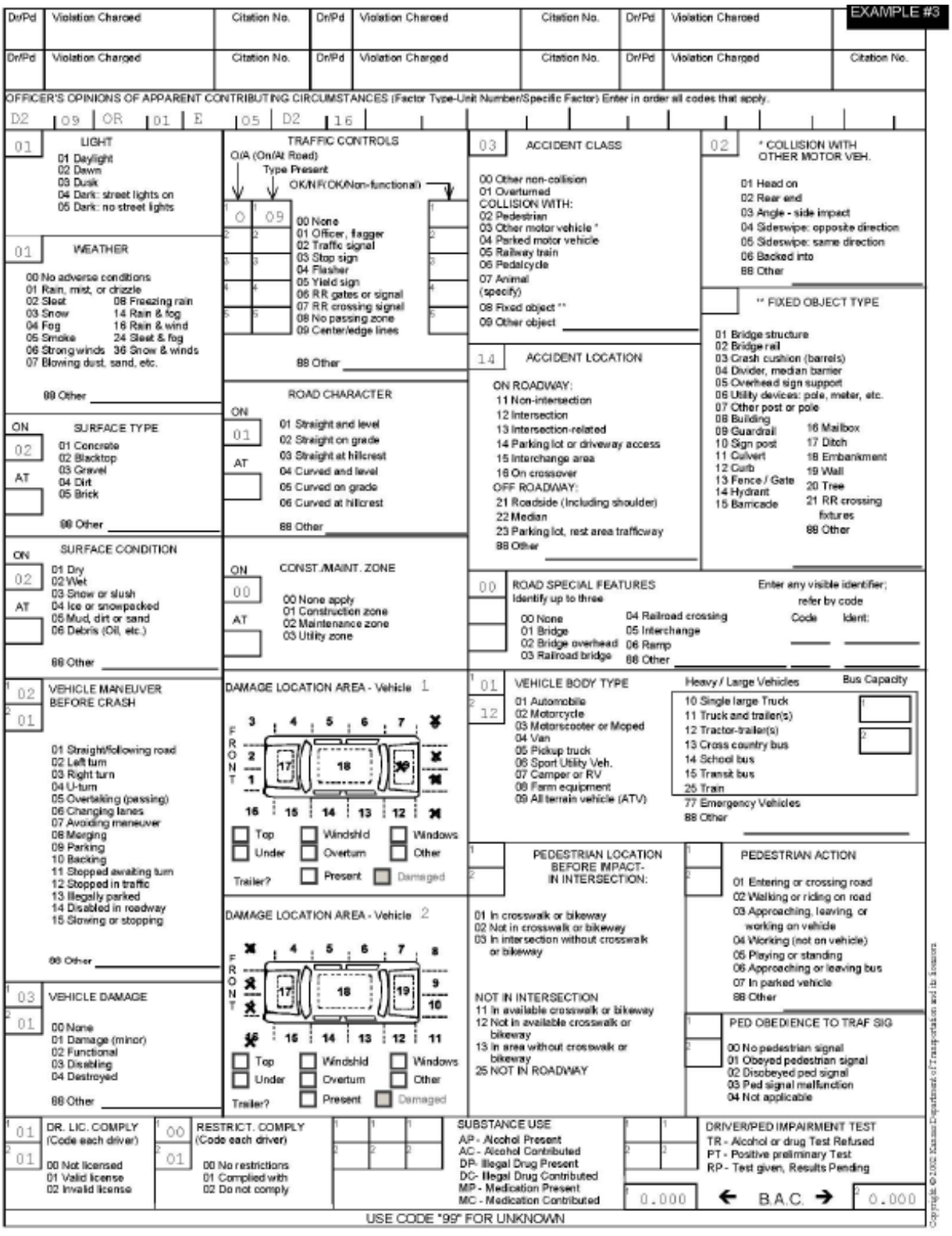
OWNER Address ("Same" if Driver)	Special Data Area	Direction of Travel	Policy Number
1972 W. 3rd Topeka KS 66617		NN	0-4443176

Special Conditions for unit above: ☐ 1 Hit & Run ☐ 2 Non-Contact ☐ 3 Stolen ☐ 4 Legally parked ☐ 5 Police pursuit ☐ 6 Driverless ☐ 7 Towed away

TRAF UNIT	SEAT TYPE	Last NAME	First Name	Initial	ADDRESS (Number, Street, City, State, Zip)	SEX	AGE	S.E. USED	EJECT TRAP	INJ SEV	EMS UNIT
01	01	Wake	Jonathan	M	2815 Harrison Wichita KS 67890	M	24	R	N	I	
02	01	Casa	Roberto	S	12123 SW 86th Topeka KS 66617	M	56	S	N	N	
02	03	Mannebach	Glenn	A	5310 SE Pawley Dr. Topeka KS	M	57	S	N	N	

EMS Unit A	INJURED TAKEN By:	INJURED TAKEN To:
EMS Unit B	INJURED TAKEN By:	INJURED TAKEN To:
EMS Unit C	INJURED TAKEN By:	INJURED TAKEN To:

KANSAS SAMPLE CRASH REPORT FORM



KANSAS SAMPLE CRASH REPORT FORM

INVESTIGATIVE - FATALITY REPORT

EXAMPLE #

COUNTY	ON Road	CITY	DATE of Accident	Fatal, narrative & diagram on fatal accident (required by State) / Investigative Report	Page
CD	Jade Rd		04/23/2004	☒ / ☐	1 / 2

STATE USE ONLY	INVESTIGATIVE DEPT.	TIME Occurred	Day	Invest. OFFICER	BADGE No.	Local Case Number
	CLOUD COUNTY SHERIFF	15:05	FR	Susan Stewart	245	5876-04

V-1 was traveling at a high rate of speed; for an unknown reason, V-1 left the roadway hitting an embankment and overturning on the south side of Jade Rd.

Open beer cans were found both inside the vehicle, and outside the vehicle on the ground. It is believed that alcohol was a contributing factor in the accident.

FATALITY DATA

TIME EMS NOTIFIED	EXTRICATION WAS REQIRED FOR THE FOLLOWING PERSONS	SPECIAL JURISDICTION	VEHICLE DAMAGE 01	VEHICLE DAMAGE
15:09		00	I = 12	I =
TIME EMS ARRIVED			P = 12	P =
15:14		00 Not Special 01 National Park Service 02 Military 03 Indian Reservation 04 College/University Campus 05 Other Federal properties 88 Other 99 Unknown	FRONT	FRONT
TIME EMS ARRIVED AT HOSPITAL			☒ Undercarriage ☐ No Damage 40 Estimated Speed,MPH	☐ Undercarriage ☐ No Damage Estimated Speed,MPH
15:44				

IMPACT POINTS: Show initial impact point by arrow and label "I".
Show principal impact point by arrow and label "P".

D.O.T FORM NO. 851

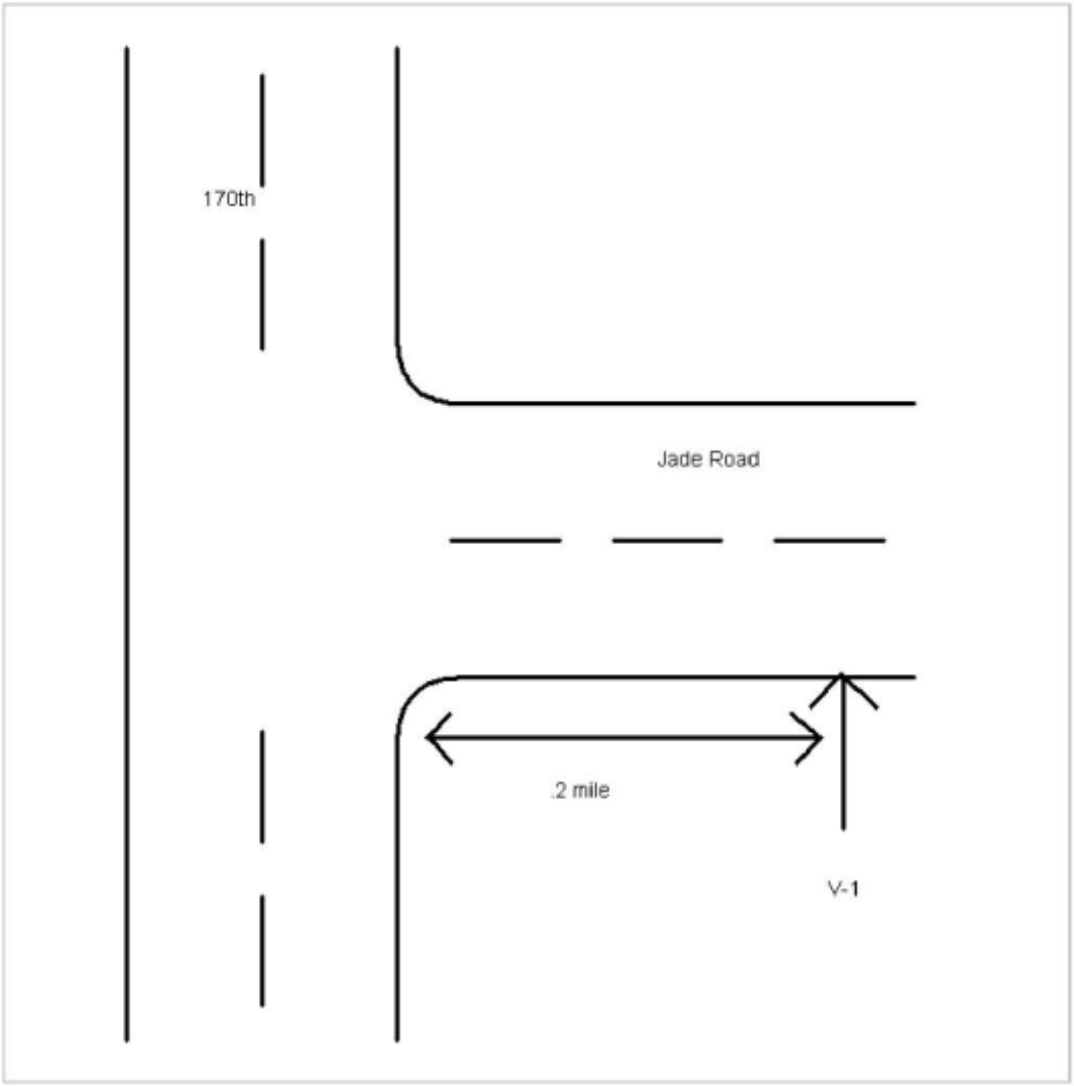
KANSAS SAMPLE CRASH REPORT FORM

EXAMPLE #5

COLUSION DIAGRAM

Draw scene as observed. Refer to vehicles, drivers, and pedestrians by numbers assigned in this report.

SHOW
(1) Outline of street and access points and identify specifically by number.
(2) Paths of units prior to and after impact, skidmarks, and point of impact (POI).
(3) Location of signs, traffic controls, and reference points.
(4) Location of other property hit or damaged (trees, signs, etc.).
(5) Specific features at location (bridge, overpass, culvert, railroad crossing, etc.).
(6) Location of temporary highway conditions.
(7) All measurements to locate the accident relative to specific, fixed, and identifiable points.



KANSAS SAMPLE CRASH REPORT FORM

EXAMPLE #3

TRUCK - BUS SUPPLEMENT

☐ Completed post-cr

Supplement required for accidents involving trucks with at least 2 axles and 6 tires, OR buses with a seat capacity of 15 or more, OR any vehicle transporting hazardous material.

COUNTY	ON Road	CITY	DATE of Accident	TIME Occurred	Day	Traffic Unit No.	Page of
SG	Oliver St.	WICHITA	06/10/2004	16:16	TH	2	1 / 2

STATE USE ONLY	Investigating Dept.	Investigating Officer	Badge No.	Local Case Number
	WICHITA POLICE DEPT.	Jack Davis	610	AC-206-04

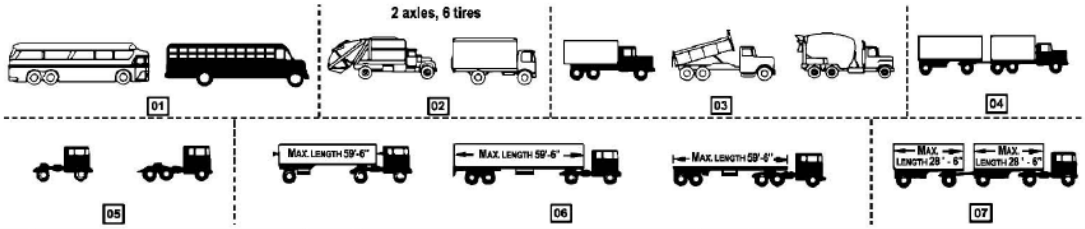
CARRIER NAME (CORPORATE BUSINESS NAME): Transland Trucking Inc.

KANSAS PERMITS (Issuer and Permit Number): 1. KCC 101436 2. 3.

CARRIER ADDRESS	CITY	STATE	ZIP CODE
1972 W. 3rd	Topeka	KS	66617

U.S. GOVERNMENT PERMITS (Issuer and Number): USDOT 0327574 ICC MC 644735

03 SOURCE OF NAME (enter one only)
01 Side of vehicle 03 Driver
02 Shipping papers or manifest 04 Logbook



06 VEHICLE CONFIGURATION
01 Bus _____ (capacity)
02 Single-unit truck (2-axle, 6-tires)
03 Single-unit truck (3 or more axles)
04 Truck and trailer
05 Truck tractor (bobtail)
06 Truck tractor and semi-trailer
07 Truck tractor and double trailer
08 Truck tractor and triple trailer
09 Heavy truck, cannot classify

01 CAB TYPE (for single truck or tractor)
01 Cab behind engine
02 Cab over engine

01 CARGO BODY TYPE
01 Van or enclosed box
02 Hopper
03 Tank
04 Flatbed
05 Dump
06 Concrete mixer
07 Auto transporter
08 Garbage or refuse
88 Other _____

00 ON ROAD LANE TYPE
00 Undivided
01 One-way roadway
02 Divided roadway, medianstrip without barrier
03 Divided roadway, medianstrip with barrier

08 CARGO TYPE
00 Empty
01 Driveaway or towaway
02 Explosives
03 Farm and other animals
04 Farm products
05 Gases
06 General freight (packages)
07 Heavy machinery, objects
08 Household goods
09 Liquids (bulk)
10 Logs, poles, lumber
11 Metal (coils, sheets, etc.)
12 Mobile / Modular home
13 Motor vehicles
14 Refrigerated foods
15 Solids (bulk)
16 Rock, sand, gravel, salt
17 Food products
18 Plastic products
88 Other _____

00 ACCESS CONTROL
00 No control (unlimited access)
01 Full control (entry/exit only by ramp)
88 Other _____

1 22 SEQUENCE OF EVENTS (list up to 4)
00 Ran off road
11 Jackknife
12 Overturn
13 Downhill runaway
14 Cargo loss or shift
15 Explosion
16 Fire
17 Separation of units
18 Trailer swing

COLLISION WITH:
21 Pedestrian
22 Motor vehicle in transport
23 Parked motor vehicle
24 Train
25 Pedalcycle
26 Animal
27 Fixed object
28 Other object
88 Other event _____

TRAILERS			TOTALS				HAZARDOUS MATERIALS DATA		
	WIDTH (inches)	LENGTH (feet)	Total Length (feet)	No. of Axles	No. of Trailers	Gross Vehicle Weight	Material ID No.	Weight (pounds)	Spill or Release?
Trailer 1	102	36							
Trailer 2									
Trailer 3			48	5	1	73800			

USE CODE "99" FOR UNKNOWN — Placard? ☐ — Class:

Rev. 1-2003 D.O.T FORM NO. 852

KANSAS SAMPLE CRASH REPORT FORM

ACCIDENT CODING LIST

Contributing Circumstances -- List in order of significance

(Example: Officer's Opinion... | D1 | 07 | OR | 02 | interpretation: driver 1 - made improper turn; On Road - icy or slushy)

D (n) Driver (1, 2, etc.)

01	Under the influence of illegal drugs
02	Under the influence of alcohol
03	Failed to yield right of way
04	Disregarded traffic signs, signals, markings
05	Exceeded posted speed limit
06	Too fast for conditions
07	Made improper turn
08	Wrong side or wrong way
09	Followed too closely
10	Improper lane change
11	Improper backing
12	Improper passing
13	Improper or no signal
14	Improper parking
15	Fell asleep
16	Inattention
17	Did not comply - license restrictions
18	Other Distraction in or on vehicle
19	Avoidance or evasive action
20	Impeding or too slow for traffic
21	Ill or medical condition
22	Distraction - mobile (cell) phone
23	Distraction - other electronic devices
24	Aggressive / Antagonistic driving
25	Reckless / Careless driving

P (n) Pedestrian/Cyclist (1, 2, etc.)

01	Under the influence of illegal drugs
02	Under the influence of alcohol
03	Failed to yield right of way
04	Disregarded traffic control
05	Illegally in roadway
06	Pedalcycle violation
07	Clothing not able to be seen
08	Inattention
09	Distraction - mobile (cell) phone

E- Environment

01	Fog, smoke, or smog
02	Sleet, hail, or freezing rain
03	Blowing sand, soil, or dirt
04	Strong winds
05	Rain, mist, or drizzle
06	Animal
07	Vision Obstruction: building, vehicle, objects made by humans
08	Vision Obstruction: vegetation
09	Vision Obstruction: glare from sun or headlights
10	Reduced visibility due to cloudy skies
11	Falling Snow

V (n) Vehicle (1, 2, etc.)

01	Brakes
02	Tires
03	Exhaust
04	Headlights
05	Window or windshield: includes ice on windshield & designer window tinting, etc.)
06	Wheel(s)
07	Trailer coupling
08	Cargo
09	Unattended or Driverless (in motion)
10	Unattended or Driverless (not in motion)
11	Other lights

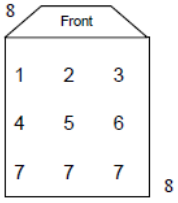
O/A (On/At) R (Road)

01	Wet
02	Icy or slushy
03	Debris or obstruction
04	Ruts, holes, bumps
05	Road construction or maintenance
06	Traffic control device inoperative
07	Shoulders: low, soft, or high
08	Snowpacked

Miscellaneous Codes:

Occupant Seat Position Codes

01	Driver (any vehicle type)
02	Center front
03	Right front
04	Left rear
05	Center rear
06	Right rear
07	Other seat position IN vehicle
08	Any position ON or Outside Veh.
09	Unknown location IN or ON Veh.
10	Motorcycle passengers
11	Extra person on driver's seat or lap
12-17	Extra person on passenger's lap



Ejected / Trapped

N	No
E	Ejected
P	Partially Ejected
T	Trapped
U	Unknown

Train Occupant Seat Codes

31	Train crew (List all in control whether injured or not)
32	Train passenger (List only if injured)

Pedestrian Type Codes

21	Pedestrian
22	Pedalcyclist
23	Rider of animal
24	In animal-drawn vehicle
25	In vehicle **NOT IN TRANSPORT**
26	Machine Operator or Passenger
88	Other

Injury Severity

N	Not injured
P	Possible injury
I	Injury - not incapacitating
D	Disabled - incapacitating
F	Fatal injury
U	Unknown

Hazardous Material Classes

1	Explosives
2	Gases
3	Flammable/Combustible Liquid
4	Flammable/Combustible Solid
5	Oxidizers & organic peroxides
6	Poisonous/Infectious substance
7	Radioactive material
8	Corrosive material
9	Miscellaneous hazardous material

Safety Equipment Use

S	Shoulder & Lap belt
X	Shoulder belt only
L	Lap belt only
I	Infant seat / restraint system (see manual)
C	Child seat / restraint system (see manual)
T	"Booster" seat / restraint system (see manual)
P	Airbag deployed only (Passive System)
R	Airbag deployed - Shoulder & Lap belt
J	Airbag deployed - Shoulder belt only
W	Airbag deployed - Lap belt only
F	Airbag deployed - Infant seat
D	Airbag deployed - Child seat
K	Airbag deployed - "Booster" seat
B	Both MC Helmet & Eye protection
E	Motorcyclist Eye protection
H	Motorcyclist or Pedalcyclist Helmet
N	None Used
U	Unknown

Gender

M	Male
F	Female
U	Unknown

Animal Type Codes

01	Deer
02	Other wild animal: bobcat, coyote, etc.
03	Cow
04	Other domestic animal: cat, dog, etc.
05	Horse

MISSOURI SAMPLE CRASH REPORT FORM

MISSOURI UNIFORM ACCIDENT REPORT PAGE _____ OF _____

SPACE USED FOR BARCODE

1 - AGENCY NAME AND ORI

LEFT THE SCENE ☐ YES ☐ NO | CLEARED ☐ YES ☐ NO | ACCIDENT CLASSIFICATION | PROPERTY DAMAGE ONLY ☐ | NUMBER INJURED | NUMBER KILLED | REPORT / CASE / INCIDENT NUMBER

NUMBER OF VEHICLES INVOLVED | ACCIDENT DATE | ACCIDENT TIME (MIL.) | TIME NOTIFIED (MIL.) | TIME ARRIVED (MIL.) | INVESTIGATION DATE

2 - LOCATION

COUNTY | MUNICIPALITY | BEAT / ZONE | TRP / DIST / PCT | INVESTIGATED AT SCENE ☐ YES ☐ NO

ON | DISTANCE FROM _____ FEET ___ • ___ MILES | LOCATION ☐ AFTER ☐ BEFORE ☐ AT | INTERSECTING STREET OR ROADWAY

ROADWAY DIRECTION | SPEED LIMIT | SPEED LIMIT | GEO - CODE | GPS LONGITUDE _____

ROAD MAINTAINED BY ☐ 1. STATE ☐ 2. COUNTY ☐ 3. MUNICIPAL ☐ 4. PRIVATE PROPERTY ☐ 5. OTHER | LATITUDE

3 - DAMAGE TO PROPERTY OTHER THAN VEHICLES ☐ NONE

GIVE OWNER'S NAME AND ADDRESS, DESCRIPTION OF PROPERTY, AND DAMAGE.
☐ MoDOT

DRIVER 1

4. DRIVER'S FULL NAME (LAST, FIRST, MI) | ADDRESS (STREET, CITY, STATE, ZIP)

DRIVER LICENSE NUMBER / ID NUMBER | STATE | TYPE OF LICENSE ☐ 1. OPERATOR CLASS ____ ☐ 2. CDL CLASS ____ ☐ 3. PERMIT ☐ 4. UNLICENSED ☐ 5. MC ONLY | MC ENDORSEMENT ☐ YES ☐ NO ☐ NA

PROOF OF INSURANCE ☐ YES ☐ NO ☐ NOT REQUIRED | INSURANCE COMPANY ☐ DRIVER ☐ VEHICLE | POLICY NUMBER ☐ NA

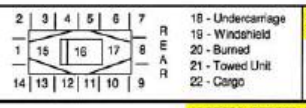
VEHICLE 1

YEAR | MAKE | MODEL | COLOR

LIC. PLATE NO. | STATE | YEAR | VIN | TOTAL NO. OF OCCUPANTS

VEHICLE OWNER NAME (LAST, FIRST, MI) / COMMERCIAL CARRIER | ADDRESS (STREET, CITY, STATE, ZIP) ☐ SAME AS DRIVER

VEHICLE DAMAGE (Circle all damaged areas) ☐ NONE | INITIAL IMPACT NO. ☐ NA



18 - Undercarriage
19 - Windshield
20 - Burned
21 - Towed Unit
22 - Cargo

TOWED FROM SCENE ☐ YES ☐ NO | TOW CO. INFORMATION

DRIVER 2

5. DRIVER'S FULL NAME (LAST, FIRST, MI) | ADDRESS (STREET, CITY, STATE, ZIP)

DRIVERS LICENSE NUMBER / ID NUMBER | STATE | TYPE OF LICENSE ☐ 1. OPERATOR CLASS ____ ☐ 2. CDL CLASS ____ ☐ 3. PERMIT ☐ 4. UNLICENSED ☐ 5. MC ONLY | MC ENDORSEMENT ☐ YES ☐ NO ☐ NA

PROOF OF INSURANCE ☐ YES ☐ NO ☐ NOT REQUIRED | INSURANCE COMPANY ☐ DRIVER ☐ VEHICLE | POLICY NUMBER ☐ NA

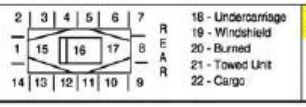
VEHICLE 2

YEAR | MAKE | MODEL | COLOR

LIC. PLATE NO. | STATE | YEAR | VIN | TOTAL NO. OF OCCUPANTS

VEHICLE OWNER NAME (LAST, FIRST, MI) / COMMERCIAL CARRIER | ADDRESS (STREET, CITY, STATE, ZIP) ☐ SAME AS DRIVER

VEHICLE DAMAGE (Circle all damaged areas) ☐ NONE | INITIAL IMPACT NO. ☐ NA



18 - Undercarriage
19 - Windshield
20 - Burned
21 - Towed Unit
22 - Cargo

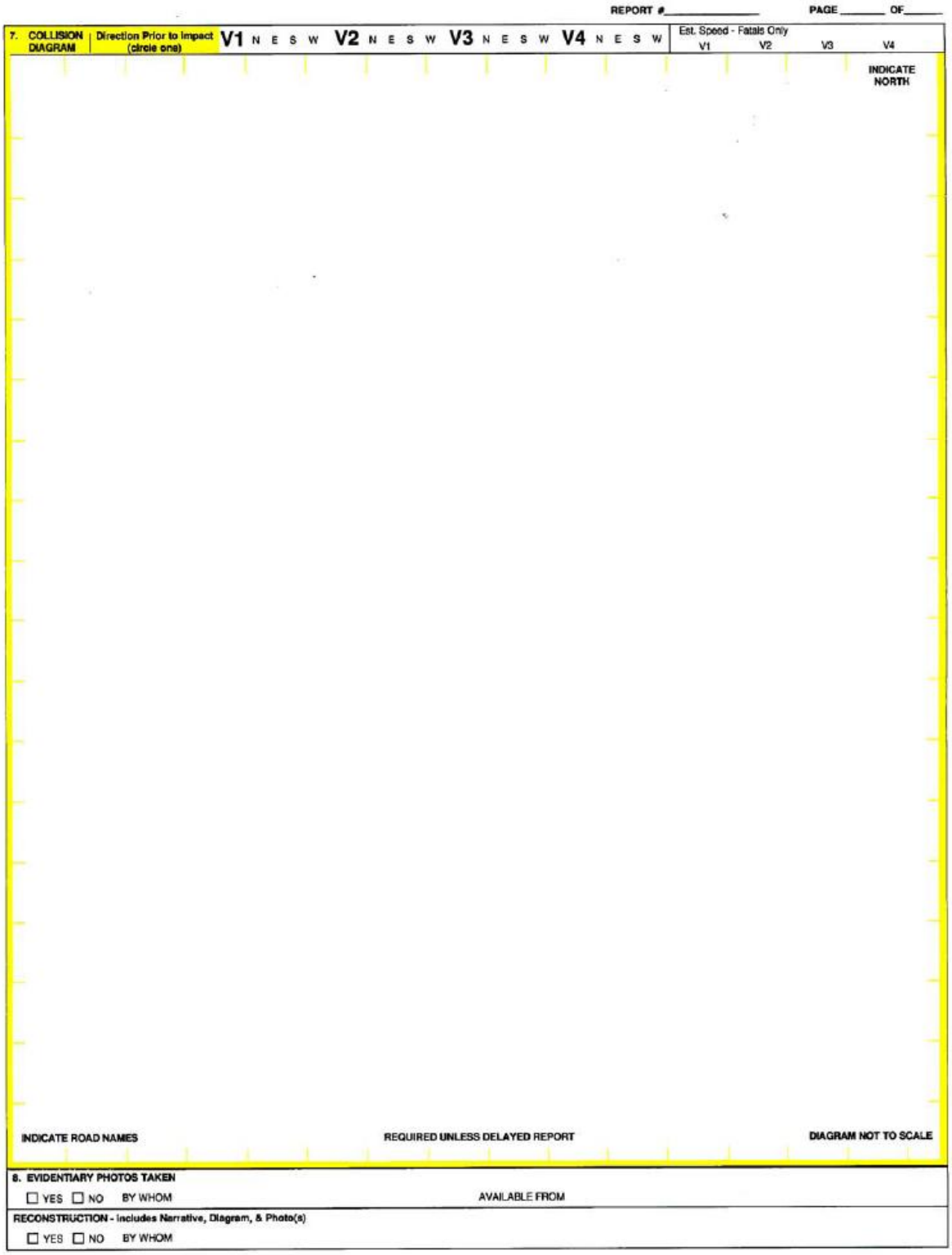
TOWED FROM SCENE ☐ YES ☐ NO | TOW CO. INFORMATION

6 - WITNESS ☐ NONE IDENTIFIED

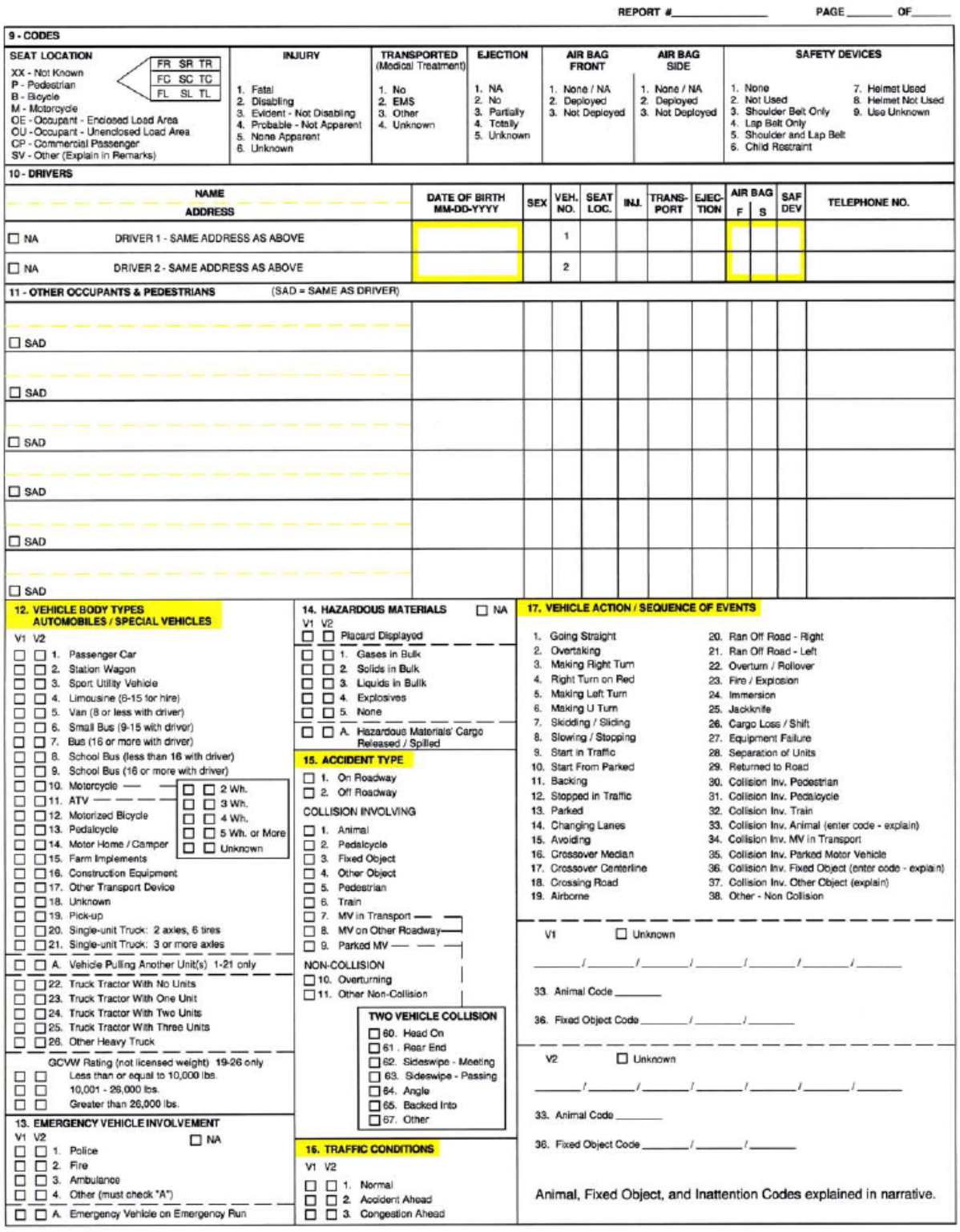
NAME OF WITNESS	ADDRESS (STREET, CITY, STATE, ZIP)	TELEPHONE NO.

DISTRIBUTION: **COPY** - AGENCY FILE; **ORIGINAL** - MISSOURI STATE HIGHWAY PATROL - TRAFFIC DIVISION - P.O. BOX 568 - JEFFERSON CITY, MO 65102 SHP-2P 01/02

MISSOURI SAMPLE CRASH REPORT FORM



MISSOURI SAMPLE CRASH REPORT FORM



REPORT #_____ PAGE _____ OF_____

9 - CODES

SEAT LOCATION
FR SR TR / FC SC TC / FL SL TL
XX - Not Known
P - Pedestrian
B - Bicycle
M - Motorcycle
OE - Occupant - Enclosed Load Area
OU - Occupant - Unenclosed Load Area
CP - Commercial Passenger
SV - Other (Explain in Remarks)

INJURY
1. Fatal
2. Disabling
3. Evident - Not Disabling
4. Probable - Not Apparent
5. None Apparent
6. Unknown

TRANSPORTED (Medical Treatment)
1. No
2. EMS
3. Other
4. Unknown

EJECTION
1. NA
2. No
3. Partially
4. Totally
5. Unknown

AIR BAG FRONT
1. None / NA
2. Deployed
3. Not Deployed

AIR BAG SIDE
1. None / NA
2. Deployed
3. Not Deployed

SAFETY DEVICES
1. None
2. Not Used
3. Shoulder Belt Only
4. Lap Belt Only
5. Shoulder and Lap Belt
6. Child Restraint
7. Helmet Used
8. Helmet Not Used
9. Use Unknown

10 - DRIVERS

NAME / ADDRESS	DATE OF BIRTH MM-DD-YYYY	SEX	VEH. NO.	SEAT LOC.	INJ.	TRANS-PORT	EJEC-TION	AIR BAG F	AIR BAG S	SAF DEV	TELEPHONE NO.
☐ NA DRIVER 1 - SAME ADDRESS AS ABOVE			1								
☐ NA DRIVER 2 - SAME ADDRESS AS ABOVE			2								

11 - OTHER OCCUPANTS & PEDESTRIANS (SAD = SAME AS DRIVER)

☐ SAD											
☐ SAD											
☐ SAD											
☐ SAD											
☐ SAD											
☐ SAD											

12. VEHICLE BODY TYPES AUTOMOBILES / SPECIAL VEHICLES

V1 V2
1. Passenger Car
2. Station Wagon
3. Sport Utility Vehicle
4. Limousine (6-15 for hire)
5. Van (8 or less with driver)
6. Small Bus (9-15 with driver)
7. Bus (16 or more with driver)
8. School Bus (less than 16 with driver)
9. School Bus (16 or more with driver)
10. Motorcycle — 2 Wh. / 3 Wh. / 4 Wh. / 5 Wh. or More / Unknown
11. ATV
12. Motorized Bicycle
13. Pedalcycle
14. Motor Home / Camper
15. Farm Implements
16. Construction Equipment
17. Other Transport Device
18. Unknown
19. Pick-up
20. Single-unit Truck: 2 axles, 6 tires
21. Single-unit Truck: 3 or more axles
A. Vehicle Pulling Another Unit(s) 1-21 only
22. Truck Tractor With No Units
23. Truck Tractor With One Unit
24. Truck Tractor With Two Units
25. Truck Tractor With Three Units
26. Other Heavy Truck

GCVW Rating (not licensed weight) 19-26 only
Less than or equal to 10,000 lbs.
10,001 - 26,000 lbs.
Greater than 26,000 lbs.

13. EMERGENCY VEHICLE INVOLVEMENT ☐ NA

V1 V2
1. Police
2. Fire
3. Ambulance
4. Other (must check "A")
A. Emergency Vehicle on Emergency Run

14. HAZARDOUS MATERIALS ☐ NA

V1 V2
Placard Displayed
1. Gases in Bulk
2. Solids in Bulk
3. Liquids in Bulk
4. Explosives
5. None
A. Hazardous Materials/ Cargo Released / Spilled

15. ACCIDENT TYPE
1. On Roadway
2. Off Roadway

COLLISION INVOLVING
1. Animal
2. Pedalcycle
3. Fixed Object
4. Other Object
5. Pedestrian
6. Train
7. MV in Transport
8. MV on Other Roadway
9. Parked MV

NON-COLLISION
10. Overturning
11. Other Non-Collision

TWO VEHICLE COLLISION
60. Head On
61. Rear End
62. Sideswipe - Meeting
63. Sideswipe - Passing
64. Angle
65. Backed Into
67. Other

16. TRAFFIC CONDITIONS

V1 V2
1. Normal
2. Accident Ahead
3. Congestion Ahead

17. VEHICLE ACTION / SEQUENCE OF EVENTS

1. Going Straight
2. Overtaking
3. Making Right Turn
4. Right Turn on Red
5. Making Left Turn
6. Making U Turn
7. Skidding / Sliding
8. Slowing / Stopping
9. Start in Traffic
10. Start From Parked
11. Backing
12. Stopped in Traffic
13. Parked
14. Changing Lanes
15. Avoiding
16. Crossover Median
17. Crossover Centerline
18. Crossing Road
19. Airborne
20. Ran Off Road - Right
21. Ran Off Road - Left
22. Overturn / Rollover
23. Fire / Explosion
24. Immersion
25. Jackknife
26. Cargo Loss / Shift
27. Equipment Failure
28. Separation of Units
29. Returned to Road
30. Collision Inv. Pedestrian
31. Collision Inv. Pedalcycle
32. Collision Inv. Train
33. Collision Inv. Animal (enter code - explain)
34. Collision Inv. MV in Transport
35. Collision Inv. Parked Motor Vehicle
36. Collision Inv. Fixed Object (enter code - explain)
37. Collision Inv. Other Object (explain)
38. Other - Non Collision

V1 ☐ Unknown

_____/_____/_____/_____/_____/_____/_____

33. Animal Code _____

36. Fixed Object Code _____/_____/_____

V2 ☐ Unknown

_____/_____/_____/_____/_____/_____/_____

33. Animal Code _____

36. Fixed Object Code _____/_____/_____

Animal, Fixed Object, and Inattention Codes explained in narrative.

MISSOURI SAMPLE CRASH REPORT FORM

REPORT #_____ PAGE _____ OF_____

18. PROBABLE CONTRIBUTING CIRCUMSTANCES

V1 V2

- 1. Vehicle Defects (explain)
- 2. Traffic Control Inoperable or Missing
- 3. Improperly Stopped on Roadway
- 4. Speed - Exceeded Limit
- 5. Too Fast for Conditions
- 6. Improper Passing
- 7. Violation Signal / Sign
- 8. Wrong Side (not passing)
- 9. Following Too Close
- 10. Improper Signal
- 11. Improper Backing
- 12. Improper Turn
- 13. Improper Lane Usage / Change
- 14. Wrong Way (One-Way)
- 15. Improper Start From Park

P1 P2

- 16. Improperly Parked
- 17. Failed to Yield
- 18. Alcohol
- 19. Drugs
- 20. Physical Impairment (explain)
- 21. Inattention (explain)

P1 _____ P2 _____ V1 _____ V2 _____

- 22. None

19. PEDESTRIAN INVOLVEMENT

P1 P2 ☐ NA

- 1. At Intersection
- 2. Not At Intersection

CROSSING ROAD

- 3. With Signal
- 4. Against Signal
- 5. No Signal
- 6. Diagonally
- 7. Within Crosswalk
- 8. Within Marked Crosswalk
- 9. Behind / In Front of Parked Car
- 10. With Traffic
- 11. Against Traffic
- 12. Getting On / Off Vehicle
- 13. Standing / Lying / Sitting on Road
- 14. Pushing / Working on Vehicle
- 15. Other Working
- 16. Playing on Road
- 17. Off Roadway

20. VISION OBSCURED

V1 V2

- 1. Windshield
- 2. Load on Vehicle
- 3. Trees / Brush
- 4. Building
- 5. Embankment
- 6. Signboards
- 7. Hillcrest
- 8. Parked Cars
- 9. Moving Cars
- 10. Glare
- 11. Other (explain)
- 12. Not Obscured

21. TRAFFIC CONTROL

V1 V2

- 1. Construction Zone
- 2. Other Work Zone
- 3. School Zone
- 4. Stop Sign
- 5. Electric Signal
- 6. RR Signal / Gate
- 7. Yield Sign
- 8. Officer / Flagman
- 9. No Passing Zone
- 10. Turn Restricted
- 11. Signal on School Bus
- 12. None

22. ROAD CHARACTER

ALIGNMENT

- 1. Straight
- 2. Curve

PROFILE

- 1. Level
- 2. Grade
- 3. Hillcrest

23. LIGHT CONDITION

- 1. Daylight
- 2. Dark with Street Lights On
- 3. Dark with Street Lights Off
- 4. Dark - No Street Lights
- 5. Indeterminate (explain)

24. WEATHER CONDITION

- 1. Clear
- 2. Cloudy
- 3. Rain
- 4. Snow
- 5. Sleet
- 6. Freezing (temp.)
- 7. Fog / Mist
- 8. Indeterminate (explain)

25. ROAD CONDITION

- 1. Dry
- 2. Wet
- 3. Snow
- 4. Ice
- 5. Slush
- 6. Mud
- 7. Standing Water
- 8. Moving Water
- 9. Other (explain)

26. ROAD SURFACE

- 1. Concrete
- 2. Asphalt
- 3. Brick
- 4. Gravel
- 5. Dirt / Sand
- 6. Multi-Surface

27 - COMMERCIAL MOTOR VEHICLE (Complete for each commercial vehicle involved.)

A. CMV CRITERIA

Answer the following to determine if this section should be completed.

1. Does this accident involve any of the following:
   1. a person fatally injured; or
   2. a person transported for medical attention; or
   3. a vehicle towed from the scene of the accident

   ☐ NO - DO NOT COMPLETE
   ☐ YES - GO TO NUMBER 2
2. Examine each vehicle to determine if it is a commercial vehicle based on the following:
   1. a truck with GCVWR of more than 10,000 lbs. and engaged in commerce; or
   2. a bus or school bus (9 or more including driver); or
   3. a vehicle with a hazardous materials placard

   ☐ NO - DO NOT COMPLETE
   ☐ YES - COMPLETE SECTIONS B - E

B. CARRIER ID NUMBER

V1 ICC NO. MC _____ USDOT NO. _____

V2 ICC NO. MC _____ USDOT NO. _____

C. HAZARDOUS MATERIAL PLACARD NUMBER ☐ NA

V1 4-Digit Placard Number from Diamond / Box _____ Number From Bottom of Diamond _____

V2 4-Digit Placard Number from Diamond / Box _____ Number From Bottom of Diamond _____

D. TRAFFICWAY

- 1. Two-Way; Not Divided
- 2. Two-Way; Divided; Unprotected Median
- 3. Two-Way; Divided; Positive Median Barrier
- 4. One-Way; Not Divided

E. CARGO BODY TYPE

V1 V2

- 1. Enclosed Box
- 2. Cargo Tank
- 3. Flatbed
- 4. Dump
- 5. Concrete Mixer
- 6. Auto Transporter
- 7. Garbage / Refuse
- 8. Grain, Chip, Gravel
- 9. Pole Trailer
- 10. Other

28 - NARRATIVE / STATEMENTS (If additional room is necessary, attach a separate sheet.)

29. REPORTING OFFICER SIGNATURE	DSN / BADGE NO.	BEAT / ZONE	TROOP / DIST / PCT

REVIEWING OFFICER 1 SIGNATURE	DSN / BADGE NO.	REVIEWING OFFICER 2 SIGNATURE	DSN / BADGE NO.

NEBRASKA SAMPLE CRASH REPORT FORM

Use Black Ink — State of Nebraska — **Driver's Motor Vehicle Accident Report** — Questions? 1-402-479-4645

Mail within 10 days of accident to: Highway Safety, Nebraska Department of Roads, P.O. Box 94669, Lincoln, NE 68509-4669

DATE OF ACCIDENT (M M / D D / Y Y Y Y) 2 0 — S M T W TH F S — TIME OF ACCIDENT (In Military Time) — FOR STATE USE ONLY

LOCATION OF ACCIDENT

COUNTY — CITY — Total Number of Vehicles Involved

ROAD ON WHICH ACCIDENT OCCURRED — STREET/HIGHWAY NO. (If no Hwy. No., identify by name) — Posted Speed Limit on the Street You Were Traveling

DISTANCE FROM MILEPOST — FEET — N S E W — OF MILEPOST NO. — HIGHWAY NO. — PRIVATE PROPERTY? YES NO — ONE-WAY STREET? YES NO

IF AT INTERSECTION	IF NOT AT INTERSECTION
NAME OF INTERSECTING ROADWAY	○ FEET ○ MILES N S E W OF NEAREST STREET, BRIDGE, RAILROAD CROSSING

IF ACCIDENT WAS OUTSIDE CITY LIMITS, INDICATE DISTANCE FROM NEAREST TOWN — MILES — N S E W — AND MILES — N S E W — OF NEAREST CITY OR TOWN

YOUR VEHICLE (VEHICLE NUMBER - 1)

DRIVER — PHONE ( ) – — DRIVER ADDRESS — CITY, STATE, ZIP — SEX ○ FEMALE ○ MALE

DRIVER LICENSE — STATE — NUMBER — DATE OF BIRTH (MM/DD/YYYY) / /

VEHICLE — LICENSE PLATE — YEAR (Plate expires) — STATE — NUMBER — ESTIMATED DAMAGE $

YEAR — MAKE — MODEL — BODY STYLE — COLOR

VEHICLE ID NO. (VIN)

OWNER NAME — PHONE ( ) – — OWNER ADDRESS — CITY, STATE, ZIP

OTHER VEHICLE (VEHICLE NUMBER - 2)

DRIVER — PHONE ( ) – — DRIVER ADDRESS — CITY, STATE, ZIP — SEX ○ FEMALE ○ MALE

DRIVER LICENSE — STATE — NUMBER — DATE OF BIRTH (MM/DD/YYYY) / /

VEHICLE — LICENSE PLATE — YEAR (Plate expires) — STATE — NUMBER — ESTIMATED DAMAGE $

YEAR — MAKE — MODEL — BODY STYLE — COLOR

VEHICLE ID NO. (VIN)

OWNER NAME — PHONE ( ) – — OWNER ADDRESS — CITY, STATE, ZIP

VEHICLE MOVEMENT BEFORE COLLISION

VEH NO.	N	S	E	W	ROAD OR HIGHWAY NAME
1					
2					

Vehicle 1 2

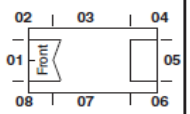
01 Essentially straight ahead
02 Backing
03 Changing lanes
04 Overtaking/Passing
05 Turning right
06 Turning left
07 Making U-turn
08 Entering traffic lane
09 Leaving traffic lane
10 Parked
11 Slowing or stopped in traffic
12 Other
13 Unknown

POINT OF IMPACT AND MOST DAMAGED AREA

(Enter numbers for each vehicle)

	YOUR VEHICLE NO. 1	OTHER VEHICLE NO. 2
POINT OF IMPACT		
MOST DAMAGED AREA		

00 None
09 Top & windows
10 Undercarriage
11 Total (all areas)
12 Other



TRAFFIC CONTROL DEVICE

(Check one for each vehicle)

Vehicle 1 2

1 No controls
2 Traffic control signal
3 Flashing traffic control signal
4 School zone signal
5 Stop sign
6 Yield sign
7 Warning sign
8 Railroad crossing device
9 Unknown

DISPOSITION OF VEHICLE

(Check one for each vehicle)

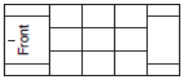
Vehicle 1 2

1 Towed – due to damages
2 Towed – other reasons
3 Left at scene
4 Driven away
5 Unknown

Total number of persons in your vehicle

AIRBAG DEPLOYED

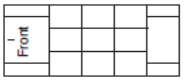
For each person in your vehicle, enter an Airbag Deployed code for their seating position



1 Deployed – front
2 Deployed – side
3 Deployed – both front/side
4 Not deployed
5 Not applicable/ No airbag available
6 Unknown

RESTRAINT USE

For each person in your vehicle, enter a Restraint Use code for their seating position

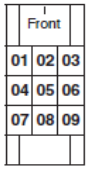


1 None used
2 Lap & shoulder belt used
3 Shoulder belt only used
4 Lap belt only used
5 Child safety seat used
6 Child booster seat used
7 Helmet used
8 Restraint use unknown

Complete this section for all Injured persons in your vehicle, also any bicyclists, pedestrians or fatalities involved in the accident. Enter the code number which best answers questions 1- 5 in the appropriate box located at the lower right.

1. Seating Position (Enter one)

10. Other enclosed passenger/cargo area
11. Other unenclosed passenger/cargo area
12. Riding on vehicle exterior
13. Sleeper section of truck cab
14. Trailing unit
15. Moped
16. Motorcycle operator
17. Motorcycle passenger
18. Pedestrian
19. Bicycle (pedalcycle)
20. Unknown



2. Ejected / Trapped

(Enter one)

1. Not ejected or trapped
2. Partially ejected
3. Totally ejected
4. Trapped - Occupant removed without use of equipment
5. Trapped - Equipment used in extrication
6. Unknown

3. Body Region with Most Severe Injury

(Enter one)

01. Head
02. Face
03. Neck
04. Chest
05. Back/spine
06. Shoulder/upper arm
07. Elbow/lower arm/hand
08. Abdomen/pelvis
09. Hip/upper leg
10. Knee/lower leg/foot
11. Entire body
12. Unknown
13. None

4. Injury Severity

(Enter one)

1. **Killed**
2. **Disabling** - cannot leave scene without assistance *(broken bones, severe cuts, prolonged unconsciousness, etc.)*
3. **Visible** but not disabling *(minor cuts, swelling, etc.)*
4. **Possible** but not visible *(complaint of pain, etc.)*
5. None

5. Transported to Medical Facility

(Enter one)

If the individual was transported from the crash site to a medical facility for treatment of injuries received in the crash:

Source of Transport:

1. Not transported
2. EMS *(Ambulance)*
3. Police
4. Other
5. Unknown

NAME	ADDRESS	DATE OF BIRTH (MM / DD / YYYY)	1 Seat Position	2 Eject	3 Body Region	4 Injury Sev.	5 Trans.	SEX M F
		/ /						
		/ /						
		/ /						
		/ /						

NEBRASKA SAMPLE CRASH REPORT FORM

Driver Contributing Circumstances *(Check one per driver)*

	Vehicle 1	Vehicle 2	
01	☐	☐	No improper driving
02	☐	☐	Failed to yield right of way
03	☐	☐	Disregarded traffic signs, signals, road markings
04	☐	☐	Exceeded authorized speed limit
05	☐	☐	Driving too fast for conditions
06	☐	☐	Made improper turn
07	☐	☐	Wrong side or wrong way
08	☐	☐	Followed too closely
09	☐	☐	Failure to keep in proper lane or running off road
10	☐	☐	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner
11	☐	☐	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc.
12	☐	☐	Over-correcting/over-steering
13	☐	☐	Visibility obstructed
14	☐	☐	Inattention
15	☐	☐	Mobile phone distraction
16	☐	☐	Distracted - other
17	☐	☐	Fatigued/asleep
18	☐	☐	Operating defective equipment
19	☐	☐	Other improper action
20	☐	☐	Unknown

Driver Condition *(Check one per driver)*

	Vehicle 1	Vehicle 2	
1	☐	☐	Apparently normal
2	☐	☐	Physical impairment
3	☐	☐	Emotional (depressed, angry, disturbed, etc.)
4	☐	☐	Illness
5	☐	☐	Fell asleep, fainted, fatigued, etc.
6	☐	☐	Under the influence of medications/drugs/alcohol
7	☐	☐	Other *(specify)*
8	☐	☐	Unknown

Road Contributing Circumstances *(Check one)*

- 01 ☐ None
- 02 ☐ Road surface condition (wet, icy, snow, slush, etc.)
- 03 ☐ Debris
- 04 ☐ Rut, holes, bumps
- 05 ☐ Work zone (construction/maintenance/utility)
- 06 ☐ Worn, travel-polished surface
- 07 ☐ Obstruction in roadway
- 08 ☐ Traffic control device inoperative, missing or obscured
- 09 ☐ Shoulders (none, low, soft, high)
- 10 ☐ Non-highway work
- 11 ☐ Other (specify)
- 12 ☐ Unknown

Road Character *(Check one)*

- 1 ☐ Straight and level
- 2 ☐ Straight and on slope
- 3 ☐ Straight and on hilltop
- 4 ☐ Curved and level
- 5 ☐ Curved and on slope
- 6 ☐ Curved and on hilltop

Road Surface *(Check one)*

- 1 ☐ Concrete
- 2 ☐ Asphalt
- 3 ☐ Brick
- 4 ☐ Gravel
- 5 ☐ Dirt
- 6 ☐ Other *(specify)*

Road Surface Condition *(Check one)*

- 1 ☐ Dry
- 2 ☐ Wet
- 3 ☐ Snow
- 4 ☐ Ice
- 5 ☐ Sand, mud, dirt, oil, gravel
- 6 ☐ Water *(standing, moving)*
- 7 ☐ Slush
- 8 ☐ Other *(specify)*
- 9 ☐ Unknown

Environment Contributing Circumstances *(Check one)*

- 1 ☐ None
- 2 ☐ Weather conditions
- 3 ☐ Vision obstruction
- 4 ☐ Glare
- 5 ☐ Animal in roadway
- 6 ☐ Other *(specify)*
- 7 ☐ Unknown

Total Number of Through Lanes *(Check one)*

- 1 ☐ One lane
- 2 ☐ Two lanes
- 3 ☐ Three lanes
- 4 ☐ Four lanes
- 5 ☐ Five lanes
- 6 ☐ Six or more lanes

Median Type *(Check one)*

- 1 ☐ Median barrier
- 2 ☐ Raised median *(curbed)*
- 3 ☐ Grass median *(no curb)*
- 4 ☐ Painted *(no curb)*
- 5 ☐ None

Light Condition *(Check one)*

- 1 ☐ Daylight
- 2 ☐ Dawn
- 3 ☐ Dusk
- 4 ☐ Dark–lighted roadway
- 5 ☐ Dark–roadway not lighted
- 6 ☐ Dark–unknown roadway lighting
- 7 ☐ Other *(specify)*
- 8 ☐ Unknown

Weather Condition *(Check up to two)*

- 01 ☐ None
- 02 ☐ Cloudy
- 03 ☐ Fog, smog, smoke
- 04 ☐ Rain
- 05 ☐ Sleet, hail, freezing rain/drizzle
- 06 ☐ Snow
- 07 ☐ Severe crosswinds
- 08 ☐ Blowing sand, soil, dirt, snow
- 09 ☐ Other *(specify)*
- 10 ☐ Unknown

Was the crash in or near a construction maintenance or utility work zone? *(Check one)*

1 ☐ No 2 ☐ Unknown 3 ☐ Yes

Indicate North by Arrow

INDICATE BY DIAGRAM WHAT HAPPENED

DESCRIBE WHAT HAPPENED (Refer to your vehicle as No. 1, any others as No. 2, No. 3, etc.)

PROPERTY	NON-VEHICLE OBJECT DAMAGED	OWNER NAME	ADDRESS	PHONE	APPROX. COST OF DAMAGE
				( ) –	$
	NON-VEHICLE OBJECT DAMAGED	OWNER NAME	ADDRESS	PHONE	APPROX. COST OF DAMAGE
				( ) –	$

Was a Police Officer Contacted? ◯YES ◯NO

OFFICER NAME OR BADGE NUMBER

DEPARTMENT *(Name of City, County, etc.)*

I certify, to the best of my knowledge, that this report is true and accurate.

OPERATOR SIGNATURE *(Required if physically able)* X

DATE

NEBRASKA SAMPLE CRASH REPORT FORM

ON-LINE VERSION	DRIVER MUST COMPLETE IN FULL	

You, *the driver, must provide information about the liability insurance covering the motor vehicle you were driving. Please complete the following.*

Name of Insurance Company Affording
Liability Coverage on Date of Accident _____

Address _____

Vehicle Information: VIN No._____ Year _____ Make _____ Model _____

Name of Agent
Who Sold Policy _____ Address _____

Policy No. _____ Date of Accident _____ In or near _____, Nebraska
(Month) (Day) (Year)

Driver _____ Address _____

Owner _____ Address _____

Name of Policyholder _____

SR-21L

ON-LINE VERSION	THIS SIDE FOR INSURANCE COMPANY USE ONLY	

TO: Department of Motor Vehicles
Financial Responsibility Section
301 Centennial Mall South
PO Box 94877
LINCOLN NE 68509-4877

Please return this form immediately if policy was not in effect as described by motorist.

Do not return form if policy was in effect.

The undersigned company advises that the insurance policy, as described on the reverse side, does not afford liability coverage to both the driver and owner in the limits of $25,000 – $50,000 bodily injury and $25,000 property damage for this accident **because of the following reasons:**

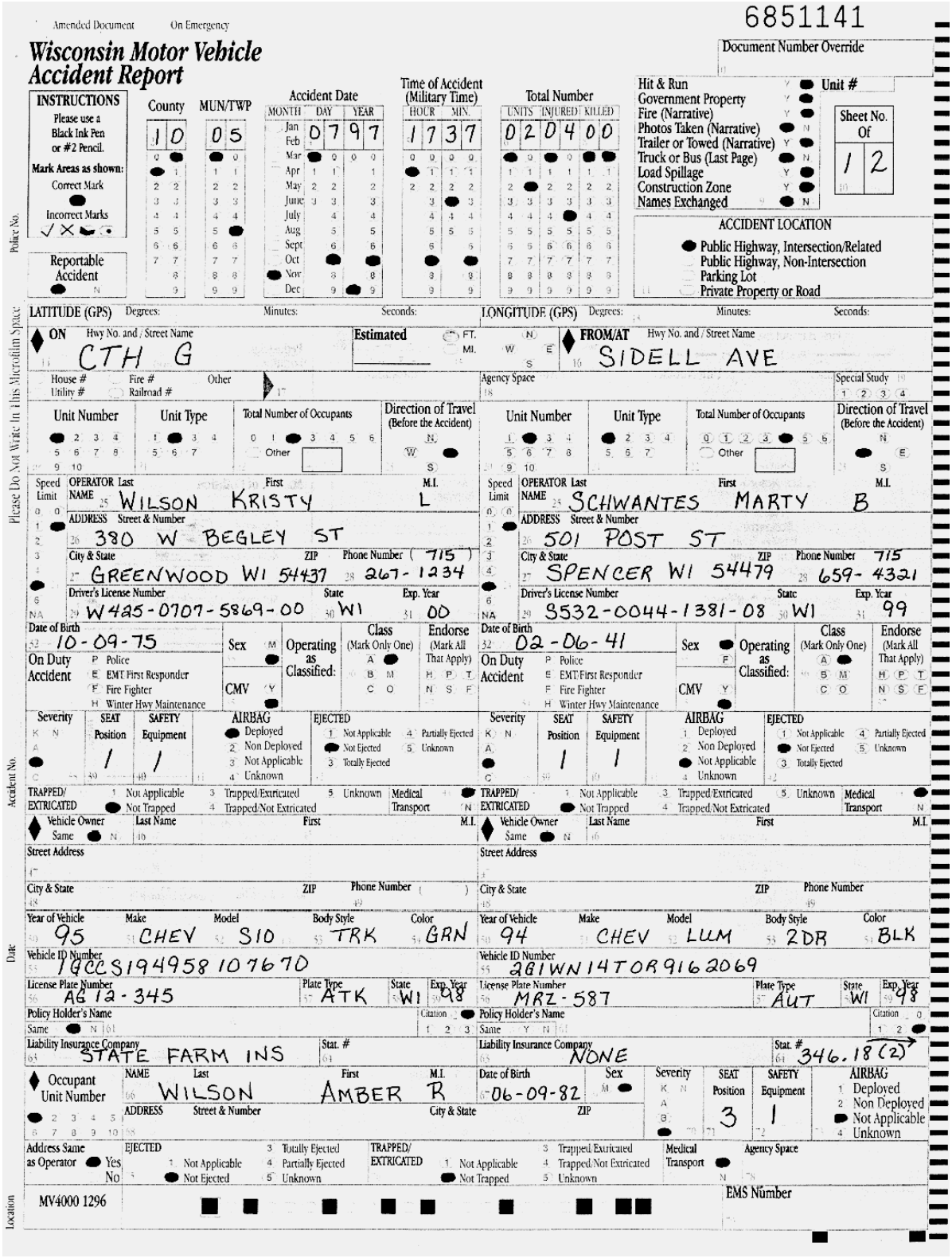
_____
(please complete)

_____ _____ _____
Name of Insurance Company *Authorized Representative* *Date*

INSURANCE INFORMATION

Please read instructions carefully.
Return this entire page with the completed Accident Report.

WISCONSIN SAMPLE CRASH REPORT FORM



Amended Document — On Emergency — 6851141

Wisconsin Motor Vehicle Accident Report

Document Number Override

INSTRUCTIONS: Please use a Black Ink Pen or #2 Pencil. Mark Areas as shown: Correct Mark ● Incorrect Marks ✓ X

Reportable Accident: ● N

County: 10 — MUN/TWP: 05

Accident Date: MONTH Dec (9) — DAY 09 — YEAR 97

Time of Accident (Military Time): HOUR 17 — MIN. 37

Total Number: UNITS 02 — INJURED 04 — KILLED 00

Hit & Run: Y — Unit #
Government Property: Y
Fire (Narrative): Y
Photos Taken (Narrative): ● N
Trailer or Towed (Narrative): Y ●
Truck or Bus (Last Page): ● N
Load Spillage: Y ●
Construction Zone: Y
Names Exchanged: ● N

Sheet No. Of: 1 2

ACCIDENT LOCATION
● Public Highway, Intersection/Related
Public Highway, Non-Intersection
Parking Lot
Private Property or Road

LATITUDE (GPS) Degrees: Minutes: Seconds:
LONGITUDE (GPS) Degrees: Minutes: Seconds:

ON Hwy No. and / Street Name: CTH G
Estimated: FT. MI. N W E S
FROM/AT Hwy No. and / Street Name: SIDELL AVE

House # Fire # Other
Utility # Railroad #
Agency Space
Special Study: 1 2 3 4

Unit Number	Unit Type	Total Number of Occupants	Direction of Travel (Before the Accident)
● 1	● 2	0 1 ● 3 4 5 6 Other	N W ● S
● 1	● 2	0 1 2 3 ● 5 6 Other	N ● E S

	Driver 1	Driver 2
Speed Limit	00	00
OPERATOR NAME Last	WILSON	SCHWANTES
First	KRISTY	MARTY
M.I.	L	B
ADDRESS Street & Number	380 W BEGLEY ST	501 POST ST
City & State	GREENWOOD WI	SPENCER WI
ZIP	54437	54479
Phone Number	(715) 267-1234	715 659-4321
Driver's License Number	W425-0707-5869-00	3532-0044-1381-08
State	WI	WI
Exp. Year	00	99
Date of Birth	10-09-75	02-06-41
Sex	● M	F ●
CMV	Y ●	Y ●
Operating as Classified:		
Class (Mark Only One)	A ● B M C O	A ● B M C O
Endorse (Mark All That Apply)	H P T N S F	H P T N S F
On Duty Accident	P Police, E EMT/First Responder, F Fire Fighter, H Winter Hwy Maintenance	P Police, E EMT/First Responder, F Fire Fighter, H Winter Hwy Maintenance
Severity	K N A ● C	K N A ● C
SEAT Position	1	1
SAFETY Equipment	1	1
AIRBAG	● 1 Deployed, 2 Non Deployed, 3 Not Applicable, 4 Unknown	1 Deployed, 2 Non Deployed, ● 3 Not Applicable, 4 Unknown
EJECTED	1 Not Applicable, ● 2 Not Ejected, 3 Totally Ejected, 4 Partially Ejected, 5 Unknown	1 Not Applicable, ● 2 Not Ejected, 3 Totally Ejected, 4 Partially Ejected, 5 Unknown
TRAPPED/EXTRICATED	1 Not Applicable, ● 2 Not Trapped, 3 Trapped/Extricated, 4 Trapped/Not Extricated, 5 Unknown	1 Not Applicable, ● 2 Not Trapped, 3 Trapped/Extricated, 4 Trapped/Not Extricated, 5 Unknown
Medical Transport	● N	● N
Vehicle Owner Same	● N	● N
Vehicle Owner Last Name / First / M.I.		
Street Address		
City & State / ZIP / Phone Number		
Year of Vehicle	95	94
Make	CHEV	CHEV
Model	S10	LUM
Body Style	TRK	2DR
Color	GRN	BLK
Vehicle ID Number	1GCCS194958107670	2G1WN14T0R9162069
License Plate Number	AG 12-345	MRZ-587
Plate Type	ATK	AUT
State	WI	WI
Exp. Year	98	98
Policy Holder's Name	Same ● N	Same Y N
Citation	1 2 3	1 ● 2
Liability Insurance Company	STATE FARM INS	NONE
Stat. #		346.18(2) →

Occupant Unit Number	NAME Last	First	M.I.	Date of Birth	Sex	Severity	SEAT Position	SAFETY Equipment	AIRBAG
● 1	WILSON	AMBER	R	06-09-82	● M	K N A ● B C	3	1	1 Deployed, 2 Non Deployed, ● 4 Not Applicable, 4 Unknown

ADDRESS Street & Number / City & State / ZIP

Address Same as Operator: ● Yes No

EJECTED: 1 Not Applicable, ● Not Ejected, 3 Totally Ejected, 4 Partially Ejected, 5 Unknown

TRAPPED/EXTRICATED: 1 Not Applicable, ● Not Trapped, 3 Trapped/Extricated, 4 Trapped/Not Extricated, 5 Unknown

Medical Transport: ● N

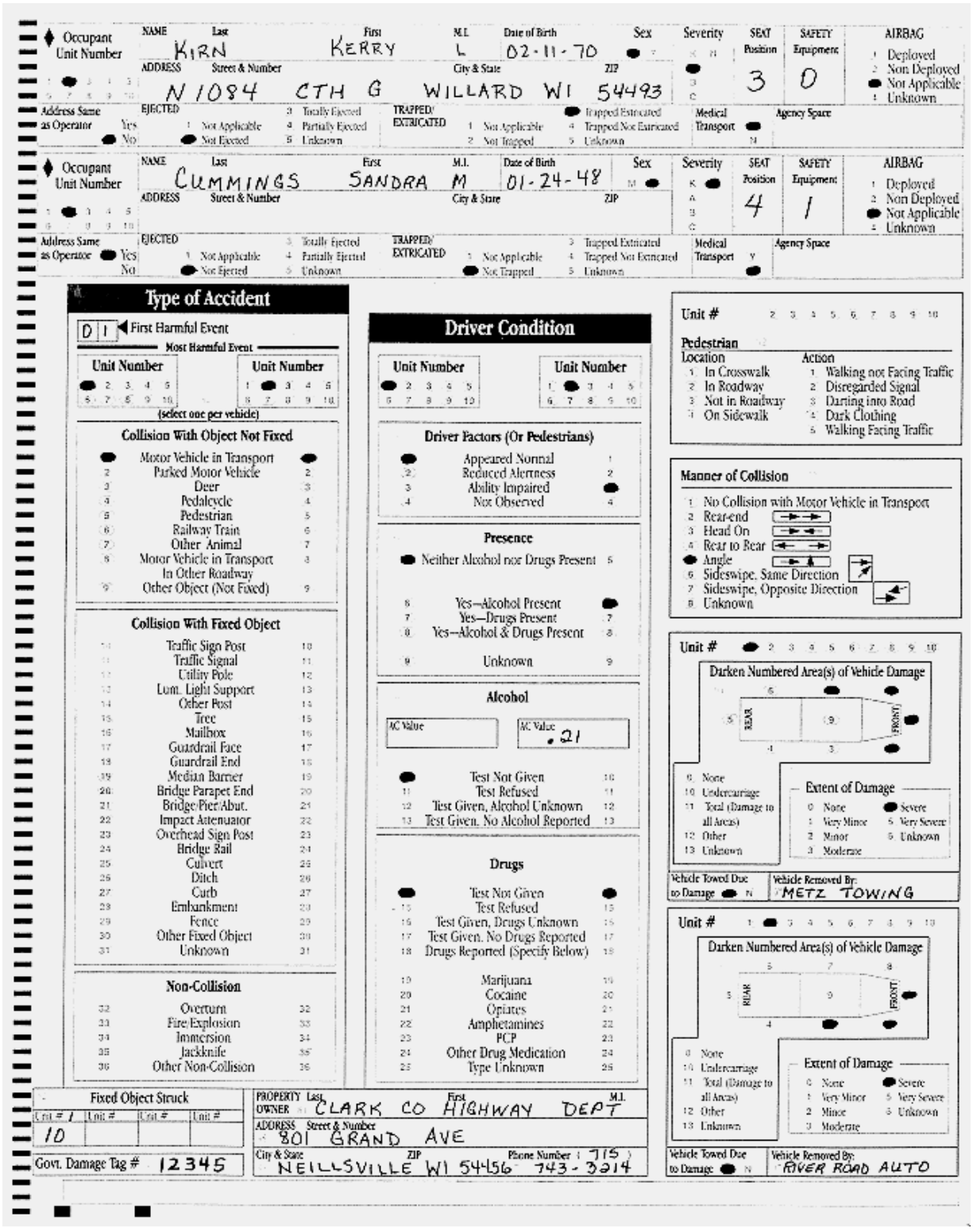
Agency Space

MV4000 1296

EMS Number

Police No. / Please Do Not Write In This Microfilm Space / Accident No. / Date / Location

WISCONSIN SAMPLE CRASH REPORT FORM



Occupant Unit Number: 1

NAME — Last: KIRN — First: KERRY — M.I.: L — Date of Birth: 02-11-70 — Sex: F

ADDRESS — Street & Number: N1084 CTH G — City & State: WILLARD WI — ZIP: 54493

Address Same as Operator: Yes / No

EJECTED: 1 Not Applicable; 2 Not Ejected; 3 Totally Ejected; 4 Partially Ejected; 5 Unknown

TRAPPED/EXTRICATED: 1 Not Applicable; 2 Not Trapped; 3 Trapped Extricated; 4 Trapped Not Extricated; 5 Unknown

Medical Transport: N

Severity: C

SEAT Position: 3

SAFETY Equipment: 0

AIRBAG: 1 Deployed; 2 Non Deployed; 3 Not Applicable; 4 Unknown

Occupant Unit Number: 2

NAME — Last: CUMMINGS — First: SANDRA — M.I.: M — Date of Birth: 01-24-48 — Sex: M

ADDRESS — Street & Number: — City & State: — ZIP:

Address Same as Operator: Yes / No

EJECTED: 1 Not Applicable; 2 Not Ejected; 3 Totally Ejected; 4 Partially Ejected; 5 Unknown

TRAPPED/EXTRICATED: 1 Not Applicable; 2 Not Trapped; 3 Trapped Extricated; 4 Trapped Not Extricated; 5 Unknown

Medical Transport: Y

Severity: K

SEAT Position: 4

SAFETY Equipment: 1

AIRBAG: 1 Deployed; 2 Non Deployed; 3 Not Applicable; 4 Unknown

Agency Space:

Type of Accident

First Harmful Event: 01

Most Harmful Event

Unit Number: 2

Unit Number: 1

(select one per vehicle)

Collision With Object Not Fixed

1 Motor Vehicle in Transport
2 Parked Motor Vehicle
3 Deer
4 Pedalcycle
5 Pedestrian
6 Railway Train
7 Other Animal
8 Motor Vehicle in Transport In Other Roadway
9 Other Object (Not Fixed)

Collision With Fixed Object

10 Traffic Sign Post
11 Traffic Signal
12 Utility Pole
13 Lum. Light Support
14 Other Post
15 Tree
16 Mailbox
17 Guardrail Face
18 Guardrail End
19 Median Barrier
20 Bridge Parapet End
21 Bridge/Pier/Abut.
22 Impact Attenuator
23 Overhead Sign Post
24 Bridge Rail
25 Culvert
26 Ditch
27 Curb
28 Embankment
29 Fence
30 Other Fixed Object
31 Unknown

Non-Collision

32 Overturn
33 Fire/Explosion
34 Immersion
35 Jackknife
36 Other Non-Collision

Driver Condition

Unit Number: 2

Unit Number: 1

Driver Factors (Or Pedestrians)

1 Appeared Normal
2 Reduced Alertness
3 Ability Impaired
4 Not Observed

Presence

5 Neither Alcohol nor Drugs Present
6 Yes–Alcohol Present
7 Yes–Drugs Present
8 Yes–Alcohol & Drugs Present
9 Unknown

Alcohol

AC Value:

AC Value: .21

10 Test Not Given
11 Test Refused
12 Test Given, Alcohol Unknown
13 Test Given, No Alcohol Reported

Drugs

14 Test Not Given
15 Test Refused
16 Test Given, Drugs Unknown
17 Test Given, No Drugs Reported
18 Drugs Reported (Specify Below)
19 Marijuana
20 Cocaine
21 Opiates
22 Amphetamines
23 PCP
24 Other Drug Medication
25 Type Unknown

Unit #: 2

Pedestrian

Location: 1 In Crosswalk; 2 In Roadway; 3 Not in Roadway; 4 On Sidewalk

Action: 1 Walking not Facing Traffic; 2 Disregarded Signal; 3 Darting into Road; 4 Dark Clothing; 5 Walking Facing Traffic

Manner of Collision

1 No Collision with Motor Vehicle in Transport
2 Rear-end
3 Head On
4 Rear to Rear
5 Angle
6 Sideswipe, Same Direction
7 Sideswipe, Opposite Direction
8 Unknown

Unit #: 2

Darken Numbered Area(s) of Vehicle Damage

REAR / FRONT

0 None
10 Undercarriage
11 Total (Damage to all Areas)
12 Other
13 Unknown

Extent of Damage: 0 None; 1 Very Minor; 2 Minor; 3 Moderate; 4 Severe; 5 Very Severe; 6 Unknown

Vehicle Towed Due to Damage: N

Vehicle Removed By: METZ TOWING

Unit #: 1

Darken Numbered Area(s) of Vehicle Damage

REAR / FRONT

0 None
10 Undercarriage
11 Total (Damage to all Areas)
12 Other
13 Unknown

Extent of Damage: 0 None; 1 Very Minor; 2 Minor; 3 Moderate; 4 Severe; 5 Very Severe; 6 Unknown

Vehicle Towed Due to Damage: N

Vehicle Removed By: RIVER ROAD AUTO

Fixed Object Struck

Unit # 1: 10

Unit #:

Unit #:

Unit #:

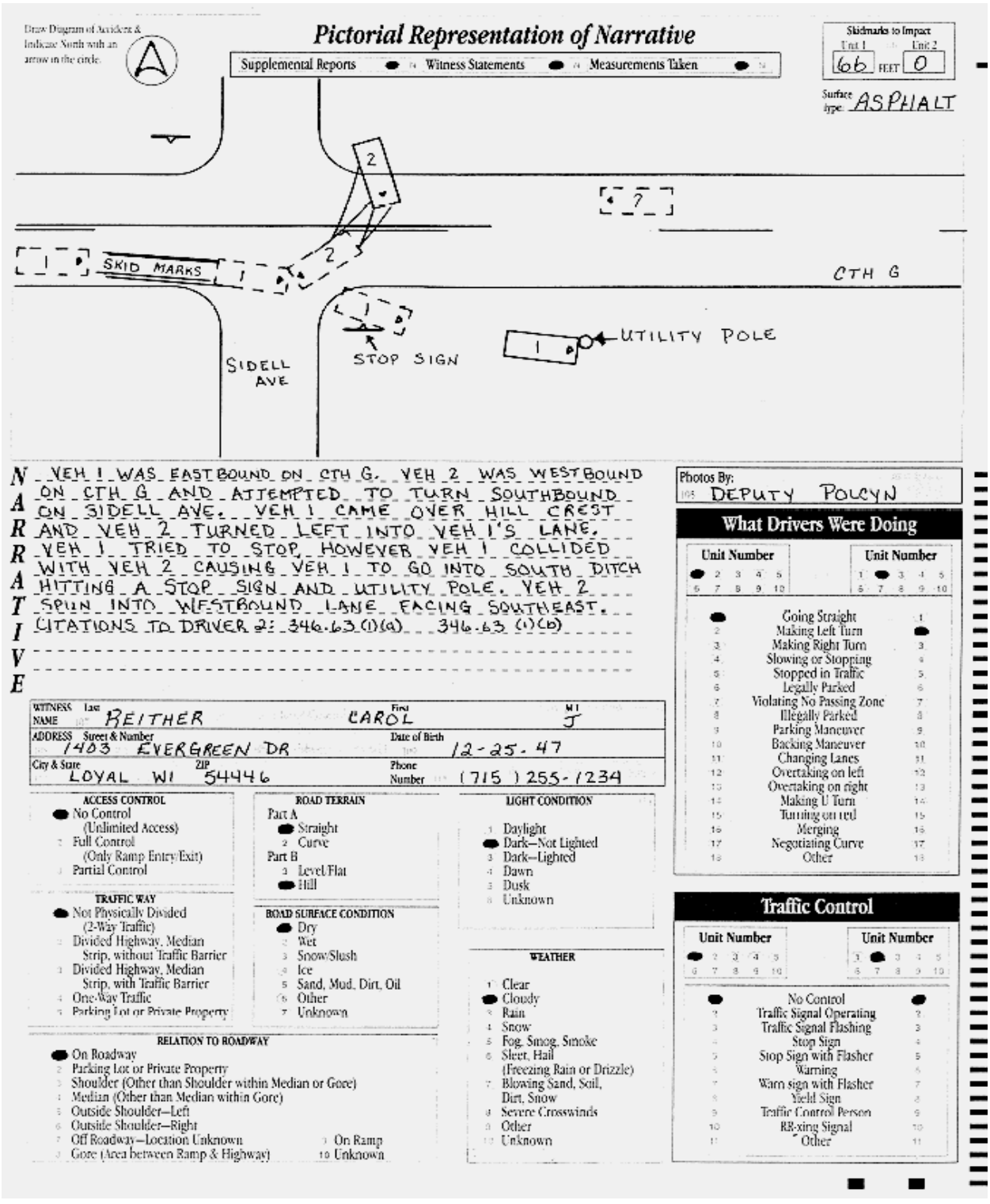
Govt. Damage Tag #: 12345

PROPERTY OWNER — Last: CLARK CO HIGHWAY DEPT — First: — M.I.:

ADDRESS — Street & Number: 801 GRAND AVE

City & State: NEILLSVILLE WI — ZIP: 54456 — Phone Number: 715 743-3214

WISCONSIN SAMPLE CRASH REPORT FORM



Draw Diagram of Accident & Indicate North with an arrow in the circle.

Pictorial Representation of Narrative

Supplemental Reports ● N Witness Statements ● N Measurements Taken ● N

Skidmarks to Impact — Unit 1: 66 FEET; Unit 2: 0

Surface Type: ASPHALT

NARRATIVE

VEH 1 WAS EASTBOUND ON CTH G. VEH 2 WAS WESTBOUND ON CTH G AND ATTEMPTED TO TURN SOUTHBOUND ON SIDELL AVE. VEH 1 CAME OVER HILL CREST AND VEH 2 TURNED LEFT INTO VEH 1'S LANE. VEH 1 TRIED TO STOP, HOWEVER VEH 1 COLLIDED WITH VEH 2 CAUSING VEH 1 TO GO INTO SOUTH DITCH HITTING A STOP SIGN AND UTILITY POLE. VEH 2 SPUN INTO WESTBOUND LANE FACING SOUTHEAST.
CITATIONS TO DRIVER 2: 346.63 (1)(a) 346.63 (1)(b)

Photos By: DEPUTY POLCYN

WITNESS NAME Last: REITHER First: CAROL MI: J

ADDRESS Street & Number: 1403 EVERGREEN DR Date of Birth: 12-25-47

City & State: LOYAL WI ZIP: 54446 Phone Number: (715) 255-1234

ACCESS CONTROL
- ● No Control (Unlimited Access)
- 2 Full Control (Only Ramp Entry/Exit)
- 3 Partial Control

TRAFFIC WAY
- ● Not Physically Divided (2-Way Traffic)
- 2 Divided Highway, Median Strip, without Traffic Barrier
- 3 Divided Highway, Median Strip, with Traffic Barrier
- 4 One-Way Traffic
- 5 Parking Lot or Private Property

ROAD TERRAIN
- Part A
  - ● Straight
  - 2 Curve
- Part B
  - 3 Level/Flat
  - ● Hill

ROAD SURFACE CONDITION
- ● Dry
- 2 Wet
- 3 Snow/Slush
- 4 Ice
- 5 Sand, Mud, Dirt, Oil
- 6 Other
- 7 Unknown

LIGHT CONDITION
- 1 Daylight
- ● Dark–Not Lighted
- 3 Dark–Lighted
- 4 Dawn
- 5 Dusk
- 6 Unknown

WEATHER
- 1 Clear
- ● Cloudy
- 3 Rain
- 4 Snow
- 5 Fog, Smog, Smoke
- 6 Sleet, Hail (Freezing Rain or Drizzle)
- 7 Blowing Sand, Soil, Dirt, Snow
- 8 Severe Crosswinds
- 9 Other
- 10 Unknown

RELATION TO ROADWAY
- ● On Roadway
- 2 Parking Lot or Private Property
- 3 Shoulder (Other than Shoulder within Median or Gore)
- 4 Median (Other than Median within Gore)
- 5 Outside Shoulder–Left
- 6 Outside Shoulder–Right
- 7 Off Roadway–Location Unknown
- 8 Gore (Area between Ramp & Highway)
- 9 On Ramp
- 10 Unknown

What Drivers Were Doing

	Unit Number	Unit Number
	●	
1	Going Straight	1
2	Making Left Turn	●
3	Making Right Turn	3
4	Slowing or Stopping	4
5	Stopped in Traffic	5
6	Legally Parked	6
7	Violating No Passing Zone	7
8	Illegally Parked	8
9	Parking Maneuver	9
10	Backing Maneuver	10
11	Changing Lanes	11
12	Overtaking on left	12
13	Overtaking on right	13
14	Making U Turn	14
15	Turning on red	15
16	Merging	16
17	Negotiating Curve	17
18	Other	18

Traffic Control

	Unit Number	Unit Number
	●	
1	No Control	1
2	Traffic Signal Operating	2
3	Traffic Signal Flashing	3
4	Stop Sign	4
5	Stop Sign with Flasher	5
6	Warning	6
7	Warn sign with Flasher	7
8	Yield Sign	8
9	Traffic Control Person	9
10	RR-xing Signal	10
11	Other	11

WISCONSIN SAMPLE CRASH REPORT FORM

6851141

Document Number Override

Officer's Opinion of Possible Contributing Circumstances

Driver Factors

Unit Number | Unit Number

N/A | N/A

- Exceeding Speed Limit
- Speed too Fast Condition
- Fail to Yield Right of Way
- Inattentive Driving
- Following too Close
- Improper Turn
- Left of Center
- Disregarded Traffic Control
- Improper Overtaking
- Unsafe Backing
- Failure to have Control
- Driver Condition
- Physically Disabled
- Other

Vehicle Factors

Unit Number | Unit Number

N/A | N/A

- Brake System
- Tires
- Steering System
- Turn Signals
- Head Lamps
- Stop Lamps
- Tail Lamps
- Disabled in Prior Accident
- Other Disabled
- Mirrors
- Suspension System
- Other

Highway Factors

Unit Number | Unit Number

N/A | N/A

- Snow, Ice or Wet
- Narrow shoulder
- Low Shoulder
- Soft Shoulder
- Loose Gravel
- Rough Pavement
- Debris from Prior Accident
- Other Debris
- Sign Obscured or Missing
- Narrow Bridge
- Construction Zone
- Visibility Obscured
- Other

OFFICER INFORMATION

Last	First	M.I.
KLINKE	SGT	

Law Enforcement Agency Address: 517 COURT ST

City & State: NEILLSVILLE WI ZIP: 54456

Phone Number: (715) 743-3157

Agency #	Enforcement Agency	Officer ID #
	CLARK CO	525

Date Notified	Time Notified (Military Time)	Time Arrived (Military Time)	Date of Report
MONTH DAY YEAR	HOUR MIN.	HOUR MIN.	MONTH DAY YEAR
07 9 7	1745	1756	07 9 7

Truck & Bus Accident Information

(This Section Must Be Completed for Each Truck or Bus Involved in this Accident.).

When To Use This Section: *Did the accident involve:. . .*

Part A

- A truck with at least two axles and six tires? Y
- A truck with a hazardous materials placard? Y
- A bus designed to carry 16 or more persons, including the driver? Y

STOP! If all the responses to Part A are "NO" do not complete this Truck & Bus Accident Information Section. If there are any "YES" answers, continue to Part B.

Part B

- Any person who was fatally injured? Y N
- Any injured person requiring transport for immediate medical treatment? Y N
- One or more vehicles that had to be towed from the scene as a result of the accident? Y N

STOP! If all the responses to Part B are "NO" do not continue. If there are any "YES" answers, please complete this Truck & Bus Accident Information Section. . .

Hazardous Material Information

- Hazardous Material Class Numbers (1-2digit):
- Hazardous Material "UN" Numbers (4 digit):
- Hazardous Material Placard Displayed? Y N
- Hazardous Cargo was Released? Y N

List the Hazardous Material(s) by name in this load:

List the Name(s) of Released Hazardous Material(s):

Carrier Information

- Interstate Carrier? Y N

Carrier Name

Carrier Identification Numbers

US DOT	LC
ICC MC	IC

Carrier Address

Source: Vehicle Side, Shipping Papers, Trip Manifest, Driver, Log Book

Vehicle Information

Gross Vehicle Weight Rating | LBS | Total # of Axles

Vehicle Configuration

1 Bus; 2 Single unit truck - 2 axles, 6 tires; 3 Single unit truck - 3 axles; 4 Truck Trailer; 5 Truck Tractor; 6 Tractor Semi-Trailer; 7 Tractor Doubles; 8 Tractor Triples; 9 Unknown Heavy Truck; 10 Log Truck

Cargo Body Type

1 Bus; 2 Van (Enclosed box); 3 Cargo Tank; 4 Flatbed; 5 Dump; 6 Concrete Mixer; 7 Auto Transporter; 8 Garbage/Refuse; 9 Other; 10 Log Truck

SEQUENCE OF EVENTS FOR THIS VEHICLE

1 2 3 4 Ran off Road
1 2 3 4 Jackknife
1 2 3 4 Overturn (Rollover)
1 2 3 4 Downhill Runaway
1 2 3 4 Cargo Loss or Shift
1 2 3 4 Explosion or Fire
1 2 3 4 Separation of Units
1 2 3 4 Collision involving pedestrian
1 2 3 4 Collision involving motor vehicle in transp.
1 2 3 4 Collision involving parked motor vehicle
1 2 3 4 Collision involving train
1 2 3 4 Collision involving pedalcycle
1 2 3 4 Collision involving animal
1 2 3 4 Collision involving fixed object
1 2 3 4 Collision involving other object
1 2 3 4 Other