

# Michigan Work Zone Safety Action Plan



## Governor's Traffic Safety Advisory Commission

### Member Agencies:

Michigan Department of Transportation  
Office of Highway Safety Planning  
Michigan Department of State  
Michigan State Police  
Office of Services to the Aging  
Michigan Department of Education  
Michigan Department of Community Health

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## **Introduction**

In 1998, the American Association of State Highway and Transportation Officials (AASHTO) approved its Strategic Highway Safety Plan, which was developed by the AASHTO Standing Committee for Highway Traffic Safety with the assistance of the Federal Highway Administration, the National Highway Traffic Safety Administration, and the Transportation Research Board Committee on Transportation Safety Management. The plan includes strategies in 22 key emphasis areas that affect highway safety. The plan's goal is to reduce the annual number of highway deaths by 5,000 to 7,000. Each of the 22 emphasis areas includes strategies and an outline of what is needed to implement each strategy.

NCHRP Project 17-18(3) is developing a series of guides to assist state and local agencies in reducing injuries and fatalities in targeted areas. The guides correspond to the emphasis areas outlined in the AASHTO Strategic Highway Safety Plan. Each guide includes a brief introduction, a general description of the problem, the strategies/countermeasures to address the problem, and a model implementation process. <http://safety.transportation.org/guides.aspx>

The Michigan Work Zone Safety Action Plan (MWZSAP) was created by using the above documents and resources as a base foundation.

## **Action Plan Development**

A Strategic Highway Safety Plan should define a system, organization, and process for managing the attributes of the road, the driver, and the vehicle to achieve the highest level of highway safety by integrating the work of disciplines and agencies involved. These disciplines include the planning, design, construction, operation, and maintenance of the roadway infrastructure (engineering); injury prevention and control (emergency response services), health education; and those disciplines involved in modifying road user behaviors (education and enforcement).

The development of the strategic highway safety plan was commissioned by Michigan's Governors Traffic Safety Advisory Commission (GTSAC) in October 2004. The GTSAC consists of the Governor (or a designee), the Directors (or their designees) of the Departments of Community Health, Education, State, State Police, and Transportation, the Office of Highway Safety Planning, the Office of Services to the Aging, and three local representatives from the county, city, and township level.

Work zone safety issues were identified as an emphasis area in the both AASHTO and GTSAC Strategic Highway Safety Plans. A GTSAC sub-committee consisting of a multi-disciplinary group of agencies and industry was identified to work on this topic and conducted a kick off meeting on July 22, 2005 in East Lansing, Michigan. The membership of this sub-committee is provided under Acknowledgments. Issues and

strategies from the national and state agenda were carried forward into the Michigan plan, as well as other issues and strategies not mentioned in the national plan.

## **The Issue: Work Zone Safety**

The roadway infrastructure continues to age and deteriorate at a rate faster than our funding levels for rehabilitation and expansion can address system need. As a result, congestion on Michigan roadways is becoming an increasing problem as the vehicle miles traveled continue to increase. The Federal Highway Administration (FHWA) reports that between 1982 and 2002 vehicle miles traveled increased by 79% while the highway lane miles increased at a rate of 3% during the same period nationally.<sup>1</sup>

What does this mean to the average driver? In an effort to maintain and rehabilitate this aging infrastructure, motorists are being exposed to more work zones as road crews try to share the road with the motoring public. On average 23,745 miles of roadway received improvements per year from 1997 to 2001 nationally<sup>2</sup>. This translates to more than 11 billion vehicle miles of estimated travel through active work zones during the 2001 construction season<sup>3</sup>. According to the Michigan Department of Transportation (MDOT), over 2,200 miles of road and bridge improvements were completed on state trunkline routes during the 2004 construction season, at a cost of more than \$700 million dollars<sup>4</sup>. The end result of increased work zone activity is increased motorist and worker exposure, additional pressure on congested roadways, elevated driver road rage, and negative impacts to Michigan businesses due to lost productivity.

Road agencies have tried a number of creative work zone strategies to provide safe seamless zones that provide mobility while combating delay. The use of public relations campaigns, educational seminars for both workers and drivers, incentive contracts, peak hour work restrictions and the use of intelligent transportation systems have all been used to offer some relief. Yet, crashes in work zones nationally have been slowly increasing. A Texas Transportation Institute Study on work zone crash data suggests that these numbers could be higher due to inconsistencies in how work zone crash data is reported among the different states<sup>5</sup>. The Michigan State Police statistics detail that for the 2004 calendar year 6,584 crashes occurred in Michigan work zones causing 1,827 injuries and 22 fatalities<sup>6</sup>. These numbers represent 1.8% of the total number of crashes that occurred during 2004 on Michigan roadways.

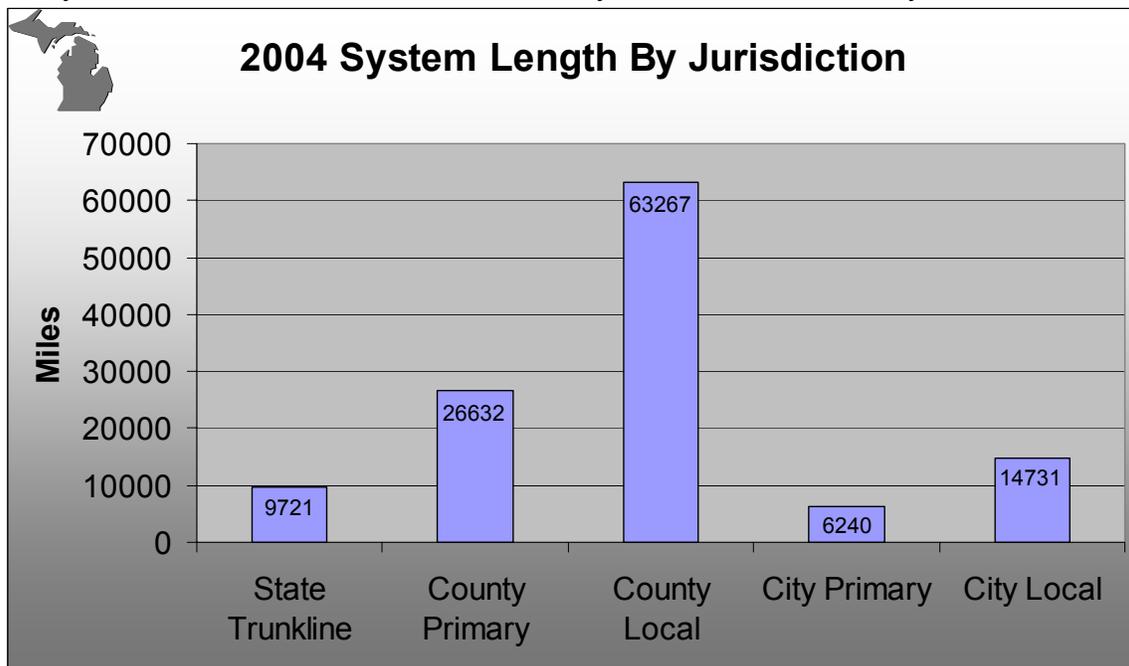
In an effort to determine how to reduce the overall crash numbers in work zones, an understanding of how and why these crashes are occurring was completed. A breakdown of the road classification, crash type, environmental conditions, roadway geometry, vehicle type and the driver characteristics involved in each crash type was conducted. The objective was to quantify the crash information and use the trends as a guide to provide an action plan that provides the motoring public with work zones that are designed with a uniform appearance across all agencies in Michigan. The plan will include recommendations for additional training requirements needed by those implementing the work zones. It will also include recommendations for increased

training and testing for drivers who traverse the work zones so that the motoring public have a better understanding of the work zone deployment characteristics. Finally, it will offer recommendations on the use of appropriate speed limits within work zones providing the law enforcement community with the tools necessary to properly set and enforce work zone speed limits. In the end the action plan should provide recommendations that provide safe passage through the zone, minimize motorist delay and offer the appropriate protection for the employees working in the work zones.

## Michigan Roadway System Mileage and Work Zone Crash Data

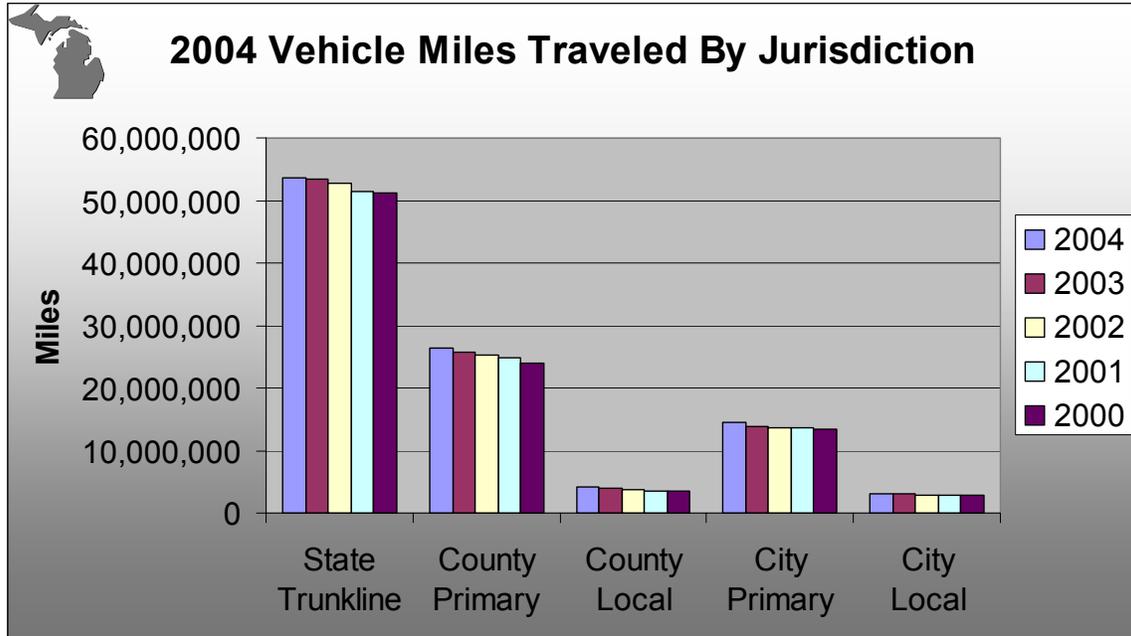
The Michigan roadway system mileage and work zone crash data has been compiled and summarized in graphical format. This information quantifies five years of data in various formats to look for trends that can be used to improve the overall safety in all types of Michigan work zones.

Analysis of the Total Number of Lane Miles By Jurisdictional Authority



- The state trunkline system accounts for 8% of the total lane miles in the state
- The county primary system accounts for 22% of the total lane miles in the state.
- The county local system accounts for 53% of the total lane miles in the state.
- The city primary system accounts for 5% of the total lane miles in the state.
- The city local system accounts for 12% of the total lane miles in the state.

Analysis of the Total Vehicle Miles Traveled By Jurisdictional Authority



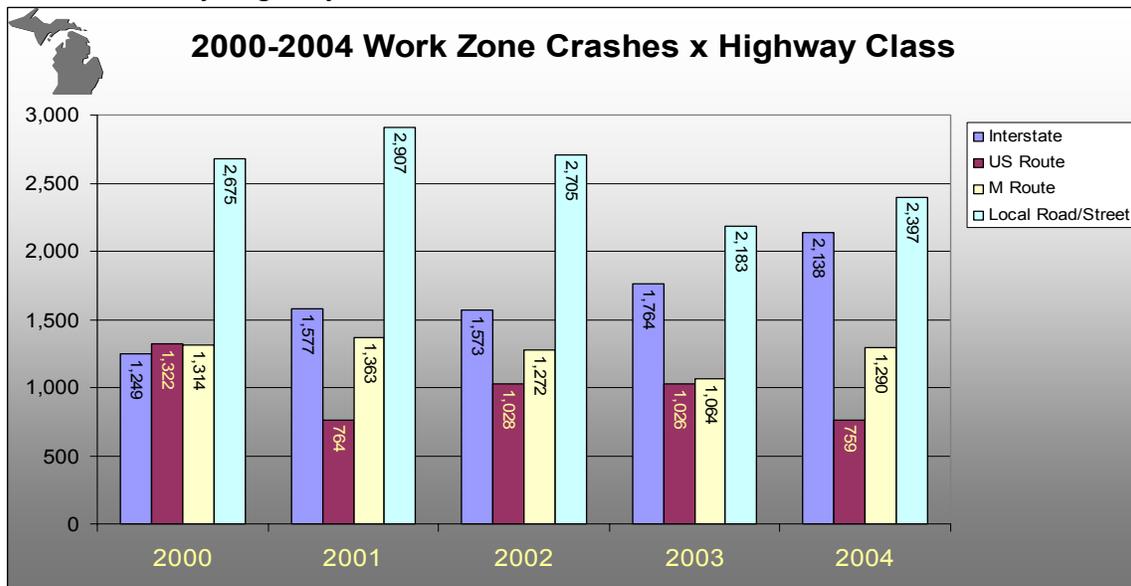
- The state trunkline system, which represents 8% of all the roads in the state, carries 53% of the total traffic.
- The county primary system which represents 22% of all the roads in the state, carries 26% of the total traffic.
- The county local system which represents 53% of all the roads in the state, carries 4% of the total traffic.
- The city primary system which represents 5% of all the roads in the state, carries 14% of the total traffic
- The city local system which represents 12% of all the roads in the state, carries 3% of the total traffic.

Total Work Zone Cashes

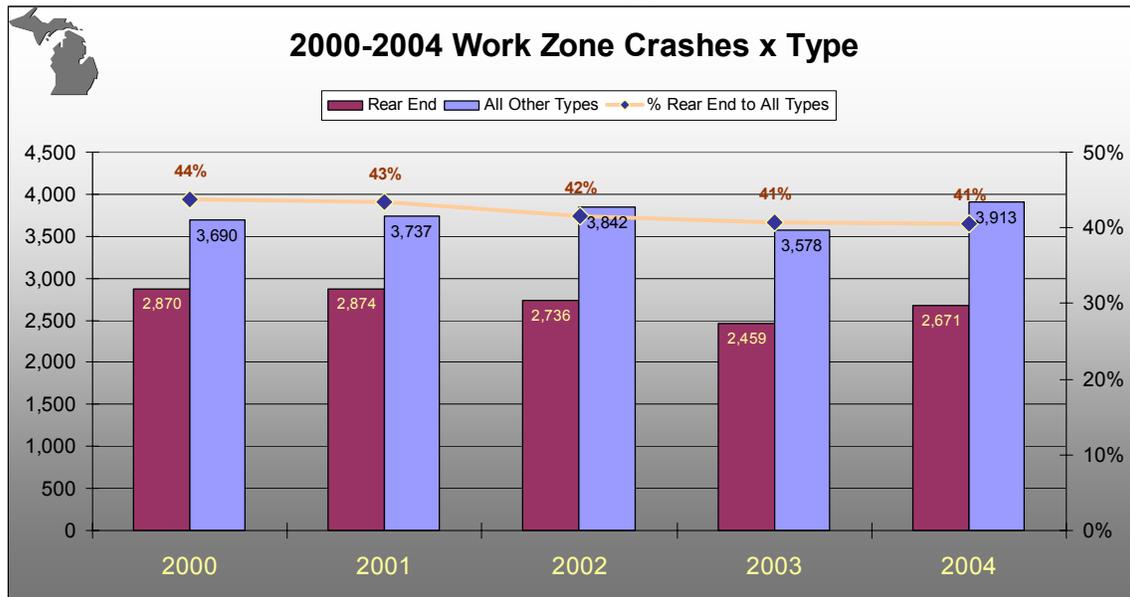


The number of work zone crashes has held consistent over the past 5 years even though the total number of miles traveled in Michigan has increased by 7%.

Total Crashes by Highway Classification

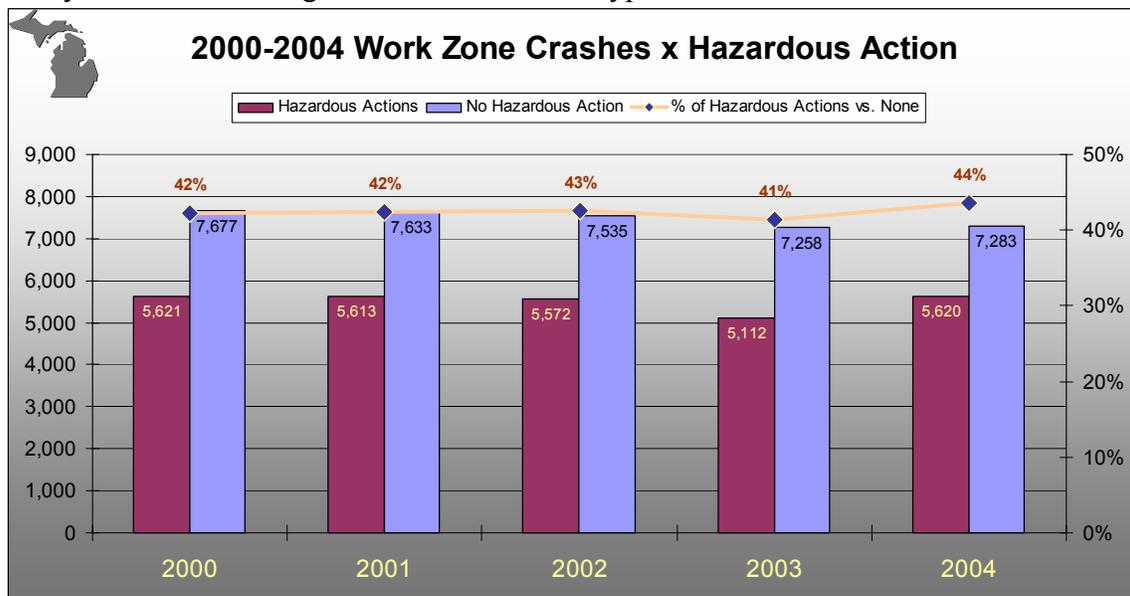


## Analysis of the Predominant Work Zone Crash Type



Rear end crashes account for over forty percent of all the crashes in work zones.

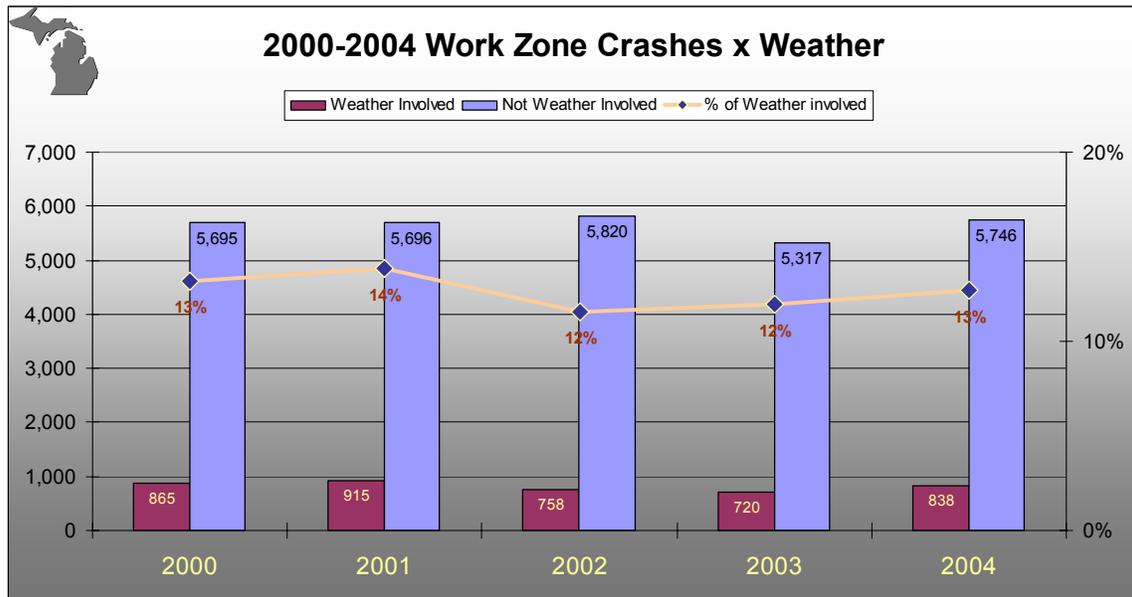
## Analysis of Contributing Factors to the Crash Types



For the purpose of this report, hazardous driver actions are considered to be:

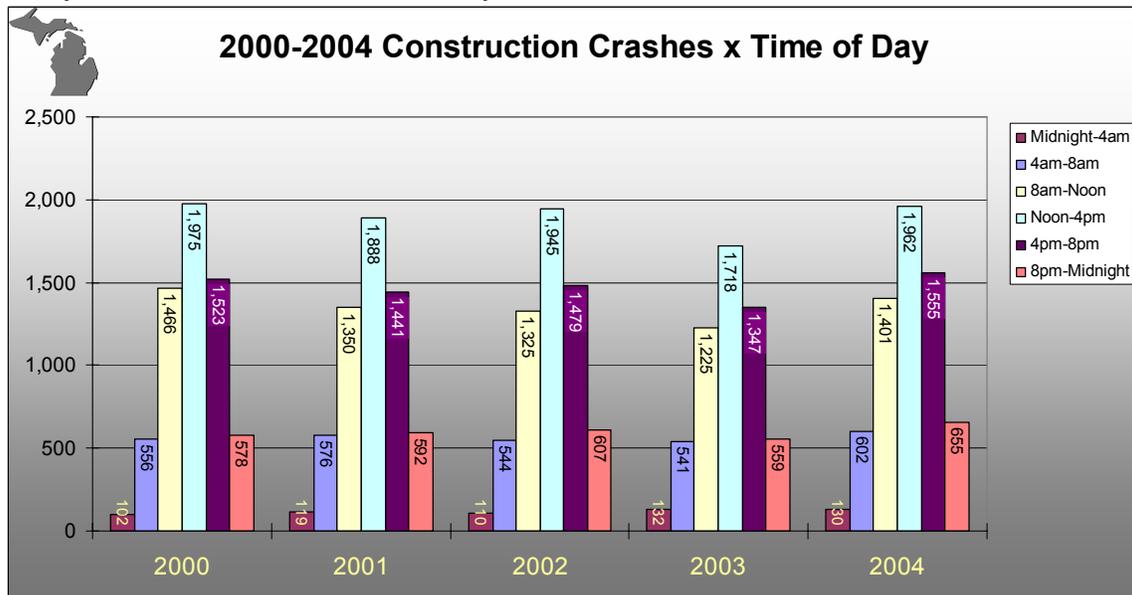
- Reckless driving
- Failure to drive at an appropriate speed too fast or slow
- Failure to use proper driving techniques i.e. improper use of turn signals etc.
- Disregard for traffic control devices
- Failure to allow for adequate stopping distance

## Analysis of Environmental Factors on Work Zone Crashes



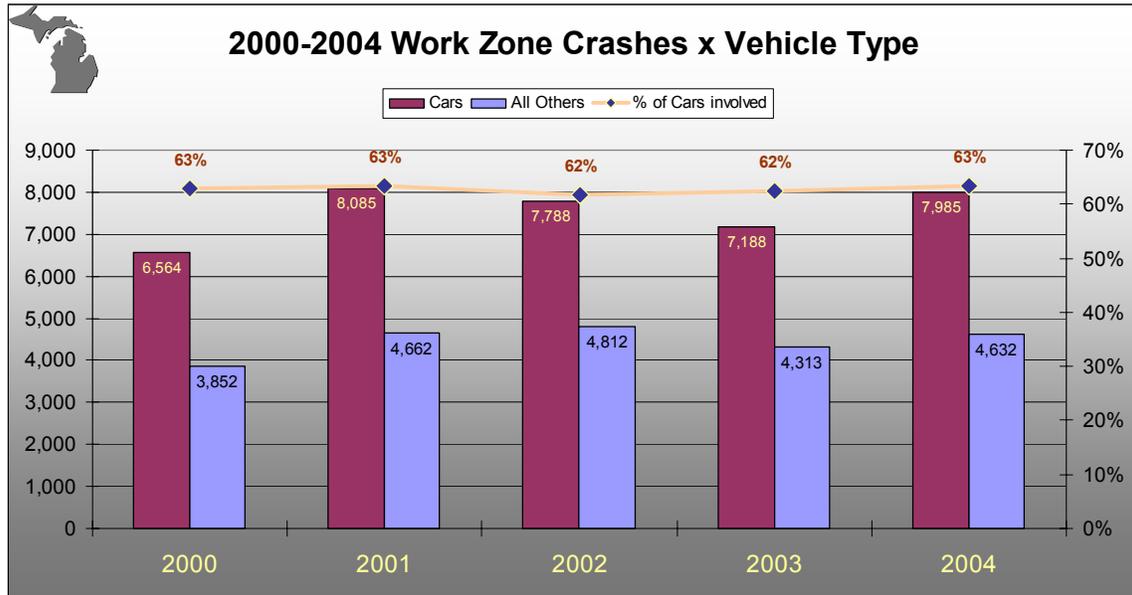
Weather was cited as a contributing factor in less than 14% of all work zone crashes.

## Analysis of the Effects of Time of Day on Work Zone Crashes

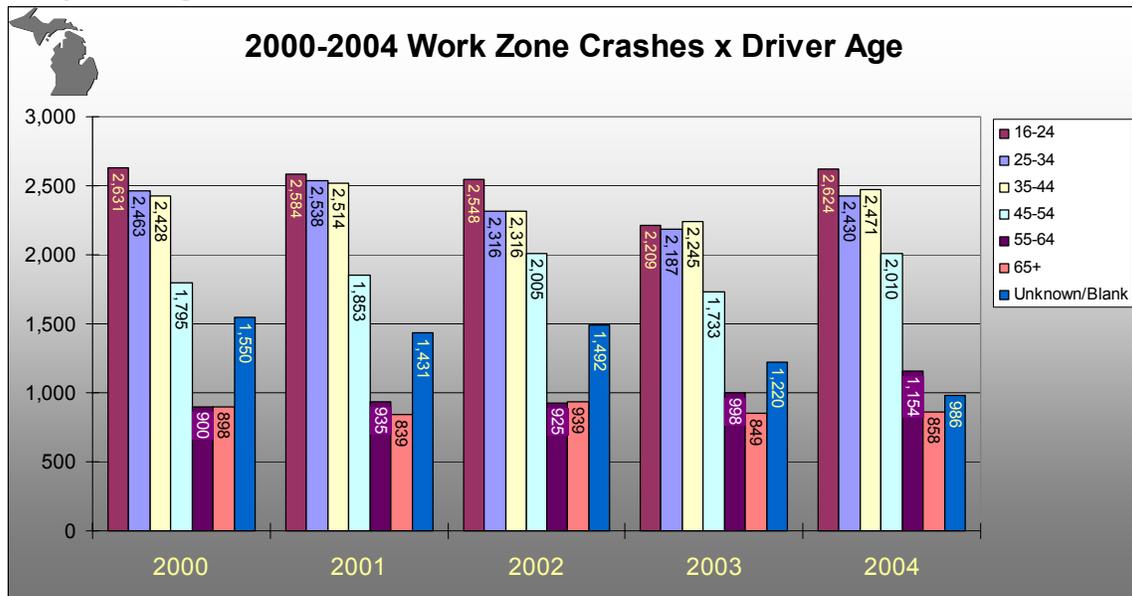


On average 75 % of the work zone crashes occur between 8 AM and 8 PM.

### Analysis of Vehicle Type on Work Zone Crashes

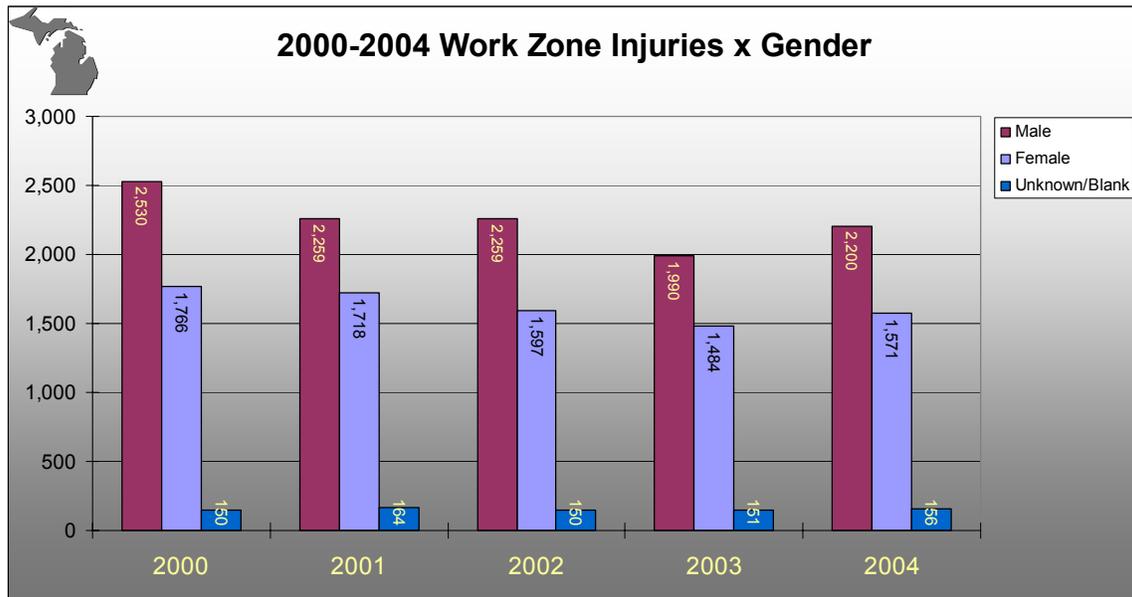


### Analysis of Age of Drivers as it Relates to Work Zone Crashes



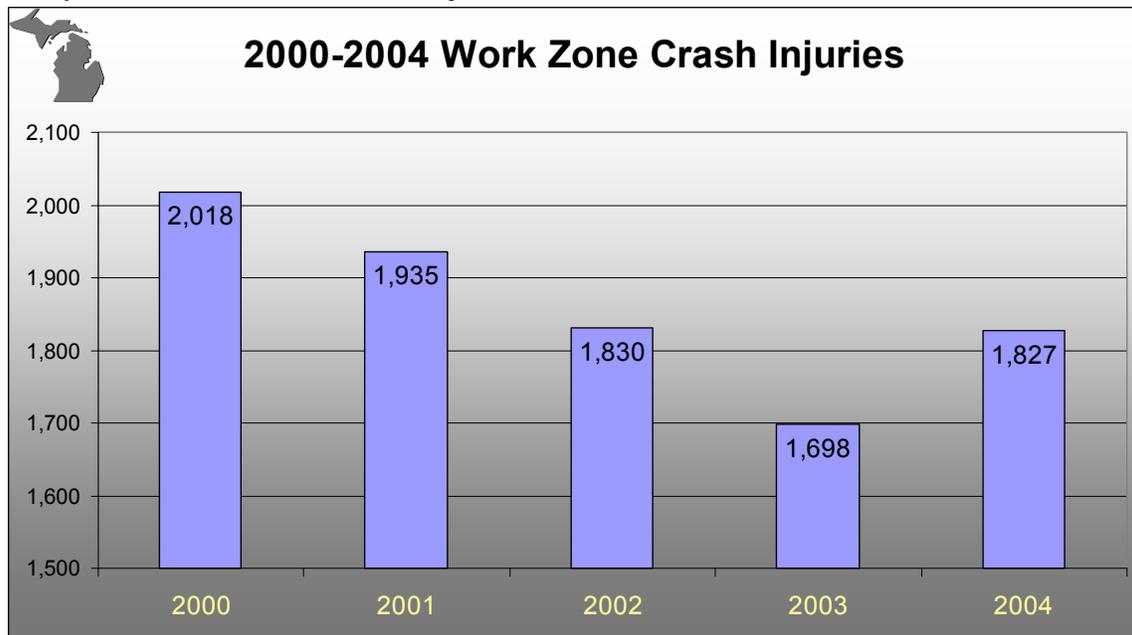
60% of all work zone crashes involve persons between the ages of 16 and 44.

Analysis of Gender as it Relates to Work Zone Crashes



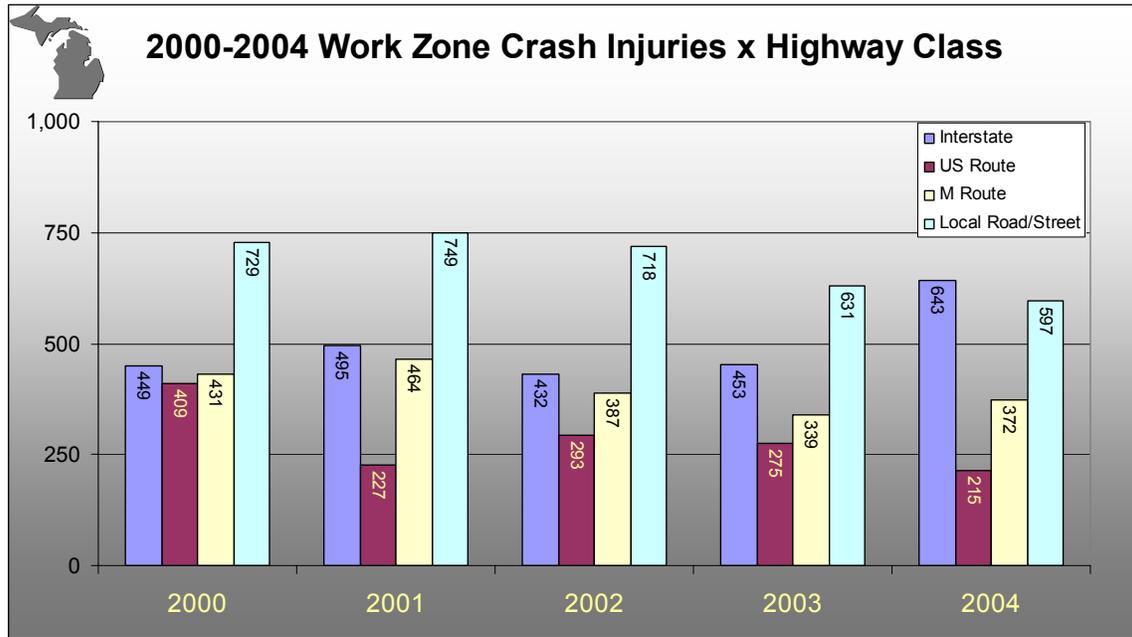
The male gender is involved in 58% of all work zone crashes

Analysis of the Number of Total Injuries in Work Zone Crashes

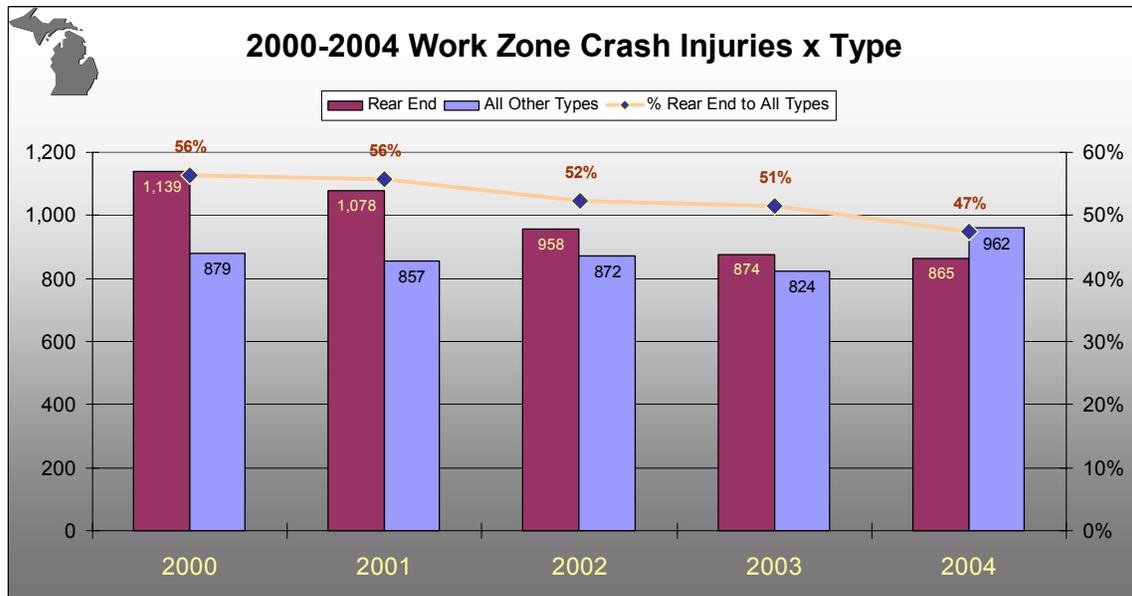


While the overall number of crashes in work zones has remained steady, the number of injuries has seen an overall reduction of 9.5% since 2000.

### Analysis of Work Zone Crash Injuries by Highway Class



### Analysis of Work Zone Crash Type With Injuries



## Analysis of the Total Number of Fatalities in Work Zone Crashes



In 2000, of the 9 fatalities, 3 involved construction personnel. The remaining 6 were motorists.

In 2001, of the 18 fatalities, 2 involved construction personnel. The remaining 16 were motorists.

In 2002, of the 19 fatalities, 6 involved construction personnel. The remaining 13 were motorists.

In 2003, of the 12 fatalities, 2 involved construction personnel. The remaining 10 were motorists.

In 2004, no construction personnel were killed in work zones. The 22 fatalities were motorists.

### **Michigan Work Zone Safety Goals**

The goal of the Michigan Work Zone Safety Action Team is to outline a course of action that, when followed, targets a 10% reduction in the total number and severity of work zone crashes in Michigan by 2009.

## Cost/Benefit Analysis

The National Safety Council estimates the calculable cost of each highway crash fatality is \$1,090,000. Non fatal disabling injuries are estimated to cost \$49,900 and the cost for minor injuries and/or property damage is estimated to be \$6,200.

Achieving a 10 % reduction in the number of work zone crashes would, on average, result in:

Crash Type	Five Year Average	10 % Reduction	Cost Savings/Year
Non/Minor Injury Crashes	4,596	459.6	\$2,849,520
Injuries	1,862	186.2	\$9,289,384
Fatalities	16	1.6	\$1,744,000
Total			\$13,882,904

## Michigan Strategies

### Education

#### Objective:

Decrease the number of work zone crashes through an aggressive educational campaign targeted at the high risk drivers as shown by the statistical trends.

#### Strategies:

As part of the requirement for driver training education and driver licenses renewals, an understanding of basic work zone laws and potential hazards should be required.

#### Actions Necessary:

- Develop training aids to be used by driving instructional academies and by the Secretary of State to provide the needed tools to educate the motoring public on how to safely maneuver through work zones.
- Work with state legislators to pass needed legislation to mandate this type of training before motor vehicle licenses are granted/ renewed.

#### Implementation Plan

The Michigan State Police has just completed two out of a series of television public service announcements (PSA) targeting negotiating work zones and police enforcement. The Traffic Safety Services section plans to continue these PSA which will air across the state. Copies of the PSA can be made available to the Secretary of State and driver

training courses as a launching point to the discussion about driver behavior and work zone safety.

MDOT, the MSP and MITA have been working to modify the work zone speed limits in an effort to post more realistic speed limits in work zones. Driver behavior has shown that the speed limit is widely ignored in work zone areas where workers are not present. However, these same drivers naturally slow where workers are actively engaged on a project. Using this concept, the maintenance of traffic standards in work zones has changed for 45 mph throughout the entire zone to 45 mph where workers are present and a 10 mph speed reduction elsewhere in the zone when necessary. Preliminary studies have shown this concept to be successful. Additional studies are planned as the construction season progresses.

MSP will take the lead on working with the legislative branch to get work zone training incorporated into the testing mandates for driver license certification and renewals.

**Objective:**

Decrease the number of work zone crashes through an aggressive educational campaign targeted at the construction/utility industries and roadway authorities in an effort to ensure that proper work zone devices and closures are implemented.

**Strategies:**

Uniformity in the deployment of traffic control devices is critical if it is expected that the motoring public is to understand how to safely maneuver through the work zone and minimize the risk to those working in the work zone.

**Actions Necessary:**

- Develop training aids to be used by the construction/utility industries and roadway authorities to provide the needed tools to educate the personnel on work zone traffic control deployment.
- Set minimum educational standards for work zone traffic control deployment personnel that are mandated to be achieved with regular mandated refresher courses prior to the authorization to implement work zone traffic control deployments.

**Implementation Plans**

Over the past two years MDOT has aggressively stepped up the training of the state, county and the consultant forces that are hired to oversee state road construction and maintenance activities. Recently, programs are being put in place to help train the contractors and utility companies that perform work on or along Michigan roadways. This training was piloted in early 2006 and will expand state wide in the winter of 2006/2007.

The development of minimum educational standards has yet to be developed. The State/Industry Work Zone Committee will start to work on this subject in 2006. An implementation date is yet to be determined.

**Objective:**

Increase the accuracy of the data collected involving work zone crash recording through an aggressive educational campaign for all law enforcement officials who are engaged in responding, collecting and recording work zone crash data.

**Strategies:**

Uniformity in the collection and recording of work zone crash data will enhance the statistical data base accuracy to which trends can be isolated and corrective measures developed.

**Actions Required:**

-Develop training aids to be used by law enforcement personnel to ensure accurate, uniform work zone crash data collection.

**Implementation Plans**

MSP in cooperation with MDOT will develop materials that can be used to train law enforcement officers how to determine, enforce and properly report crashes that take place within work zones to improve the quality of the crash data within the crash reporting system. Information can be disseminated through the MSP electronic field update reports and through various law enforcement training sessions. To date, the electronic field updates are being sent on work zone enforcement issues and an enforcement training video is being developed. Additional training materials will be developed once the current efforts are completed.

**Engineering****Objective:**

Using the current data and statistical trends identified, develop improved work methods and work zone traffic control standards that provide ample advance notice and clear visual cues that help the motoring public negotiate work zones without confusion and with minimal delay.

**Strategies:**

- Rear end crashes result in over 40 % of all the crashes in work zones. It is well documented that uniform traveling speeds greatly reduce the likelihood of rear end collisions. Michigan should adopt work zone speed reduction policies that promote speed reductions only when based on sound engineering analysis and eliminate mandated set speed limit reductions.
- Hazardous actions are contributing factors to over 40 % of all the crashes in work zones. Additional emphasis should be put on work zone law enforcement patrols in an effort to reduce work zone crash occurrences.

- Review current work methods and develop new processes to reduce the number and duration of work zone activities.
- The development of emergency action planning for the movement of large numbers of vehicles in short time frames can provide lessons learned on how to address capacity deficiencies during lane reductions in work zones.

**Actions Required:**

- Continue to develop work zone traffic standards that incorporate state of the art technologies to provide seamless traffic flow capabilities while maximizing the safety and operational capabilities of the work zone for the agencies.
- Because the installation of work zone traffic control devices increases worker exposure and can cause erratic driver response, continue to refine work zone traffic standards and reduce any devices being used that provides minimal value including devices mandated by legislation. Ensure that the work zone traffic control devices being placed provides optimal advance notice and clear visual cues in an effort to minimize driver confusion and maximize the safety and operation capabilities of the work zone.
- Work with the legislative officials to revise the Michigan Vehicle Code to eliminate mandated set work zone speed limits and allow for appropriate speed reductions based on engineering analysis.
- Continue to emphasize the efforts that currently are being promoted to increase the presence of law enforcement officials in work zones to reduce the hazardous actions being conducted by motorists which are contributing to the number of work zone crashes each year.
- Conduct a through review of construction/maintenance/utility practices in the design/construction/ contracting processes and develop innovative methods to improve how work is accomplished that reduce the exposure time that work zones are required.
- Work with emergency management personnel to review current emergency management plans and brainstorm ideas on how the information sharing can improve work zone traffic control as well as emergency preparedness.
- Develop statewide standardized emergency routes for all major trunkline which can be included as part of a statewide emergency management plan to be used by all agencies even if these routes cross jurisdictional boundaries. Ensure that these routes provide smooth traffic flow in both directions and allow for access in and out of the affected area by emergency management personnel.
- Compare crash rates on a given roadway before the implementation of a work zone and during the construction to see if crash rate and type vary to determine if these crashes are attributable to the work zone or the roadway geometrics.

**Implementation Plans**

MDOT continues to research and pilot a variety of work zone innovations to assess driver behavioral response to each innovation tested and determine if there was an overall improvement to work zone safety for the motorist and construction personnel. This season MDOT will be piloting the dynamic late lane merge system in two locations across the state to assess its value to increasing work zone safety. Additionally, MDOT in partnership with MSP and the contracting industry also revised the work zone speed limits for 2006. Speed studies and crash histories will be analyzed throughout the 2006

construction season to assess how the change in the work zone speed limit impacted work zone safety.

Work with law enforcement, legislative officials and industry partners are an ongoing effort that has been underway for many years. As opportunities present themselves, changes will be made to protect and improve the work zone safety for the construction personnel and motorist who use the zones.

MDOT will continue its effort to provide additional law enforcement within work zones through law enforcement overtime reimbursement for the 2006 construction season. The addition of the law enforcement presence within work zones helps provide a uniform traffic flow through the work zone and helps to ensure worker and motorist safety.

As part of the implementation of the Final Rule on Work Zone Safety and Mobility, a ad-hoc committee was set up to conduct a thorough review of how work zones are planned, designed, implemented, and maintained in the State of Michigan. Bi-weekly meetings are being held to address the requirements of the final rule. A draft outline addressing the implementation plan of the Final Rule as well as laying the foundation for an ongoing program of continual improvement in the safety and effectiveness of Michigan's work zones is due to be delivered to the MDOT Engineering Operations Committee by July 2006.

MSP in cooperation with MDOT have developed the Michigan Emergency Highway Traffic Regulation Plan. This plan was developed in calendar year 2000 and was reviewed and updated in 2006. The plan provides for a variety of high level incident management plans based upon the evacuation of large volumes of people based upon various natural and man made disaster types.

MDOT has chosen a few sample projects as part of the 2006 construction season to assess if an appreciable difference is observed in the number of crashes as part of these projects. If it is determined that there is a significant increase in the number of crashes that were attributable to the presence of a work zone, additional studies will be conducted during the 2007 construction season.

## **Public Relations**

### **Objective:**

The use of public relation plans focused on a target audiences to inform motorists of work zones, to educate them on the alternate routes available to help reduce capacity deficiencies along the route and to educate them on the dangers when traveling within work zones.

### **Strategies:**

- Hazardous actions by motorists contribute to over 40 % of all work zone crashes. Drivers, 44 and under, are involved in 60% of the work zone crashes. Targeted public relations campaigns should be developed to highlight the dangers to the workers and to the motorist that travel within these work zones.
- The use of technology should be further explored to provide advance notice to motorist so that alternate routes can be chosen thus reducing the traffic volume through the zone and ultimately reducing congestion.

### **Actions Required:**

- Increase the regularity that targeted public relation campaigns are utilized to heighten the awareness of the high risk drivers to the dangers of work zones. This may include the use of web advertising, advertising on targeted cable television stations, and other applicable venues to reach the desired audience.
- Explore various opportunities to utilize technology to enhance how information is provided to motorist through the use of web sites, global positioning systems, live feed cameras, and real time changeable message boards in an effort to allow motorist options when choosing the route they travel.

### **Implementation Plans**

The MDOT, MSP and the OHSP continue to work together to develop targeted public relations materials used to raise the awareness of drivers to the dangers of work zones. Be it the annual Give'em a Brake Campaign, radio and television PSA's or billboards as you enter a corridor with major construction activity.

MDOT is also working with the various automobile manufacturers on Vehicle Integrated Intelligence (VII). While still in the development stages the VII concept would allow cars to talk with the road and with other cars. Information could be fed to roadside changeable message boards, and computers in the cars to provide suggested alternate routes, road conditions, and emergency response information in an effort to reduce traffic congestion and crashes. This effort is ongoing.

## **Resources**

- 1) Federal Highway Administration: <http://fhwa.dot.gov/wz/resources>
- 2) Federal Highway Administration: <http://fhwa.dot.gov/wz/resources>
- 3) Federal Highway Administration: <http://fhwa.dot.gov/wz/resources>
- 4) Michigan Department of Transportation: <http://www.michigan.gov/mdot/>
- 5) Transportation Research Board: <http://TRB.org>
- 6) Michigan Office of Highway Safety Planning: <http://www.michigan.gov/msp/>

Roadway System Information:

The Michigan Department of Transportation Planning Division

Work Zone Crash Data:

The Michigan Office of Highway Safety Planning

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