Michigan Department of Transportation
Work Zone Review Summary
2008

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Background

In 2008, the Michigan Department of Transportation (MDOT) continued the annual Work Zone review process as required by Title 23 – Highways, Part 630 – Preconstruction Procedures (23 CFR 630). The language in 23 CFR 630.1006, Work Zone Safety and Mobility Policy, has recently been changed, as outlined below:

Process Reviews.

- **Former Rule**. The former Rule had a requirement for States to conduct an annual process review of selected projects for the purpose of assessing the effectiveness of its procedures. It also required the results of the review to be forwarded to the Federal Highway Administration (FHWA) Division Administrator for review and approval of the State's annual traffic safety effort.

- **Updated Rule**. The updated Rule requires agencies to conduct process reviews, but the requirement has been changed from annual reports to bi-annual reports**.** The Rule states that the ultimate objective of the process review is to enhance efforts to address safety and mobility on current and future projects. It does not require that the results of the review be forwarded to the FHWA Division Administrator for approval, but does encourage the Department of Transportation (DOT) to include FHWA in the review.

Period of Review

This report covers 2008, in accordance with the Former Rule. The 2008 reviews took place between January 1, 2008 and December 31, 2008. However, most of the reviews were between April 2008 and November 2008.

Scope

The number of projects reviewed, and the time period when the projects were reviewed, varied by region. However, the cross section of projects reviewed included rural and urban freeways, multi-lane roadways, two lane-two way roads, and bridges. Personnel conducting the reviews included Region and Transportation Service Center (TSC) Traffic and Safety Engineers/Technicians, Central Office Work Zone Engineers/Technicians, Delivery Engineers, Consultants, Permit Agents and Construction Technicians.

Each review team used specific criteria for day and night reviews, including compliance with the Michigan Manual of Uniform Traffic Control Devices (MMUTCD), MDOT Standard

Specifications for Construction, project specific plans, proposal Special Provisions, Traffic Control Typicals, American Traffic Safety Services Association's (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices, Transportation Management Plans (TMP) and Maintenance of Traffic (MOT) Special Provisions.

Each region developed a work zone review form and rating system, so that consistency through each region could be maintained. If an immediate safety consideration was found, personnel at the TSC were notified to remedy the concern.

Findings

During the course of 2008, MDOT staff reviewed 347 projects. There were 640 day time project reviews and 104 night time project reviews performed. Specific focus areas included; temporary signing, lighted arrow boards, temporary pavement markings, channelizing devices, traffic regulator operations, lane closures and shifts, portable changeable message boards, detours, temporary concrete barrier wall, attenuators, temporary speed limits, unique devices, contractor behavior, and safety.

A work zone review questionnaire (Appendix A) was prepared and sent to each region Traffic and Safety Engineer in order to collect state-wide general trends in temporary traffic control for 2008. The following is a summary of trends:

Item reviewed	**General Trend**
Temporary Signing	Poor sign quality Improperly stored signs Improper placement
Lighted Arrow Boards	Good compliance
Temporary Pavement Markings	Good compliance
Channelizing Devices	Lights out on drums Improper drum spacing Lack of proper drum maintenance (cleaning, etc)
Traffic Regulators	Untrained Regulators Improper and/or incomplete sign sequences Regulator inattention Improper paddles Incomplete Personal Protection Equipment No escape path
Lane Closures/Lane Shifts	Good compliance
Portable Changeable Message Boards	Over all good compliance, with the following exceptions: Confusing messages Dim lights during both day and night Difficult to get contractor to remove board when not in use

Detours	Improper and/or incomplete sign sequencing. Signs missing at critical turns Signs left in place when detour is no longer applicable
Temporary Concrete Barrier Wall	Poor quality barrier wall delivered and installed. Poor adhesion of reflectors Spalls Access issues for maintenance
Attenuation	Poor condition of attenuators Contractor not understanding the correct angles, buffer zones, etc. Lack of Temporary Mounted Attenuator (TMA) use when required
Temporary Speed Limits	Speed limit signs incorrect
Contractor Behavior	Over all good compliance with the exception of the following: Long response time to fix issues Traffic regulators untrained
Safety	Contractor interference with traffic (ingress/egress/unloading) Poor pedestrian considerations Signs not ballasted enough to prevent blow-over Edge drops

Included in Appendix B is an in depth look at the common challenges that are seen state-wide.

Corrective Strategies

In order to ensure that improvements are seen during the 2009 and 2010 construction seasons, the general trends and challenges, found during the 2008 construction season, have been communicated to MDOT staff during conferences and Work Zone Safety and Mobility training. The following is a list of some of the opportunities that were used in 2009 to communicate proposed corrective strategies:

January 22, 2009	Presentation to Michigan Infrastructure & Transportation Association
February 19, 2009	Presentation to all region and TSC permit engineers
March 3, 2009	Construction and Materials Conference
April 15, 2009	Structures and Maintenance Conference
March 5, 2009	MDOT Co-Op training, Superior Region

This report will be shared with industry to collaborate and improve on the challenges that continue to be seen throughout the state.

It is clear that an area of concern across the state is the performance and safety of traffic regulators. MDOT is working with industry to update the current traffic regulator training requirements.

In 2007, MDOT created a Quality Compliance Special Provision that requires contractors to fix quality and safety issues within four hours from the time notification is given. If there is a delay of more than four hours, monetary fines are imposed. Due to this special provision, MDOT has seen an improvement in contractor compliance and the quality of temporary traffic control items.

The most recent version of the ATSSA Quality Guidelines for Work Zone Traffic Control Devices has been distributed to MDOT staff and is available to contractors through http://www.atssa.com. These guidelines are used in all MDOT projects to aid in the determination of the quality of temporary traffic control devices.

In early 2009, a Work Zone Business Team (WZBT) was created that includes representatives from each region. The WZBT addresses region and state-wide issues, shares best practices and discusses new products and technology which may improve safety and mobility through work zones.

Future work zone reviews will include an emphasis on permit activities and local agency projects for compliance to current standards and the Final Rule for Work Zone Safety and Mobility.

Conclusion

During 2008, MDOT staff inspected 347 projects for compliance with current standards and specifications for temporary traffic control through work zones. Some areas of concerns are traffic regulators, pedestrians in work zones, temporary signs, temporary concrete barrier wall and edge drops.

A number of corrective strategies have been introduced in an effort to bring about improvements for the 2010 construction season. For example, MDOT is working to revise the existing traffic regulator training process in an attempt to improve contractor compliance. A committee, which includes MDOT planning, design and delivery staff, is working to develop new guidelines for the safety and mobility of pedestrians through work zones. A work zone business team was created to share state-wide best practices for work zone traffic control.

While there are still challenges to work zone traffic control, the 2008 Work Zone Reviews were a great opportunity to see what is working and where improvements need to be made. MDOT is currently improving its work zone safety and mobility review process in order to meet the requirements of the Final Rule. It is anticipated, that with the knowledge of the results shown in this report, considerable improvements will be made in 2010.

Appendix A: Work Zone Review Questionnaire

2008 Annual Work Zone Review Questionnaire

Region:		
Typical Work Zone Review Inspection Team Members (Name or Position) or Consultant Name and Personnel:	1.	
	2.	
	3.	
	4.	
	5.	
	6.	
	7.	
Number of Daytime Project WZ Reviews:		
Number of Nighttime Project WZ Reviews:		
Total Number of Projects Reviewed:		
Number of times an office had to utilize the Special Provision for Traffic Control Quality and Compliance:		
Number of times a contractor complied before monetary adjustment was implemented:		
Number of times a monetary adjustment was assessed:		
Total Value of Adjustments:		
What was the most prominent work zone challenge encountered (including temporary traffic control, Contractor Response, traffic, utilities, etc.):		

2008 Annual Work Zone Review Questionnaire

Please note specification compliance with the following temporary traffic control items including quality, ability to repair/replace, special uses, unique circumstances, etc.	
Temporary Traffic Control Signing	
Lighted Arrow Panels	
Temporary Pavement Markings	
Channelizing Devices (Barrels, Cones, etc.)	
Traffic Regulators	
Lane Closures/Shifts	
Message Boards	
Detours	
Temporary Concrete Barrier	
Attenuators	

2008 Annual Work Zone Review Questionnaire

Temporary Speed Limits	
Were any unique or special devices used on your projects? Were there any issues? Please provide additional information.	
How did the contractor respond to deficient items?	
Were there any safety items or issues that required immediate action? Please explain.	
Was the MDOT Traffic Control Review Form utilized? If not, what format or form was used?	
What changes would you suggest to the MDOT Traffic Control Review Form? Please explain.	

Appendix B: State-Wide Work Zone Review Data

The information in the following spread sheet was gathered from each region using the 2008 Work Zone Review Questionnaire (Appendix A).

2008 Work Zone (WZ) Review Summary

	Bay	Grand	Metro	North	Southwest	Superior	University	Totals
Number of Daytime Project WZ Reviews:	96	24	20	97	89	186	128	**640**
Number of Nighttime Project WZ Reviews:	13	7	12	19	26	5	22	**104**
Total number of Projects Reviewed	24	33	15	36	115	67	57	**347**
Number of times the Special Provision for Traffic Control Quality and Compliance was utilized	7	6	22	10	4	10	44	**103**
Number of times a contractor complied before monetary adjustments were implemented	7	6	13	8	3	10	35	**82**
Number of times a monetary adjustment was assessed	0	0	2	2	1	0	9	**14**
Total value of adjustments	NA	NA	$ 6,000	$ 300	$ 300	NA	$ 5,050	**$ 11,650**

2008 Work Zone Review Summary
Most Prominent Work Zone Challenge

1	Freeway to freeway detour signing
2	Keeping up with changing traffic volumes
3	Unforeseen construction delays
4	Compressed contractor schedules and frequent traffic control changes
5	Challenge to provide drivable pavement width
6	Clearance for traffic shifts
7	Challenge working in ramp gore areas and moving traffic safely to those areas
8	Merge ramps
9	Balance worker and motorist safety
10	Difficulty getting contractor performing work in a more timely manner
11	Contractor working outside of the daily allotted time frame
12	Contractor buy in on the Work Zone Safety and Mobility Policy and maintaining mobility during peak hours
13	Keeping the contractor confined to closure lengths set forth in the contract
14	Contractor response time
15	Contractor setting up Temporary Traffic Control (TTC) when it varies daily
16	Motorist safety while construction equipment is working on a closed roadway
17	Maintaining local traffic to businesses on closed routes
18	Staging traffic shift through winter work
19	Using Truck Mounted Attenuator (TMA) to set up or take down TTC
20	Project / Corridor mobility when concurrent projects have detours
21	Revising detours and closures for special events, local business and local resident concerns
22	Contractor response time on fixing TTC items during the project and TTC clean up after the project was complete
23	Contractor blocking traffic to unload materials
24	Maintain access to intersections and drive ways
25	Contractor lacking sufficient and/or qualified staff to complete daily temporary sign issues
26	Traffic regulator positioning and performance
27	TTC for construction and permit/utility projects not meeting NCHRP 350 requirements (excludes maintenance projects)
28	Contractor not having correct signs for short term lane closures
29	Contractor not moving TTC with moving operations
30	Maintaining TTC measures, especially when changing stages
31	Getting contractor to understand the importance of MDOT TTC
32	Construction equipment interfering with traffic when trying too maneuver around other construction equipment inside a lane closure
33	Maintain safe work zones while trying to improve mobility: using traffic shifts instead of flag control and having to reduce buffer areas
34	Signage for unforeseen complications
35	Temporary sign placement and bottom height
36	Traffic regulator location and lack of intermediate flaggers
37	Too many MDOT typicals and MDOT requiring too many signs (worker safety)
38	Device quality and performance of traffic regulators
39	Lack of pedestrian accommodations
40	Incorrect devices
41	Devices were not stored correctly off shoulder when not in use
42	Public complaints for long detours

2008 Work Zone Review Summary
Temporary Signing

1	4'x4' signs with holes too large for washers (falling apart)
2	Poor sign quality: scratched, torn, poor day/night reflectivity
3	Lights falling off NCHRP 350 signs (holes too big)
4	Signs improperly stored when not in use
5	Lack of prompt sign removal at the end of projects
6	Contractors are opposed to cover Stop Signs as it is against their policy (Howard City)
7	Lack of temporary traffic control cleaning and maintenance
8	Low bottom heights in curbed areas
9	Limited sight distance due to sign placement
10	Signs not plumb when installed on driven supports
11	Improper or poor sign covers
12	Conflicting signs not covered
13	Improper sign storage when not in use
14	Temporary signs not driven when possible
15	Signs in excess of 20 sft placed on portable supports or on driven supports that are too small
16	Supplemental signs were installed improperly such that they blocked portions of the parent sign or were installed on wrong supports
17	Improper "D" distance sign placement
18	Improper sign fabrication (wrong font, wrong colors, wrong symbol, etc)
19	Type C lights were either out of proper orientation, missing or not working
20	Limited ballast on signs resulting in signs blowing down
21	Incorrect and incomplete sign sequences
22	Had to reject some temporary signs and barrels because of cleanliness and bad sign conditions

2008 Work Zone Review Summary
Lighted Arrow Boards

1	Arrow board having the feet down, in the correct mode and good visibility
2	Some arrow boards had dim lights or lights out
3	Slow response time to fix issues by the subcontractor
4	Improper position/placement: blocked by trees, curves, temoprary traffic control, contractor equipment, etc
5	Battery occasionally needed recharged or replaced
6	Fair amount showed up in poor working conditions
7	Missing conspicuity tape

2008 Work Zone Review Summary
Temporary Pavement Markings

1	Added barrels in some cases
2	Contractor not installing temporary tape properly resulting in poor performance
3	Poor performance when installed correctly (tearing, push, peel, durability issues)
4	Contractor remembering to include temporary paint for cold weather projects instead of tape
5	Blackout tape was used with good success, however the usage extended beyond the 10-day limit
6	Some problems with temporary tape coming up or shoving

2008 Work Zone Review Summary
Channelizing Devices

1	Some lights on barrels out
2	Contractor not keeping up on cleaning channelizing devices on long projects
3	Excessive spacing on drums
4	Drums with missing, damaged and/or non-operating lights especially later in the season
5	Drives and side streets not properly delineated
6	Some areas cluttered with drums making it difficult to find driveways
7	Drums used to delineate Portable Changeable Message Sign's (PCMS) were often orphaned during the project
8	Dirty drums Difficult to get contractor to clean
9	Channelizing devices in poor condition when brought to job site
10	Device spacing
11	Some reflective material marginal

2008 Work Zone Review Summary
Traffic Regulators

1	Not enough intermediate regulators
2	Position of regulator (in lane, no escape path, etc)
3	"Labor Ready" employees provide most deficiencies (not trained by AASHTO)
4	Some regulators on freeway ramps were easily confused: stopping ramp traffic, as opposed to trucks entering / exiting site
5	Many not attentive
6	Sitting on arrow board with back to traffic
7	Traffic regulators stepping out in to traffic
8	Sign sequences incomplete
9	Sign sequences left up with no regulator activity taking place
10	Regulators not equipped with Stop/Stop paddles when required
11	Stop/Slow paddles in poor conditions
12	Using "Indy 500" hand signals
13	Regulator station not defined with lighted arrow in caution mode
14	Contractor reluctant to reduce the number of lanes
15	Inattention
16	Intermediate traffic regulator without radio communications
17	No escape route
18	Improper paddles
19	Incomplete Personal Protection Equipment (PPE)
20	Signals inconsistent
21	Traffic regulators sitting while working traffic

2008 Work Zone Review Summary
Lane Shifts and Closures

1	Problems with lateral clearance
2	Not providing enough pavement
3	Short L distances due to improper calculations
4	Improper and/or incomplete sign sequences
5	Missing required 2L between land drops or shifts
6	Missing edge lines along tapers and shifts after 3 days
7	Permit projects poor compliance

2008 Work Zone Review Summary
Message Boards

1	Improper message
2	Left on shoulder with static messages
3	Difficult to get malfunctioning message board replaced
4	Dim lights
5	Difficult to get contractor to removed board when not needed
6	Difficult to get message changed during off hours
7	Static and out dated messages
8	Poor placement (blocked by trees, curves, etc)
9	Not working/ malfunctioning
10	Not properly delineated
11	Incoherent/garbled messages Poorly worded messages
12	Difficult to get contractor to removed board when not needed
13	Battery theft
14	Some confusing messages
15	Sometimes missing conspicuity tape

2008 Work Zone Review Summary
Detours

1	Challenging due to traffic volumes, project requirements, changing construction activities, etc
2	Improper sign placement
3	Improper bottom heights
4	Sign supports placed in middle of sidewalks
5	Signs blown over
6	Contractor did not pay attention to signs on detour routes
7	Lack proper guidance and signing
8	Large gaps between signs
9	Signs missing at critical turns
10	Improper sign sizes
11	Signs left in place when detour is no longer applicable
12	No signing in the advance warning area

2008 Work Zone Review Summary
Temporary Concrete Barrier (TCB)

1	Pins not always engaged
2	Clean up after TCB was removed
3	Access issues for maintenance
4	Transportation Service Center (TSC) would like to increase the use of glare screen
5	reflector replacement very difficult
6	Poor condition of R54 style
7	Large spalls
8	Patched spalls fell out
9	Broken Cable loops
10	Large snag points where wall not properly aligned
11	Improper connection of different style walls
12	New style TCB using bolts as pins have large spalls/cracks at connection
13	Poor quality delivered to job site
14	Poor adhesion of reflectors
15	Fair amount delivered to jobs in poor conditions

2008 Work Zone Review Summary
Attenuation

1	Providing appropriate roll ahead
2	Contractor had issues understanding the correct angles, and buffer zones
3	Poor conditions of truck mounted attenuators: were very damaged, had poor reflectivity, rusty, etc
4	Contractor seldom has trained installer
5	Low water levels in water filled attenuators
6	Segment placement sequence of water filled attenuators not per the manufacturer's specifications
7	Missing parallel segment of TCB directly downstream from the water filled attenuator as per manufacturer's specifications
8	Some sand module attenuators missing proper number of modules
9	Some tops loose with wet sand
10	Some modules damaged by contractor but still in use
11	Some water filled attenuators not connected to the TCB per manufacturer's specifications
12	Many non-NCHRP 350 compliant TMAs being used on projects early in season
13	TMA short roll distance an issue
14	Not using TMAs when required
15	Improper placement of TMAs

2008 Work Zone Review Summary
Temporary Speed Limit

1	Where Workers Present (WWP) not always followed by drivers
2	Contractors want slower speeds
3	Contractors driving well above the posted speed limit within the closed portion of the project, adjacent to traffic
4	Some contractors want 35mph shoulder closures on 55 mph road segment
5	Where workers present 45 signs used improperly
6	WWP signs used when workers are protected by temporary concrete barrier (TCB)
7	WWP sign being used as a stand alone sign
8	WWP sign being used on roads with a speed limit of 45 mph
9	Conflicting signs not covered
10	Speed reductions being used improperly for shoulder closures
11	Usage of Speed limit 45 on a 55 mph freeway when WWP 45 sign would have been more appropriate
12	Many sign sequences lacked the required speed limit after the work zone begins sign
13	WWP signs used when workers are protected by TCB

2008 Work Zone Review Summary
Unique Devices

1	Temporary traffic signal system with traffic sensors adjusted to which ever direction was busier
2	Dynamic queue notification was accurate but not easy to move. It was used only for the first stage of the US-10 project
3	Muskegon Transportation Service Center (TSC) always used a left lane closure on freeways with a traffic shift to close the right lane. It worked great and the contractors liked it
4	Signs provided to inform the motorists of approved contractor ingress / egress points of work area Also upgraded shoulders in these areas to prevent rutting
5	Barrier safety gate from Barrier System, Inc. used to provide emergency access through the temporary concrete barrier separating bi-directional freeway traffic. Length of gate needs to be a minimum of two gates long to provide larger turning radius of fire engines and tow trucks.
6	Real time information/ITS system used to inform motorists of delay time through work zone and travel times on alternate routes. Slow speed queue detection was also used. This system works well for the most part. However, there is, at times, loss of communication between devices due to sensor failures and part availability. Battery theft is an issue.
7	Wet retro reflective preformed tape for the temporary pavement marking at the I-75 bridges, as well as the transverse temporary rumble strips prior to each bridge. The placement of the temp rumbles did cause some traffic backups on I-75 as we had to go down to 1 lane during the day to place them. In general, the above treatments limited crashes to below normal levels in the I-75 corridor during construction .
8	Temporary concrete barrier being buried in back slope. Great idea and it did work well.
9	Utilized law enforcement.
10	SP for temporary signal. The interconnect failed causing minor delays .
11	Used SP for Centerline Delineators, TEMP and did not have any issues with it

2008 Work Zone Review Summary
Contractor response

1	Response time too long. The contractor responds when told to fix it or stop working. The Special Provision (SP) for Quality Control and Compliance helps gain prompt action
2	Work site traffic inspectors not well trained and had other tasks to do
3	Sometimes had to issue notice of non-compliance
4	Sometimes had to threaten with SP for Quality control and compliance

2008 Work Zone Review Summary
Safety Issues Requiring Immediate Action

1	Traffic control items out of place
2	Narrow lanes and shoulders causing run-offs, resulting in lower shoulders and more run-offs
3	Closing ramps not designed to be closed due to unsafe merging and backups experienced
4	Barrier wall adjustments for hits
5	Signal timing was constantly adjusted to provide safer work zones and greater mobility. Turning movements were key.
6	Arrow board hits located in the taper and near an interchange
7	Contractor had construction equipment in the same lane that local traffic was occupying.
8	Blunt ends of temporary concrete barrier (TCB) wall exposed to motorists
9	Dead arrow boards
10	Poor pedestrian considerations
11	Improper mobile attenuator usage
12	Temporary control devices during emergency situations
13	Downed signs
14	Traffic making continuous efforts to make u-turns to gain access to I-96. Additional temporary signs were used for motorist information. Also used law enforcement
15	Glare screens falling off
16	High frequency of rear end accidents lead to shoulders being upgraded to get construction traffic out of the through lane
17	Equipment in open traffic lanes
18	Traffic regulator inattention
19	Incorrect signing
20	Excessive traffic relay required shortening a lane closure
21	Detour adjustment was required to improve traffic flow
22	Safety concerns at a bridge widening required acquisition and placement of TCB
23	Contractor left an edge drop at the edge of the active travel lane over night. Contractor needed to build a 1 on 3 slope daily before taking down the lane closure
24	Motorists crashing through US-2 closure barricades. Signs were upgraded to retro reflective, extra barricades and signs were placed along with high intensity beacons placed on lead in signs because of dense fog conditions.
25	Temporary signal timing not being set in the field correctly for the length of the bridge in which unnecessary backups were occurring at several locations in the region. Reset timing in the field to correct backups.
26	Temporary signal issues
27	Problems with traffic regulators (device quality and performance)

2008 Work Zone Review Summary
Other issues and suggestions

Type III Barricades	Insufficient quantity used when closing roads or ramps
	Gaps between Type III's
	Stripes pointing in wrong direction
	Not using double sided sheeting when needed
	Place parallel to traffic
	Minimal or no ballast
Contractor Conduct	Storage of equipment and/or material in the clear zone without proper shielding
	Contractor points of ingress/egress not signed properly, poorly placed or were too frequent
	Not closing contractor access at the end of the work day
Traffic Signals	Improper alignment and over wrong lanes
	Wrong legend in case signs
	Signal heads not bagged/deactivated - including pedestrian signal heads
	Trailer mounted signs with improper offset
	Trailer mounted signals in place but not in operations with the heads not bagged
Conspicuity Tape	Many pieces of equipment and traffic control devices were missing or lacked adequate conspicuity tape
Pedestrian Considerations	Little effort for pedestrian mobility
	Lack of adequate guidance in the plans
	Long pedestrian detours and poorly signed
	Detours lacked the required curb drops along the route
	Pedestrians not separated from work site with protective fencing
	Fencing not tight when used
	Pedestrian heads not turned when cross walk was closed
	Signs for closed crossings placed in wrong location or blocked the open section of sidewalk