# Work Zone Safety and Mobility
# Process Review
# Colorado Department of Transportation

**March 18, 2013**

## Acknowledgments

**Conducted by:**

**Dahir Egal**

**Steve Hersey**

**David Haley**

**Brett Locke**

**Charles Meyer**

**Ken Nakao**

**Mark Straub**

**Sean Yeates**

**Laura Zamora**

**Work Zone Safety and Mobility Process Review**
**CDOT**

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## Executive Summary

The FHWA required CDOT to conduct a Process Review every two years to review the Colorado Department of Transportation's (CDOT's) work zone safety and mobility (WZSM) processes and procedures. A CDOT task force was formed in March 2012 and met monthly (twice per month during the 2012 Traffic Control Review (TCR) period to review the WZSM procedures, and collected comments made by the following stakeholders involved in the TCR of their construction projects during the summer of 2012: Region design personnel, construction project engineers, and traffic operations personnel; Contractor traffic control supervisors (TCS) and construction superintendents. The CDOT task force reviewed the comments, and based on those comments, some of the key findings included:

- Implementing the CDOT WZSM Procedures added costs to the projects, but provided safe traffic maneuvering through work zones.
- The Regions were implementing their respective lane closure strategies successfully.
- We found examples of well-coordinated public outreach and relations efforts on projects we reviewed.
- Projects were utilizing custom operation strategies that exceeded required minimum CDOT Traffic Control and Operations strategies.
- Variable message signs were being used to provide real time information, in cases of extended delays, and also to notify the traveling public of upcoming construction.
- Various methods of data collecting were used to measure traffic queues and delays along work zones. A standardized method of data collecting is needed to ensure consistency within the State.
- Additional training requirements for traffic control personnel are needed to ensure safe traffic control in work zones.
- Traffic control personnel should always be alert and prepared in any work zones.
- Whoever is responsible for traffic control must have plenty of traffic control devices (TCD's), and be prepared to adjust the locations of the TCD's in accordance to the traffic situation at that moment.
- There is a need to improve the implementation of pedestrian and bicycle paths, crosswalks, and/or stop bars into the Method of Handling Traffic (MHT) for projects.
- There is a need to establish a debriefing process in the WZSM procedures.

## Background

In September 2004, the Federal Highway Administration (FHWA) published updates to the work zone regulations at 23 CFR 630 Subpart J, referred to as *Work Zone Safety and Mobility Rule*. In December 2007, FHWA added new regulations at 23 CFR 630 Subpart K referred to as *Temporary Traffic Control Devices Rule*. Both are applicable to all Federal-Aid Highway Projects with the intent to improve work zone management and decrease the likelihood of fatalities and injuries to road users and workers exposed to motorized traffic. The Safety and Mobility Rule was effective on October 12, 2007 and the Subpart K was effective on December 4, 2008.

The Colorado Department of Transportation's (CDOT) WZSM policy directive (805.0) became effective October 2008, with accompanying procedures that were completed January 2009. The first Process Review was conducted during the summer of 2010, covering six (6) projects. CDOT has since implemented the recommendations from that review.

For this Process Review, six (6) projects were reviewed. This Process Review focused on programs and policies related to elements of the Rule that could assist or be added to the procedures or the next Process Review.

The results of the review are intended to lead to improvements in work zone processes and procedures, data and information resources, and training programs so as to enhance efforts to address safety and mobility on current and future projects. According to the Rule, the review may include the evaluation of work zone data at the State level, and/or review of randomly selected projects throughout their jurisdictions.

## Purpose Statement

The purpose of this review is to assess the effectiveness and consistency of WZSM policies and practices for design, construction, maintenance and operations. The WZSM Process Review Team assessed the effectiveness and work towards consistent implementation and better understanding of current policies and practices throughout CDOT. The focus of this WZSM Process Review is to improve the safety and efficiency of work zones. This includes, but is not limited to:

- Speed reduction practices.
- Full closure procedures.
- Lane closures adjacent to, or in vicinity of, CDOT projects.
- Use of positive protection devices.
- Transportation Management Plan (TMP) implementation.
- Monitoring daily WZSM performance.
- Knowledge-sharing of work zone safety operations and best practices among the six (6) Regions of CDOT
- Variable Message Sign (VMS) board messaging.
- Researching the performance and certification of the TCS' and flaggers.

## Scope

The scope for this review team was to review CDOT's processes and procedures as they relate to WZSM at both the program and project levels. A multidisciplinary review team included representation from Headquarters, Regions, construction, traffic, maintenance, and FHWA evaluated what was working well, what was not working well and needed adjustments, and determined how to improve the safety and efficiency of CDOT work zones. To conduct these reviews, the review team used a process similar to that used to conduct quality assurance reviews. The review team included:

| Review Team Members | Title, Office | Member Roles |
|---|---|---|
| **Dahir Egal** | Safety/Traffic Engineer, FHWA | Team Member |
| **David Haley** | Region 6 Maintenance, CDOT | Team Member |
| **Steve Hersey** | Region 6 Traffic Engineer, CDOT | Team Member |
| **San Lee** | Safety/Traffic Engineer, CDOT | Team Member |
| **Brett Locke** | Region 4 Resident Engineer, CDOT | Team Member |
| **K.C. Matthews** | Safety/Traffic Engineer, CDOT | Team Member |
| **Charles Meyer** | Safety/Traffic Engineer, CDOT | Team Leader |
| **Ken Nakao** | Safety/Traffic Engineer, CDOT | Team Leader |
| **Mark Straub** | Area Engineer, CDOT | Team Member |
| **Sean Yeates** | Region 3 Resident Engineer, CDOT | Team Member |
| **Laura Zamora** | Area Engineer, CDOT | Team Member |

Projects were identified statewide from one of the TCR projects, and one project in each of the six (6) CDOT Regions was reviewed in conjunction with the annual TCR program. The six projects that received both a TCR field and office visit also completed the Process Review surveys.

The review plan was to survey the six project designers, project engineers (construction), and the Region Traffic Operations Engineers involved in the traffic control of the projects at the CDOT Offices, using a questionnaire format (Appendix A). The questionnaires contained a series of questions specific to design, construction, traffic operations, TCS', and construction superintendents. Upon completion and review by the review team, best practices and recommendations were documented. Results of both the TCR program (Appendix B) and the Process Review were presented to each CDOT residency and to maintenance. Any follow up actions as a result of the Process Review will be documented and assigned to the appropriate CDOT branch for resolution.

List of Projects Reviewed

| Region | Date Reviewed | Project Number | Roadway | Project Location |
|---|---|---|---|---|
| 1 | FY 13 | 18648 | SH 70 | I-70 Frontage Road Improvements |
| 2 | FY 13 | FBR 0252-4 | SH 25 | NB Bridge South of Fountain |
| 3 | FY 13 | NH 0701-21 | SH 70 Bus | West of Rimrock, Grand Junction |
| 4 | FY 13 | STA 0072-0 | SH 7 | Cherryvale Rd to N. 75th St |
| 5 | FY 13 | NH 1601-06 | SH 160 | Cortez to Mesa Verde Interchange |
| 6 | FY 13 | C 1211-073 | SH 121 | Bridge Over Bear Creek |

## Successful Practices

*Successful Activity 1:* Projects are utilizing custom operation strategies that exceed required minimum CDOT Traffic Control and Operations strategies.

*Recommendation 1:* CDOT should update the WZSM Procedures to be consistent with the current specifications.

*Responsible Party:* CDOT Safety and Traffic Engineering Branch.

*Successful Activity 2:* Of the projects reviewed, there are examples of well-coordinated public outreach and relations efforts.

*Responsible Party:* Regions' Resident Engineers, Project Managers and Project Engineers; Public Relations, Traffic Operation Center, and Contractors.

*Successful Activity 3:* Variable message signs are being used in the cases of extended delays and to notify the traveling public of upcoming construction.

*Responsible Party:* Regions' Resident Engineers, Project Managers and Project Engineers; Public Relations, Traffic Operation Center, and Contractor.

## Observations/Recommendations

*Observation 1:* Maintenance personnel were not surveyed for this Process Review and some questions in the survey need to be further defined.

*Recommendation 1:* The 2015 CDOT Process Review should develop questions related to WZSM for maintenance personnel and review the survey/results to further define the questions to be beneficial for the Process Review.

*Responsible Party:* 2015 Process Review Team

*Observation 2:* Traffic queues and/or delays were not consistently documented on projects.

*Recommendation 2:* Develop a standardized method of documenting and regulating traffic queues and/or delays, based on the CDOT WZSM Procedures, Sec 630.10 (3) of the CDOT Standard Specifications for Road and bridge Construction, and the Region's Lane Closure policies.

*Responsible Party:* CDOT Project Development Branch and Safety and Traffic Engineering Branch

*Observation 3:* CDOT WZSM Procedures were not consistent with the current specifications for overall temporary traffic control.

*Recommendation 3:* The WZSM Procedures should be updated to be consistent with the current specifications.

*Responsible Party:* CDOT Safety and Traffic Engineering Branch.

*Observation 4:* Missing was a traffic control work zone debriefing process.

*Recommendation 4:* The CDOT WZSM procedures should be revised to include a traffic control work zone debriefing process.

*Responsible Party:* CDOT Project Development Branch and Safety and Traffic Engineering Branch.

*Observation 5:* TMP components have not consistently met standard expectations on significant projects.

*Recommendation 5:* The WZSM Procedures should be updated to ensure that important TMP components are addressed and included in all future significant project TMP's; and to revise current TMP procedures, including TMP evaluation guidelines for all significant projects.

*Responsible Party:* CDOT Safety and Traffic Engineering Branch

## Follow-up Actions

The following table summarizes the observations and recommendations from the Process Review. These follow up actions relate directly to the development of the WZSM guidelines in which FHWA will continue to work directly with CDOT.

| Activity/ Observation | Summary | Follow-up Action | Responsible Party | Target Date |
|---|---|---|---|---|
| | | | | |
| Observation 1 | Maintenance personnel were not surveyed for this Process Review and some questions in the survey need to be further defined. | The 2015 CDOT Process Review should develop questions related to WZSM for maintenance and review the survey/results to further define the questions to be beneficial for the Process Review. | 2015 Process Review Team | FY 2015 |
| Observation 2 | Traffic queues and/or delays are not being consistently documented on projects. | Develop a standardized method of documenting and regulating traffic queues and/or delays, based on the CDOT WZSM Procedures, Sec 630.10 (3)(i) of the CDOT Standard Specifications for Road and bridge Construction, and the Region's Lane Closure policies. | CDOT Project Development Branch and Safety and Traffic Engineering Branch | |
| Observation 3 | CDOT WZSM Procedures are not consistent with the current specifications for overall temporary traffic control. | The WZSM Procedures should be updated to be consistent with the current specifications. | CDOT Safety and Traffic Engineering Branch | |
| Observation 4 | Missing is a traffic control work zone debriefing process. | The CDOT WZSM Procedures should be revised to include a traffic control work zone debriefing process. | CDOT Safety and Traffic Engineering Branch | |
| Observation 5 | TMP components have not consistently met standard expectations on significant projects. | The WZSM Procedures should be updated to ensure that important TMP components are addressed and included in all future significant project TMP's. | CDOT Safety and Traffic Engineering Branch | |

## Conclusions

This review looked at one project in each CDOT Region with the goal of understanding how today's work zone practices can help shape future efforts to make Colorado's work zones operate effectively and be as safe as possible. We appreciated the cooperation and open communication that was very evident with both the Region and Headquarter office staff that participated in this review.

CDOT continued to take pride and was doing a commendable job in the execution of work zones, and the continued evaluation of work zones throughout the life of a project.

As with all processes and procedures, this review confirmed that there are opportunities for better coordination and management of work zones. This report identified several good practices but also identified a number of items that were being implemented differently. As CDOT continues to develop their safety and mobility implementation guidelines, these findings can act as a guide to improved these processes and procedures.

# 2012 Work Zone Process Review
# Results Summary for CDOT's Work Zone Safety and Mobility Survey

The following are questions are questions that were given to project personnel in Design, Construction, and Traffic Operations. General assumptions and recommendations were reviewed by the Work Zone Process Review Task Force.

## Design Personnel Questions

1. Did the designers for this project take the WZSM training provided by CDOT within the last three (3) years?
   **5 of 6 Answered "Yes"**

   **Recommendation:**
   - In this survey question, also ask "If no, why they did not take the training within the past 3 years".

2. What traffic control plan (TCP) and WZSM Procedure required strategies were commonly utilized on this project (see page 20-37, http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-safety-mobility/WZSM_Procedures.pdf/view)?
   **Answers include:**
   - Used a TCP specification, a traffic control management plan specification, and utilized courtesy vehicles as well as piloting bicyclists through the project site. NO motorized traffic except emergency vehicles were allowed on the road.
   - Single lane closure Typical Application 33 from MUTCD, Chapter 6.
   - The Contractor had the responsibility to determine construction phasing. The Contractor was required to maintain two through lanes in each direction during the day. The plans including numerous Traffic Control Devices; including temporary signs, changeable message signs, arrow panels, channelizing devices, temporary pavement markings, temporary traffic signals, flaggers and uniformed traffic control. The Contractor was also required to have a public information (PI) manager able to handle all press releases and news conferences.
   - Adhere to MUTCD in phasing plans. Adhere to AASHTO green book for detour alignments. Ensure enough temporary traffic control devices were included in project.
   - Reviewed lane use, upcoming special events, received Maintenance and City input. Project was deemed Non-significant.
   - Reduced Lane Widths Lane closure. Two-way traffic operations on one side of divided facility (crossover), construction phasing work hour restrictions, signage CMS/DMS/VMS Temporary traffic barrier.

**Recommendation:**

- Compare survey result strategies to those outlined in the WZSM Procedures, and update the procedures with any new strategies.
- Post the final Process Review in the CDOT Intranet site, and notify all stakeholders of its location. The stakeholders include: CDOT engineers, maintenance, and project personnel.

3. Have the WZSM Procedures positively, or negatively, affected project delivery and costs?

   **3 of 6 Answered "Positively"**

   - The items in the contract would have been included even if WZSM Procedures were not in place.
   - As number of traffic control items increased, cost increased.
   - Cost impact due to lane use was anticipated.
   - WZSM procedures have standardized the design process of TCP, enabling a streamlined plan delivery, and efficient use of design funds to put the plans together.

   **Recommendation:**

   - In the next Process Review, further define this question to enable participants to answer "positively" or "negatively".
   - Add in this question that "if the answer is 'negatively', why?"

4. Please explain any overall concerns you have with the WZSM Procedures.

   **Answers include:**

   - Many of the WZSM Procedures cannot be justified to be used in cities the size of Grand Junction and seem more suited for much larger areas.
   - No concerns. The WZSM Procedures are absolutely needed. It just adds costs to the project.
   - Seen poor workmanship and errors during night work.

   **Recommendation:**

   - Address these concerns with each individual surveyed
   - Rewrite this question; make it more specific.

5. Did any elements, such as right-of-way, environmental, ADA requirements, utilities, etc., affect your WZSM procedures? If yes, explain/give example.

   **4 of 6 Answered "No"**

   - Utility relocations and construction of the widening did affect our use of the WZSM procedures.
   - Right-of-way was tight along corridor, so there was no room to provide temporary traffic routing. Construction had to be phased to maintain traffic within the existing roadway section.

   **Recommendation:**

   - Maybe this question should be deleted from future questionnaires because sometimes the elements do, and sometimes the elements don't.

6. During project scoping, was the minimization of road users impacts considered?
   6 **of 6 Answered "Yes"**
   - The project had no choice but to close the site to all but bicyclists and pedestrians, and emergency project.
   - A lane rental rate was established to help minimize road user impacts.
   - The Contractor determined how to phase his work, and coordinate business accesses with the individual businesses.
   - The project construction was phased to minimize impacts to the traveling public. Instead of phasing the construction for the full two-mile length, the phasing was broken out in an east/west phase so no one entity would be faced with construction during the entire two-year duration.
   - Balancing user impacts with constructability is always a concern at all project stages.
   - Project construction was phased to minimize complexity. The work zone was closed to all traffic, except bicycles, pedestrians, and emergency vehicles.

   **Recommendation:**
   - None – Continue to measure.

7. Has the implementation of the WZSM Procedures caused you to consider additional or different strategies than what has been used in the past?
   **4 of 6 Answered "Yes"**

   **Recommendation:**
   - Add to the question with, "If Yes, how?"

8. Was a modeling software used to analyze work zone traffic impacts for this project, other than for lane closure policy?
   **5 of 6 Answered "No"**

   **Recommendation**
   - Add to the question with, "Why or why not?", or ask "Do you think a modeling software would have benefitted this project?"

9. Was consideration given to potential work zone impacts, including delays, and does that influence the evaluation and selection of a build alternative?
   **4 of 6 Answered "Yes".**

   **Recommendation**
   - None – Continue to measure.

10. If this project was on the interstate within a Transportation Management Area, was an exception request submitted to FHWA?
    **5 of 6 Answered "No".**

    **Recommendation**
    - Further awareness and training is needed regarding the Transportation Management Area and FHWA regulations.
    - Break up this question into two (2) parts, as follows: "Was this project in a Transportation Management Area (TMA)?", and "If yes, was an exception granted?"

11. Was a draft traffic control or phasing plan prepared prior to the FIR?
    **3 Answered "No", and 3 Answered "Yes".**
    - A TCP was prepared prior to the FOR.
    - Project was design/build type, so the TCP was completed at around the FOR timeframe.
    - A basic TCP (*add pavement to the shoulders and shift traffic)* was determined prior to FOR, but the Contractor proposed a different phasing plan that was accepted.
    - Draft phasing plan was prepared for the FIR, and it was reviewed with construction personnel before final TCP's were developed.

    **Recommendation:**
    - None – Continue to measure.

12. Was a Transportation Operation Plan *(See Sect 630.10 (b) of the CDOT Standard Specification book)* considered prior to the FIR?
    **3 of 6 Answered "Yes"**

    **Recommendation:**
    - Further define in the next Process Review.

13. Was the funding for the Transportation Operation Strategies included in the initial design estimate for the project?
    **3 of 6 Answered "Yes"**
    - The 630.10 was required as part of the RFP

    **Recommendation:**
    - None – Continue to measure.

14. What transportation operation strategies being used? http://www.dot.state.co.us/Traffic_Manuals_Guidelines/Work_Zones/WZSM/WZSM_Procedures.pdf) (see page 26-33)
    **Answers include:**
    - Pilot cars, courtesy vehicles, additional flaggers, and road closure of the entire road.
    - PI, messaging, higher lane rental rates during peak travel hours.
    - Force account for Uniform Traffic Control, which could be used for police enforcement/presence. The city police are often good about patrolling our reduced speed zones without us having to request (and pay) them.
    - None; the project was *Non-significant.*
    - None because the transportation operation strategies did not fit well with the type and location of our project.

    **Recommendation:**
    - None – Continue to measure.
15. Was there communication between traffic designers and the Region Traffic Operations Engineer?
    **6 of 6 Answered "Yes".**

    **Recommendation:**
    - None – Continue to measure.

# Construction Project Engineer Questions

1. What Traffic Control Plan (TCP) and WZSM Procedure required strategies were commonly utilized on this project?
   **Answers include:**
   - Road was closed to traffic.
   - A TCP was implemented which impacted one lane at a time for NB I-25. The TCP was similar to the Zipper-Lane plan.
   - Lane closures on the main thoroughfare of the project during off-peak traffic hours.
   - Fines Doubled, reduced speed, enforcement, proper TCC devices, UTC, etc.
   - MHT's (Reviewed and Approved), Flash Arrow Panel (C Type), and Safe Flagging practices.
   - Region Lane Closure requirements, pedestrian detour routes, bicycle trail detour routes, vehicle detour routes, lane shifts, reduced lane widths, MHT's, UTC's and VMB's.

   **Recommendation:**
   - Compare survey result strategies to those outlined in the WZSM Procedures, and update the procedures with any new strategies.
   - Post the final Process Review in the CDOT Intranet site, and notify all stakeholders of its location. The stakeholders include: CDOT engineers, maintenance, and project personnel.

2. Have the WZSM Procedures positively, or negatively, affected project delivery and costs?
   **4 of 6 Answered "Positively"**
   - Resourced were limited. All we have are Type 3 barricades with "ROAD CLOSED" sign attached, flaggers to stop traffic from going through the barricade, and advanced warning signs.
   - This was a design/build project, so not sure if it positively or negatively affected project delivery and costs.
   - From a cost standpoint, the WZSM procedures have increased the costs of projects. Contractors have to adjust project schedules and resources in order to meet the required standards. From project delivery standpoint, you are always trying to eliminate the delays and impacts to the traveling public, if at all possible.
   - WZSM Procedures added cost significantly.
   - All the WZSM procedures implemented on this project resulted in safe traffic maneuver along the work zone within the project limits, which in turn, helped the project delivery with minimal conflicts to the work in progress.
   - They have forced work that could have been done in the day to be done at night which increases the cost and negatively effects safety. The number of traffic control devices increased.

**Recommendation:**

- Rewrite question to indicate that WZSM Procedures apply to all projects, regardless of delivery procedures.
- In the next Process Review, further define this question to enable participants to answer “positively” or “negatively”.
- Add in this question that “if the answer is ‘negatively’, why?”

3. Please explain any overall concerns you have with the WZSM Procedures.
   **Answers include:**
   - Just another set of specifications and standards produced to try and dictate how work is accomplished in the field. Construction personnel should be trained on how to recognize situations and use common sense.
   - WZSM procedures costs the project too much money.

   **Recommendation:**
   - Address these concerns with each individual surveyed
   - Rewrite this question; make it more specific.

4. Did any elements, such as right-of-way, environmental, American Disability Act (ADA) requirements, utilities, etc., affect your WZSM procedures?
   **4 of 6 Answered “No”**
   - Limited work space in an urban environment. All of these factors have to be taken into consideration.
   - The TCP did not take into account ADA access to the Bear Creek trail detour. The ADA route with curb ramps required a different route and more traffic control devices.

   **Recommendation:**
   - Maybe this question should be deleted from future Construction Project Engineer questionnaires; we know that sometimes the elements do, and sometimes the elements don’t.

5. Were TMP’s implemented, as designed?
   **4 of 6 Answered “Yes”**
   - Minor adjustments were made but mostly per plan.
   - An ADA detour was added.

   **Recommendation:**
   - None – Continue to measure.

Questions 6 - 8 pertain to adjustments to the TCP:

6. Were field adjustments made to the TCP that required review by the Traffic Engineer? If yes, what were they?
   **4 of 6 Answered “No”**
   - Minor issues, such as working hours, lane closure times, etc.
   - Adjustments to ADA detour.

   **Recommendation:**
   - None – Continue to measure.

7. Were the project managers or designers notified?
   **3 of 6 Answered "Yes", 1 of 6 Answered "N/A", and 2 of 6 Answered "No"**
   - ADA specialist on site to discuss detour.

   **Recommendation:**
   - None – Continue to measure.

8. Were change orders written for changes to the TCP? If yes, please mail or e-mail the change orders to Ken Nakao at HQ (Justification Letter and Form 90).
   **1 of 6 Answered "Yes"**
   - No, but revised plan sheets were issued by Form 105.

   **Recommendation:**
   - None – Continue to measure.

9. If adjustments were made to the speed limits during the course of the project, what criterion was used?
   **Answers include:**
   - Road closure
   - Speed reduction to 50 MPH
   - Available space and lane widths for the traffic. Speed limits for areas surrounding the project site.
   - Constraints, detour radii, and City of Boulder requirements to reduce speed to 25 MPH when a bike lane is merged with traffic.
   - Lane shifts and narrow lanes.

   **Recommendation:**
   - Include in the question ", and was a Form 568 completed?"

10. Were warning signs and devices used for maintenance and protection of traffic?
    **6 of 6 Answered "Yes"**

    **Recommendation:**
    - This answer will always be "yes". Delete this question from future questionnaires.

11. Were all cones, drums, barricades or other channelization devices acceptable?
    **6 of 6 Answered "Yes"**

    **Recommendation:**
    - This answer will always be "yes". Delete this question from future questionnaires.

12. Was a detour required for this project?
    **3 of 6 Answered "Yes"**
    - During intersection closure, phase detours were implemented.
    - There were many detours – all short term detours.
    - Lanes shifted SB traffic to the west into what was the median, and NB lanes were narrowed, and bike and pedestrian detours.

    **Recommendation:**
    - None – Continue to measure.

13. Is the project being completed in stage construction?
    **4 of 6 Answered "No"**
    - East/Rural phase, then west/urban phase.
    - Three (3) phases: East, Center, then the West 1/3 of the bridge constructed.

    **Recommendation:**
    - Reword the question to state "Was the project being completed in phase construction?"

14. Did you receive copies of the crash reports?
    **4 of 6 Answered "No"**

    **Recommendation:**
    - Add to the question, "If no, why not?"

15. Were reduced speed limits in place during non-working hours if no hazards were present to the traveling public?
    **4 of 6 Answered "No"**
    - Speed reductions were left in place to caution drivers of rough road.
    - Continuous hazard 24/7 so this question is N/A.

    **Recommendation:**
    - None – Continue to measure.

16. How were traffic queues and delays measured, and where were they documented?

**Answers include:**

- N/A. Road was closed.
- Traffic queues and delays were measured daily by timing how long it took from beginning to end of project.
- On-site observations. None were documented.
- Flaggers kept track of how long they were holding traffic and limited it to 10 minutes. However, the data was not documented.
- TCS, Flaggers and CDOT Personnel were measuring delays periodically as required. The TCS has been documenting the delays on Traffic Control Daily Diaries.

**Recommendation:**

- None – Continue to measure.

17. What mitigation efforts were in place when traffic queues were greater than the Region Lane Closure Strategy (LCS) threshold?

**Answers include:**

- This project involved a lane rental cost, depending on time of day and lanes impacted. Fees have been tracked throughout the duration.
- Adjustment of work times to non-peak traffic hours.

**Recommendation:**

- None – Continue to measure.

18. If the project deviated from the LCS, did you follow the variance process?
**4 of 6 Answered "Yes"**

**Recommendation:**

- Rephrase the question.

19. On a scale of 1 (worst) to 10 (best), how would you rate the TCS, and why?
**1 was rated a "2", 2 were rated a "7", 2 were rated a "9", and 1 was rated a "10"**

a. Very poor, and inexperienced with urban construction.
b. Fairly new TCS. Gaining experience. Adequate for what is a straight-forward project.
c. TCS has adhered to the Standards, as required.
d. The TCS does his job.

**Recommendation:**

- None –Continue to measure.

20. On a scale of 1 (worst) to 10 (best), how would you rate the flaggers, and why?
**1 was rated a “5”, 2 were rated a “6”, 1 was rated a “7”, 1 was rated an “8”, and 1 was rated a “9”.**
    - Very poor, and inexperienced with urban construction.
    - Multiple flaggers, little experience, poor wages, and very little flagging required.
    - Majority of the flaggers were experienced.
    - Always dealing with new flaggers on the job.
    - They’re bored because the road was closed.
    - Safe flagging practices were being implemented.

    **Recommendation:**
    - None – Continue to measure.

21. Does CDOT need to increase the training requirements of traffic control personnel?
**4 of 6 Answered “Yes”**

    **Recommendation:**
    - More training requirements are needed.

22. Did the Contractor violate the working times?
**6 of 6 Answered “No”**

    **Recommendation:**
    - None – Continue to measure.

# Traffic Operations Personnel Questions

1. How many Region projects have implemented the WZSM Procedures? If you answered "None", please explain.
   **6 of 6 Answered "1 to 25"**
   - Region 1 → 20, Region 2 → 15, Region 3 → 25, Region 4 → 10, Region 5 → 8, Region 6 → 1

   **Recommendation:**
   - Rephrase the question, asking for a percentage and duration.

2. Are projects sequenced to consider the overall network and region-wide impacts?
   **3 of 6 Answered "Yes"**
   - If there were more than one project along the same corridor, yes, we coordinate effort.
   - They are sequenced to reflect funding availability. The projects are designed and phased to reduce impacts, and the remaining network has capacity to spare.
   - Some projects are lumped together, but most are not. Many projects are scattered throughout the Region.
   - Engineering will design the construction phases to limit and mitigate impacts of lane closures, especially in towns/cities with business accesses and peak commuter traffic periods.

   **Recommendation:**
   - This may not be an appropriate question to ask the Region Traffic Operations Engineer because they may not be involved in project sequencing. Remove this question from future Traffic Operations Personnel questionnaires.

3. What PI strategy was used?
   **Answers include:**
   - Project information sign with contact numbers. Also, notification of local entities, and overhead VMS boards and CDOT website with project information.
   - Web sites, newspapers, local television and radio stations.
   - Public open house meetings, and direct contact with local businesses. Also, press releases have been produced by public relations.
   - PI is used on most of our high profile projects. Strategies include press releases and project information phone numbers.
   - Public releases with any changes in traffic control and impacts to drivers and contact phone numbers on traffic control signing.
   - VHS, fliers, lane closure reports, and local agency coordination.

   **Recommendation:**
   - None – Continue to measure.

4. What policy, procedure or guidance was used to determine speed reductions in work zones?
   **Answers include:**
   - Volume, PHF, number of lanes, lane width, shoulder width, traffic pattern such as events, weather and accident history.
   - CDOT Chief Engineer's guidelines for Temporary Traffic Control.
   - Region Lane Control Strategy daily to determine when and how work will be performed.
   - CDOT Form 568.

   **Recommendation:**
   - None – Continue to measure.

5. When are speed limits reduced?
   **Answers include:**
   - When alignments change due to construction, or when the number of lanes are reduced.
   - When it is needed.
   - When hazards exists, or work is being performed adjacent to open lanes.
   - When approaching the work zone.
   - When workers are close to through lanes, or when flaggers are present in roadway.
   - When there are geometric constraints

   **Recommendation:**
   - None – Continue to measure.

6. Who makes the final decision on work zone speed limits?
   **6 of 6 Answered "Region Traffic Engineer"**
   - Resident Engineer, Maintenance Superintendents or designee.
   - Region Traffic Engineer delegating the authority to his traffic staff.
   - Traffic Operations Engineer
   - Traffic and Safety Program Engineer.

   **Recommendation:**
   - None – Continue to measure.

7. What policy, procedure or guidance is used to determine lane closures?
   **6 of 6 Answered "Region Lane Closure Policy"**

   **Recommendation:**
   - None – Continue to measure.

8. When are lane closures permitted?
   **4 of 6 Answered "Region Lane Closure Strategies"**
   - On construction and maintenance projects
   - Anytime.
   - 7 PM to 7 AM on our project.

   **Recommendation:**
   - None – Continue to measure.

9. What policy, procedure and/or guidance were used to determine the use of positive protection?
   **Answers include:**
   - Positive protection is normally discussed during design process and implemented on construction phase. Various by situations.
   - When project engineer determines it is necessary.
   - CDOT Chief Engineer's memo on Temporary Traffic Control.
   - Typical set up of traffic control. CDOT M & S Standards Section 630
   - CDOT Form 568.
   - M&S Standard Plans.

   **Recommendation:**
   - Rephrase the question.

10. Does end treatment selection play a role in determining the use of, or location of, positive protection?
    **5 of 6 Answered "Yes"**

    **Recommendation:**
    - This question does not appear to help measure the improvement of the overall WZSM operations. Delete this question from future questionnaires.

11. What policy, procedure or guidance was used to evaluate and mitigate safety and mobility impacts?
    **Answers include:**
    - MUTCD, CDOT M&S Standards, and Region Lane Closure Strategies.
    - Chief Engineer's Memo (September 2009), and CDOT WZSM Rule Procedure Document.
    - Roadside Design Guide, Policy on Geometric Designs (the Green Book).
    - Form 568 and Clear Zone Guidelines.

    **Recommendation:**
    - None – Continue to measure.

12. Who receives copies of crash reports, and are they studied on a project, regional or state level?

**Answers include:**

- Region Traffic Engineer, Resident Engineer, Region Traffic Operations Engineer, and Region Design Engineers.
- Region Traffic Engineering staff.
- Region Project Engineer.
- Region Project Engineer.
- Engineers of Region 5 Traffic and Safety Dept and Staff Traffic compile safety assessments and make recommendations based on accident history and local traffic/safety issues.

**Recommendation:**

- Add in this question "Where did you receive the crash reports from?".
- Rephrase the question that the crash reports are from the specific construction project.

13. Please provide a lesson learned or a possible improvement to the WZSM Procedures (http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-safety-mobility/WZSM_Procedures.pdf/view)

**Answers include:**

- Currently, we are using the 3rd Edition of Region 1 Lane Closure Strategy (LCS), which we have been revising lane closure based on field data and weather conditions.
- There is always room for improvement.
- 40-page documents are seldom read.
- Keep the LCS updated, and keep a variance process in the LCS.
- Scoping each project prior to construction is important, and review of safety assessments with the designers.
- Close coordination with the roadway design and CDOT helps with the success of the project.

**Recommendation:**

- None – Continue to measure.

14. Was there communication between traffic designers and the Region Traffic Operations Engineer?

**6 of 6 Answered "Yes"**

**Recommendation:**

- None – Continue to measure.

# Traffic Control Supervisor

1. What Traffic Control Plan (TCP) and Work Zone Safety and Mobility (WZSM) Procedure required strategies were commonly utilized on this project?

   **Answers include:**
   - 1,861 days of experience doing traffic control. And working closely with C-dot officials on other projects.
   - Approved MHT
   - TCP for lane closures, road closure with diversion route, shoulder closure, and flagging operations were commonly used on this project. The MUTCD 2009 Edition Figures 6H-3, 6H-7, 6H-9, 6H-13, 6H-20, 6H-22, 6H-23, 6H-24, 6H-28, & 6H-30 were all utilized during this project. Procedures such as safe stopping distances, adequate sign and device spacing, proper protective gear, and regulatory safety meetings were implemented.
   - Access plans, pedestrian plans.
   - One-lane road operations.
   - MHT #1, 7 and 11.

   **Recommendation:**
   - It's possible that Traffic Control Supervisors (TCS) do not know what the WZSM is because the WZSM is not part of the contract, and this question should be removed from future TCS questionnaires.

2. Have the WZSM Procedures positively, or negatively, affected project delivery and costs?
   **6 of 6 Answered "Positively Affected"**
   - Good flagging procedures/attention to detailed/and safety.
   - Only set ups within MHT's approved by TCS, CDOT and Contractor.
   - Safety is always a beneficial and positive factor. I do not view it as negative or costly.
   - It addresses all situations regarding pedestrians and traffic.

   **Recommendation:**
   - It's possible that TCS' do not know what the WZSM is because the WZSM is not part of the contract, and this question should be removed from future TCS questionnaires.

3. Please explain any overall concerns you have with the WZSM Procedures.
   **Answers include:**
   - Overabundance of signage to where the public just ignores all signs, or forgets what sign they just passed.

   **Recommendation:**
   - It's possible that TCS' do not know what the WZSM is because the WZSM is not part of the contract, and this question should be removed from future TCS questionnaires.

4. Did any elements, such as right-of-way, American Disability Act (ADA) requirements, utilities, etc. affect your WZSM procedures?
   **5 of 6 Answered "No".**
   - ADA required detour when trail closed.

   **Recommendation:**
   - It's possible that TCS' do not know what the WZSM is because the WZSM is not part of the contract, and this question should be removed from future TCS questionnaires.

5. Did you receive copies of the crash reports?
   **5 of 6 Answered "No"**
   - Yes

   **Recommendation:**
   - Rephrase this question to ask "If you had crashes, did you receive the crash reports?"
   - Add to this question "If you had crashes, what crash types occurred during construction and off-construction hours?"

6. Was the TCP adequate to develop the appropriate Method of Handling Traffic (MHT) for the project?
   **6 of 6 Answered "Yes".**

   **Recommendation:**
   - None – Continue to measure.

7. What lessons did you learn that would improve work zone safety in future projects?
   **Answers include:**
   - There were not any serious problems experienced, but we do slow traffic when it starts backing up. Having uniform traffic control would have made a big difference in how motorists pays attention traveling through work zones.
   - Always have truck-mounted attenuators and uniformed traffic control.
   - Always be alert and prepared.
   - Need to integrate peds, bikes, crosswalks, stop bars and redirect tapers into MHT's.
   - Use a second set of construction signs when extending or shortening the work zone. There may be two flagger symbols displayed, but this aids with moving the flagger station.
   - Every job has different situations. Have safe and approved MHT for each situation.

   **Recommendation:**
   - None – Continue to measure.

8. Were the training requirements adequate for traffic control personnel?
   **5 of 6 Answered "Yes".**

   **Recommendation:**
   - Rephrase the question to read "Are the training requirements adequate for traffic control personnel?"

9. How did you address traffic personnel with inadequate Personnel Protective Equipment (PPE)? When are lane closures permitted?
   **Answers include:**
   - Furnished PPE to the traffic personnel. Lane closures were permitted only with a TCP.
   - There wasn't any inadequate Personnel Protective Equipment on our project. Lane closures occurred from 7 AM to 5 PM.
   - Gave traffic personnel adequate PPE just in case, and they are given a verbal warning. Lane closures are permitted during daytime hours, unless approved by the Engineer. Lane closures were not permitted during peak travel times, unless approved by the Engineer.
   - Let traffic personnel know that they need to have all of their PPE on. If they resist the warning, the Contractor would be notified about the situation.
   - Most flaggers wore tennis shoes until they can get their first paycheck. Afterwards, they are not permitted on the highway until they are properly dressed. Lane closures are permitted during daytime hours.
   - Night time closures occurred from 7 PM to 530 AM.

   **Recommendation:**
   - TCP's need to enforce adequate PPE dress code to their traffic personnel during construction hours – No exceptions.

# Construction Superintendent

1. What Traffic Control Plan (TCP) and Work Zone Safety and Mobility (WZSM) Procedure required strategies were commonly utilized on this project?
   **Answers include:**
   - Road Closure with MHT'S, Bike Shuttle.
   - Lane Closure, reduced lane width, shoulder closure, construction phasing, work hour restrictions, signage, VMS Signs, multiple lane closures, and speed reductions.
   - TCP's.
   - Cones and barrels, and temporary barrier.

   **Recommendation:**
   - None – Continue to measure.

2. Have the WZSM Procedures positively, or negatively, affected project delivery and costs? Please Explain.
   **6 of 6 Answered "Positively affected"**
   - Road closure has improved productivity and kept down time to a minimum.
   - Impossible to build without WZSM Procedures. It forced pre-planning of the project to develop a TCP.
   - Improved worker and traveling public safety.

   **Recommendation:**
   - Address these concerns with each individual surveyed.
   - Prior to the next Process Review, address how the data should be collected and used. This should be a uniform method at CDOT.

3. Please explain any overall concerns you have with the WZSM Procedures.
   **5 of 6 Answered "None".**
   - The biggest issues are always public awareness and cause.
   - Number of MHT's required.

   **Recommendation:**
   - Rewrite this question; make it more specific.

4. Did any elements, such as right-of-way, environmental, American Disability Act (ADA) requirements, utilities, etc., affect your WZSM procedures?
   **5 of 6 Answered "No"**
   - ROW was so close that it made construction difficult, even with road closures.

   **Recommendation:**
   - None – Continue to measure.

5. Did the Contractor maintain a log of accidents that occurred in the work zone?
   **6 of 6 Answered "Yes"**

   **Recommendation:**
   - None – Continue to measure.

6. Did you receive copies of the crash reports?
   **3 of 6 Answered "Yes"**

   **Recommendation:**
   - This question is asked of all the field personnel, and the answers vary. Everybody on the project does not need a copy of the crash reports; therefore, delete this question from future Construction Superintendent questionnaires

7. Did the Contractor have a TCS certification available on-site?
   **6 of 6 Answered "Yes"**

   **Recommendation:**
   - None – Continue to measure.

8. Did the Contractor maintain worker injury reports?
   **6 of 6 Answered "Yes"**

   **Recommendation:**
   - If this question continues to be posted in this questionnaire, another question, "How about traffic-related injury reports?"

9. Should the Contractor submit its worker injury reports to the Project Engineer on a weekly basis?
   **4 of 6 Answered "Yes"**

   **Recommendation:**
   - It is not necessary for the Project Engineer to have copies of the worker injury reports, and this question should be deleted from future Construction Superintendent questionnaires.

10. On a scale of 1 (worst) through 10 (best), how would you rate the performance of the TCS?
    **Two were rated a "7", one was rated an "8", one was rated a "9", and two were rated a "10"**

11. Why?
    **Answers include:**
    - **7 -** We went through four (4) different TCS's before getting one that is working the best.
    - **8 -** Project has used several TCS's- all have performed above average.
    - **9 –** TCS **has g**reat reaction to needs, and small lack of forethought.
    - **10 –** They do their job. TCS takes his job very seriously, is very aware that everything that can be done to improve jobsite performance safely is a plus. We worked 24 hours Mon-Thurs. All TCS's involved were very attentive and offered suggestions to help with the construction as it related to traffic flow.

    **Recommendation:**
    - The ratings did not match the results from the Construction Project Engineer questionnaire. Prior to the next Process Review, address why there was a discrepancy in the results, and revise question #10.

12. On a scale of 1 (worst) through 10 (best), how would you rate the performance of the flaggers?
    **One was rated a "7", three were rated an "8", one was rated a "9" and one was rated a "10"**

13. Why?
    **Answers include:**
    - **8 –** All are well-trained, attentive, courteous to the general public, aware of construction procedures.
    - **9 -** The flaggers could only do so much along a lane closure of the corridor, but were willing and able at all times to assist. The more they did the more the traffic slowed and jammed causing great concern from CDOT not wanting to get the phone calls from the public.
    - **10 -** Flaggers were well-trained, on-the-job experience, they do their job. Flaggers were used on to keep public from following construction vehicles into the closure. They were always on the ball and performed as asked.

    **Recommendation:**
    - The ratings did not match the results from the Construction Project Engineer questionnaire. Prior to the next Process Review, address why there was a discrepancy in the results, and revise question #12.

14. List the work zone training requirements for all your workers.
    **Answers include:**
    - Proper PPE for day and night work, Job Hazards, and Fire response.
    - Provide work area access that require traffic control. Daily awareness through safety meetings of onsite conditions, CDOT, OSHA, and company policy training for highway work.
    - Review Activity Hazard Analysis for operations - Conduct safety critical meetings prior to any high hazard work.
    - Smith Drivers Training.
    - On-the-job experience.
    - Workers not allowed to move traffic control devices, and must use designated cross walks.

    **Recommendation:**
    - Compare these training requirements to those outlined in the WZSM Procedures, and update the procedures with any new training requirements.

15. Did you meet with the project coordination team *(Project Engineer, incident management, Colorado State Patrol, TCS, CDOT Traffic, and construction personnel)* regularly to discuss ongoing issues?
    **6 of 6 Answered "Yes"**

    **Recommendation:**
    - None – Continue to measure.

16. Are you familiar with the TMP, PI, and Lane Closure Strategies (LCS)?
    **6 of 6 Answered "Yes"**

    **Recommendation:**
    - None – Continue to measure.

17. What standard operating procedures of the WZSM did you implement as a Construction Superintendent that ensured the safety of your workers and the traveling public, as well as the efficient mobility of vehicles through your work zone?

**Answers include:**

- Daily pre-shift toolbox meetings, van to shuttle bicycles through the work zone.
- TCP/MHT's, sign and TC device inspection / review for conformance, UTC's, Signage/VMS, Project Website, and PI line. Also, clear zone spacing, equipment movement, personnel movements, off peak hour versus peak hour traffic adjustments
- Traffic Control and Safety discussed with project team weekly, conduct daily meetings with TCS, project inspectors, and any active subcontractors to address upcoming work, MHT's and address any concerns.
- Pre-task planning.
- Use crosswalks. Helped with MHTs and reduced speed limit to 35mph.

**Recommendation:**

- Compare these procedures to those outlined in the WZSM Procedures, and update the procedures with any new procedures.

18. Please provide comments, or lessons, learned to improve WZSM Procedures, the effectiveness of traffic control, and phasing.

**Answers include:**

- A project can never have enough advanced warning signs!!
- Adjust traffic control devices / minimize closure lengths to facilitate traffic movements. Adjust working hours when possible to facilitate traffic movement. Finer detail to lane width work, ingress and egress details coordination.
- CDOT did not provide any TCP or phasing; was all Contractor proposal. Would recommend phasing discussion pre-advertise.
- Too many MHT’s required.
- Communication in a timely fashion is the most crucial element.
- Traffic control classes. WZSM Procedures are very important.

**Recommendation:**

- None – Continue to measure.

19. Were all conflicting pavement markings removed?
**5 of 6 Answered "Yes**
    - Road was closed, so pavement markings were a non-issue.
    - Existing striping was covered with black paint. Asphalt was removed with markings.
    - Grinding, as well as blacked-out, some striping areas.
    - Used heating and remixing portion, which obliterated all original striping.

**Recommendation:**
    - None – Continue to measure.

20. Where were the materials stored for this project?
**Answers include:**
    - Staging area or at designated stockpile locations throughout work zone.
    - Construction Trailer/Yard adjacent to the project; Onsite yard area.
    - Multiple staging areas.
    - In the ROW
    - On-site pit area.
    - In on-site yard.

**Recommendation:**
    - None – Continue to measure.

21. Where was the equipment stored when construction was not in progress?
**Answers include:**
    - Staging area throughout the work zone.
    - Construction trailer/yard adjacent to the project. Yard area off zone. Other pieces of equipment were outside clear zone.
    - Outside of clear zones whenever possible.
    - In the yard or in the ROW.
    - On-site where areas were available.
    - In a vacant parking lot.

**Recommendation:**
    - This question does not appear to reveal responses that will lead to improving the overall WZSM Procedures. Remove this question from future Construction Superintendent questionnaires.

22. Were warning signs and devices used for maintenance and protection of traffic?
**6 of 6 Answered "Yes"**

**Recommendation:**
    - This question does not appear to reveal responses that will lead to improving the overall WZSM Procedures. Remove this question from future Construction Superintendent questionnaires.

23. Were all cones, drums, barricades or other channelization devices acceptable?
    **6 of 6 Answered "Yes"**

    **Recommendation:**
    - None – Continue to measure.

24. Was a detour required for this project?
    **3 of 6 Answered "Yes"**
    - A Contractor-proposed phasing plan was utilized, as well as detours for intersection closure.
    - Used numerous detours.
    - Used a pedestrian / bike detour route.

    **Recommendation:**
    - This question does not appear to reveal responses that will lead to improving the overall WZSM Procedures. Remove this question from future Construction Superintendent questionnaires.

25. Is the project being completed in stage construction?
    **4 of 6 Answered "Yes"**
    - A one-mile project with five (5) two-lane phased bridge removals at multiple locations at the same time, full length jobsite lane phased closures. Had to construct 1/2 of the northbound lanes at a time.
    - Two-Phase mainline construction and Two-Phase intersection closure.
    - Three-phase construction.

    **Recommendation:**
    - Rephrase the question by replacing the word "stage" with "stage".

26. Do you have anything further to add?
    **5 of 6 Answered "No"**
    - Project has been successful in maintaining safety for both workers and the traveling public. Team has worked well together.

    **Recommendation:**
    - None – Continue to measure.
    -

**General Recommendation:** Make sure to include Region Maintenance Superintendent in the next questionnaire.

# Summary of CDOT Traffic Control Review Activities for FY13

CDOT conducted a review of traffic control activities around the State of Colorado. This review was performed in cooperation with the various Operations Engineers at FHWA. Results of the reviews were prepared by the CDOT Project Development Branch and distributed to the CDOT Regions and to FHWA.

Beginning in July 2004, CDOT implemented a new Traffic Control Review (TCR) procedure in response to management concerns for the quality of temporary traffic control, and to comply with FHWA requirements. This program was modified in 2009 to include "No Notification" reviews of one construction project per Region to compare against the scores of the three projects per Region that received prior notification of the review.

The purpose of the program is to gather information to evaluate the overall quality and effectiveness of work zone traffic control throughout CDOT, to identify areas where improvement is needed, and to facilitate open discussion of traffic control issues. Regions are expected to use the inspection results to address and correct both project-specific and Region-wide issues.

The work zone inspection procedure involves an on-site inspection of a sample of projects in each Region. The standard procedure for the inspections is described in the attached document titled, "FY 2013 Quality Assurance Inspection for Work Zone Traffic Control".

The inspection teams typically consisted of five or six members. A Project Development Branch Area Engineer, a Staff Traffic Engineer, a FHWA Operations Engineer (when available) or the FHWA Traffic Engineer (when available), a Region Maintenance Representative and the Region Traffic Engineer (or designee) formed the nucleus of the team.

Six (6) inspections were conducted in each of the six Regions during the summer of 2012. In each Region, the team attempted to review at least one nighttime operation, two CDOT Maintenance operations, and one full office review of a construction project, including traffic control documents.

Inspections consisted of a drive-thru of each project with information and comments recorded on a standard form. The office review included a review of project safety plan, the Method of Handling Traffic (MHT) and other traffic control related documentation. Following completion of the inspection and entry of data and comments, an overall percentage score was assigned to each project. The percent score was communicated to project or Region personnel and is being reported to FHWA with this document. Project percentages were averaged to formulate a Region and Statewide average. Maintenance operations were scored similarly but are reported separately. The scores for the construction projects reviewed without prior notification are also reported separately below.

Following each Region inspection, a debriefing memo was sent to each Region with copies of the inspection forms. The Regions were allowed to respond with comments and questions.

Results of the annual inspections form the basis for identifying needed changes and improvements to ensure continuous improvement in program results. Region staff will be expected to make changes as appropriate in the design process and in maintenance procedures, as well as in individual project management. Staff Branches will use the results to identify and support needed improvements in standards, specifications, procedures and training.

The goal for FY13 was a statewide average quality rating of 90%, with no individual projects rated below 85%. As indicated by the attached document, the average statewide quality rating for the 24 engineering

projects was a 95.5%. There were two (2) engineering projects of the 24 (18 with prior notification and 6 with no notification) reviewed with scores below 85%. The statewide average of the 18 engineering projects that received notification was 96.1%. The statewide average of the six (6) construction projects that did not receive prior notification was 93.8%. The statewide average for the 12 maintenance activities was 92.6%.

The results of the recent inspections indicated some deficiencies. These are listed below. In general, the team documented acceptable sign quality and work zones that provided adequate safety and guidance to motorists.

- Public information line needs to be updated with current construction information.
- Several signs not being used in the median area were stored flat but not out of the clear zone *(To the project teams' credit, they notified the traffic control subcontractor several times to correct the situation)*.
- Conflicting signing of shoulder closure needed to be removed, or turned, once the lane closure went into effect *(Staff was working emergency and did not have the time, nor additional staff, to take down the conflicting sign)*.
- Proper placement of temporary signing in accordance to the Method of Handling Traffic (MHT)
- Pavement striping appropriate to the construction phasing.
- Appropriate speed limit signage.
- Signs did not have the appropriate NCHRP information sticker.
- Lack of proper masking of permit signage that doesn't apply during construction.
- Traffic barrels missing appropriate reflectivity tape.
- Improper spacing of traffic control devices.
- Start and end of "Fines Double" signs for projects with long work zone areas need to be displayed when entering and exiting work zones within the project limits.
- Work zones need to be cordoned off by appropriate traffic control devices.
- List of traffic control items necessary to perform the MHT listed.
- Top of the battery boxes were greater than 4 inches above ground elevation.
- Traffic Control Supervisor (TCS) did not wear proper footwear.
- Improper taper limits of traffic cones on a maintenance project.
- Appropriate Method of Handling Traffic (MHT) needed for current work performed on maintenance projects.

CDOT will address the noted deficiencies with the use of training, construction bulletins, and other methods to be determined in the next fiscal year unless there is an imminent safety threat in which case immediate corrective action will be taken by the project personnel.

On October 9, 2012, CDOT sent the Region and Statewide summaries for FY 13 to John Cater, FHWA Colorado Division Administration for his review, and to permit comparison of the progress CDOT and our traffic control safety partners have made in this area.

Also attached was a separate summary of the "No Notification" project scores spreadsheet.

# FY 2013 QUALITY ASSURANCE REVIEWS FOR WORK ZONE TRAFFIC CONTROL (TRAFFIC CONTROL REVIEWS)

## INTRODUCTION:

CDOT places a high priority on the safety of workers and the traveling public in the management of its construction and maintenance programs. Minimizing traffic congestion and adverse impacts on the local community are also important considerations. To support these objectives, work zone traffic control is an integral element in the management of Department programs. Work zone management in turn is comprised of several distinct elements. These include:

- establishment of overall goals and objectives
- development of standards and specifications
- provisions for project-specific traffic control plans
- providing staff training and development
- Contractor/industry outreach
- maintaining an accident reporting and analysis system
- maintaining an ongoing traffic control quality assurance program

CDOT annually review randomly selected projects throughout its jurisdiction for the purpose of assessing the effectiveness of its procedures.

The CDOT Quality Assurance program will be utilized for all temporary traffic control on CDOT roadways and projects–construction, maintenance, and permits. The statewide work zone review program, also known as the Traffic Control Review (TCR) program, was initiated in July 2004 in response to management concerns for the quality of temporary traffic control, and to comply with FHWA requirements.

The purpose of the program is to gather information to evaluate the overall quality and effectiveness of work zone traffic control throughout the Department, to identify areas where improvement is needed, and to facilitate open discussion of traffic control issues. Regions are expected to use the review results to address and correct both project-specific and Region-wide issues.

The responsibility for administration of these requirements will rest with the Project Development Branch and the Safety and Traffic Engineering Branch.

## DESCRIPTION OF REVIEW PROCEDURE:

The work zone review procedure involves an on-site review of a sample of projects in each Region. The standard procedure for the reviews is described in the sections that follow.

1. **Review scheduling** - Reviews will be conducted statewide each year. Each Region will be scheduled separately. Two or three review days will be scheduled in each Region. In addition, time will be allotted at night to conduct reviews at a limited number of sites to observe nighttime operations if suitable projects are available. Following completion of each review, a debriefing meeting will be held with Region staff to provide a preliminary discussion of the results. Depending on the schedule, this meeting may be held the same day as the reviews or the following day.

2. **Sample size and selection** – The reviews will include a number of projects in each Region. The goal is to inspect at least six (6) projects and activities per Region, which may encompass traffic control for a full range of activities from minor utility repairs to full-scale construction. The construction sample will be selected in advance by the Review Team, based on several factors. At least one project will include nighttime operations, if a suitable project is available, and at least two (2) CDOT Maintenance operations will be reviewed. Factors considered include geographic location to economize on travel time and distance, type of work, and Contractor. The intent is to select a range of characteristics that provide a representative sample of work active at that time. Adjustments are made to the initial list to account for actual work status on individual projects. Maintenance work activities are typically not scheduled far in advance. Advance notice will be given for TCR's again this year.

3. **Review Team makeup** – The Review Teams will typically consist of five to six members. A Project Development Area Engineer, a Staff Traffic Engineer, an FHWA Operations Engineer and/or the FHWA Traffic Engineer, a Region Maintenance Representative and the Region Traffic Engineer (or designee) will form the nucleus of the Team.

4. **Review process** – Reviews will consist of a drive-through of each project with information and comments recorded on the standard form. A percentage score will be given to each reviewed project. In addition, an office review will be performed on one project in each Region. The office review will include review of the Methods of Handling Traffic (MHTs) and other traffic control related documentation. The office review will also include a review of the Project Safety Management Plan (PSMP) by the Region Safety Officer. The standard form will record descriptive information about the project or maintenance operation and the temporary traffic controls observed. Features are listed in ten broad categories: traffic control management, method of handling traffic, worksite traffic control supervisor, flaggers, construction/maintenance signing, traffic control devices, pavement markings, miscellaneous items, traffic impacts and work zone area, and inspector safety. In addition to check-offs on the form, narrative comments will be added to describe individual features observed. These will typically include points of concern and areas that need improvement, as well as features or treatments viewed as positive. The review will consist of driving through the project in each direction, generally on each of the main approaches. In addition, one or more minor approaches, such as intersecting roadways or major driveways, will also be examined. The Review Team's vehicle may stop from time to time to observe specific features in more detail, as traffic conditions and space permit. However, nearly all observations are completed from inside the vehicle. Depending on the nature and complexity of the project, multiple trips through the project may be required to obtain the needed details. On simple projects, a single drive-through in one direction may suffice. The objective is to obtain adequate information to characterize the project. On projects with multiple work sites, one or more sites may be omitted. Because the focus of the program is on obtaining a representative sample for quality assurance purposes, rather than detailed project management, this is a reasonable compromise. In every case, the project description will clearly indicate the portions of the project reviewed, if not reviewed in its entirety.

5. **Quality rating** – The scoring system will be a percentage score. The final report and scores shall be delivered as follows:

a. Each Region's Regional Transportation Director (RTD), Program Engineers, Traffic Engineer and Maintenance Superintendent will receive a regional final report with their Region's project scores and a statewide average score. The report will also include a description of any regional or statewide issues and a description of the % scoring system.
b. Each Resident Engineer will receive the scores for their projects and the statewide average score. Their report will also include a description of any regional or statewide issues and a description of the % scoring system.
c. Each Project Engineer will receive their projects score and the statewide average score. Their report will also include a description of any regional or statewide issues and a description of the % scoring system.
d. FHWA and Traffic and Safety Unit will receive a copy of all regional final reports with all project scores and issues.

6. **Review follow-up** – Following each Region review, a debriefing meeting will be held to discuss results. Debriefing meetings may be conducted by conference call or at the project site if the Project Engineer and TCS are available and should include all Review Team members. Copies of the review forms will be transmitted to the Region Program, Resident, and Project Engineers after the review. While the completed forms will not be available for several days, Region participants are expected to take adequate notes during reviews to permit timely follow-up on points requiring field changes. Since Project Personnel are expected to be familiar with their project plans and specifications and the applicable standards and other traffic control requirements, disagreements with the Review Team's comments should be raised and resolved at the time of the de-briefing.

Following completion of each annual review, two separate reports are prepared. The first is addressed to the Region Transportation Director and provides an overall summary of the regional reviews, including construction and maintenance work. The second report is submitted to the FHWA in fulfillment of requirements for the federal-aid highway program. Results of the annual reviews form the basis for identifying needed changes and improvements to ensure continuous improvement in program results. Regional staff is expected to make changes as appropriate in the regional design process and in maintenance procedures, as well as in individual project management. The results may also indicate the need to conduct training. Staff Branches will use the results to identify and support needed improvements in standards, specifications, and procedures, as well as other program needs. Results will also be used to provide executive management an overview of progress in meeting Department goals and objectives for work zone traffic control.

Anticipated Program Results:

**Establishment of Program Goals** - Once sufficient data is compiled from annual reviews, it will become possible to establish performance goals for work zone traffic control on Department projects.

Combined with information from review program results identifying specific strengths and weaknesses, resources can be directed to resolve specific concerns needed to improve performance.

## References

CDOT Construction Manual
http://www.coloradodot.info/business/designsupport/bulletins_manuals/cdot-construction-manual

FHWA Work Zone Safety and Mobility Final Rule
Effective October 12, 2007
http://ops.fhwa.dot.gov/wz/resources/final_rule.htm

FHWA Temporary Traffic Control Devices Final Rule
Effective December 4, 2008
http://ops.fhwa.dot.gov/wz/resources/policy.htm

The following information on CDOT's WZSM Compliance is available at:
http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-safety-mobility

- Work Zone Rollout
- Work Zone Safety & Mobility (WZSM) Procedures
- Guidelines for the Use of Positive Protection in Work Zones
- Work Zone Policy Directive 805.0
- Work Zone Procedural Directive 805.1
- Work Zone Safety Improvement Memo
- Policy Memo 28 Advanced Work Zone Management & Design
- Policy Memo 29 Safe and Effective use of Law Enforcement
- Policy Memo 30 Utilization of Law Enforcement in Work Zones
- Transportation Management Plan (TMP) Specification
- Public Information (PI) Specification