

State of Connecticut Department of Transportation
Division of Construction Operations
Quality Assurance Unit

**2021 Connecticut Work Zone Field Reviews
Annual Report**



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Introduction

The Connecticut Department of Transportation (CTDOT) Division of Construction Operations (DCO) – Quality Assurance Unit conducts work zone safety field reviews in compliance with 23 CFR 630 Subpart J to evaluate the effectiveness of work zone safety and mobility policies and practices. The reviews were conducted for randomly selected active roadway construction projects administered by CTDOT.

A field review is organized by the DCO – Quality Assurance Unit’s Work Zone Review (WZR) Team, along with the respective project traffic engineers, to evaluate the quality of traffic control devices, construction sign pattern installation and removal, sign recognition/visibility, and opportunities to enhance safety for motorists.

Due to the required COVID-19 safety protocols, the review process was slightly altered to remain socially distant but still allow field reviews to be conducted. The field reviews were done individually with the use of dash cameras to capture photos and/or videos of the field conditions from the public’s perspective. The photos and/or videos were then analyzed safely from an office setting. Later, a post-review meeting was coordinated via Microsoft TEAMS with the WZR Team, respective traffic engineer, FHWA (If applicable), and project staff to discuss what was found. A work zone questionnaire noting the effectiveness of the specifications and plans is also reviewed with the associated entities.

The reviews in past years were classified as Regular or In-Depth. This year, the classification changed to Formal, Informal, and In-Depth.

- Formal reviews:
 - Planned early in the season based on active projects. Reviews are scheduled with DCO staff and Division of Traffic Engineering – Project Design Unit (Traffic) to review field practices, traffic control devices, and then obtain feedback from the project staff. Questionnaires are completed with project staff input.
- Informal reviews:
 - Considered unscheduled reviews overseen by the DCO at the request of a project or generated from complaints. For Informal Reviews, only a site assessment of the existing project conditions is conducted with no questionnaire completed.
- In-Depth reviews:
 - Conducted in the same format as Formal reviews except extending an invite for Federal Highway Administration (FHWA) to participate. FHWA would normally participate to give us a deeper insight on the practices done in the field, however due to COVID restrictions, FHWA could not attend throughout the 2021 season.

After the reviews are completed, reports noting any findings with corresponding recommendations for improvements and/or best practices, photographs of field conditions, and answers to the questionnaire (if applicable) are compiled and then distributed to all participants. The reports either help identify issues that need immediate action, identify possible systemic issues that need addressing on a statewide level, or find the best practices that could improve Connecticut's Work Zone Safety practices.

The Division of Construction Operations – Quality Assurance Unit set an initial goal to complete a minimum of ten (10) Formal and four (4) In-depth reviews per year. In 2021, the Work Zone Safety Team completed eleven (11) Formal, three (3) Informal, and four (4) In-depth reviews.

Findings from the work zone field reviews will be used in our unit's best practices/lessons learned information, as well as, notifying other units with the yearly reporting. Any systemic issues will be evaluated through Work Zone Safety and Mobility Process Review for resolution through Department unit collaboration and innovative methods.

The Process Review is an evaluation tool used for the Department's Work Zone Program. The Process Review team is comprised of personnel from DCO, Traffic, Bureau of Highway Operations, Strategic Planning, and FHWA Division Office. Opportunities for improvement, successful practices, and implementation of new technologies can be efficiently proposed and managed between these units to develop a holistic work zone safety program the Department can benefit from.

Compilation of Findings and Recommendations:

The following is a summary of specific issues found during Work Zone Field Reviews which were then further broken into categories to look for consistent patterns to be focused upon.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
ADDITIONAL DEVICES NEEDED		
0083-0264	Drivers seemed to be confused when merging onto the Connector from Route 1. At the bottom of the ramp, some drivers thought there were two lanes and tried to drive two-vehicles wide coming off the ramp.	More traffic drums can be added to the taper to make motorists merge to one lane before entering the lane closure on the Connector.
ADVANCE PLANNING		
0172-0500 Formal	The Chief Inspector would like to know what to do if the Contractor mills and it starts raining before the end of the shift and before getting down temporary pavement markings.	The Division of Traffic Engineering suggests keeping an eye on the weather radar and if it looks like rain is imminent, place what they can beforehand.
BEST PRACTICES		
0080-0131/0130-0184	The detour signs also have a Brookside Memorial sign posted a destination that has been disrupted from the closure and can be reached through the detour.	It a good practice for Public Outreach to help the public reach popular destinations which routes are interfered with construction.
0080-0131/0130-0184	Temporary Precast Concrete Barrier Curb is used to protect the work area on the Bucks Hill Road closure when project is inactive. The barrier is moved away during the day while work is active to allow a resident access to his driveway which is directly adjacent to the work zone.	Being accommodating for residents as much as possible is a good practice and is needed since construction poses enough of a disruption to daily routines. Although barrier couldn't remain in place at the end of the work area, at least it was delineated with traffic cones and drums.
0122-0103	The project added more traffic signs and CMS to the detour route.	Adding additional signs to better inform motorists of the work zone conditions is a good practice.
0138-0248	Signs stating Entering/Exiting Construction Trucks for the active stage construction sites at the Veterans Boulevard and Ferry Boulevard Southbound intersection and along Ferry Boulevard should be placed to warn motorists of truck traffic.	Warning of construction traffic entering and exiting work areas can help prevent incidents between construction vehicles and the traveling public.

PROJECT	FINDING	RECOMMENDATION
0151-0326	I-84 EB Rolling Road Block was from 9:28 pm to 9:41 pm and Westbound RRB was from 10:28 pm to 10:41 pm.	Both Rolling Road Blocks abided by the time limit set in the Construction Directive CD-2016-2: Work Zone Safety, Rolling Road Block Procedures.
0172-0500 Informal	The Pre-Warning Vehicle was stationed in the shoulder of the gore of Exit 23.	Having the PWV stationed close to the end of the queue from the RRB, is in accordance with the RRB procedures to help prevent back-of-queue crashes.
0172-0500 Informal	A TMA with a straight bar flashing arrow was positioned in the left lane of the Rolling Road Block and a State Police vehicle was positioned in the right lane. The other TMA was used to close the ramps until the RRB was proceeded past.	It was good to use TMAs for protection and speed control; it would be better to have them in both lanes for added protection for the crew. State Police are good for presence to help reduce speeds, but they can't be used for protection of the work crew if there is a speeding vehicle.
0172-0500 Informal	Equipment back down the closed lane to the work area.	Equipment backing down the closed lane is the best method for equipment entry into the work area opposed to them exiting/entering from the open lane.
CONSTRUCTION DIRECTIVE NON-COMPLIANCE		
0007-0189	The Contractor decided to wait until allowed in the Limitations of Operation to close two lanes on Route 9 even though they had already closed a lane on the on ramp from I-91. The lane off the on ramp was placed around 7:00 pm with no other closure or END ROAD WORK sign. The other lanes weren't closed until after 8:00 pm.	Waiting until it's allowed to close two lanes is acceptable according the procedure in CD-2016-2 Work Zone Safety Rolling Road Block directive but closing the lane after the on ramp with no other closure or direction of the closure ending is not.
0043-0131	The Rolling Road Block started at Exit 54 at 7:47 pm and ended at 7:55 pm. A Truck-Mounted Attenuator with a flashing arrow in the "lane closed" mode was in the center lane after the Rolling Road Block was completed not in the closed left lane. When traffic was permitted through, motorists had to drive around it to the open right lane since it was blocking the center lane from through traffic.	The Work Zone Safety, Rolling Road Block Directive (CD-2016-2) states the allowable time is 15 minutes and only for the installation and removal of the advance warning signs and tapers. Once the taper is installed the trucks are to enter the closed lane and continue installing the pattern from the closed lane and allow traffic to proceed through.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0096-0200	The Rolling Road Block on I-84 WB took place from 8:01 pm to 8:20 pm (19 minutes). The RRB on I-84 EB took place from 9:01 pm to 9:21 pm (20 minutes).	Both RRBs extended longer than the allowable time of 15 minutes however with the pattern set up on the on ramps could have extended the time. Refer to Construction Directive 2016-CD-2 on procedures for conducting a Rolling Road Block.
0151-0326	There was no sign of a Pre-Warning Vehicle being used.	When using a Rolling Road Block, the use of a Pre-Warning Vehicle helps prevent back of queue crashes. <u>Post Review Meeting:</u> During the field review, there was no Pre-Warning Vehicle observed being used. The inspection staff said that the project was designed before the Rolling Road Block Directive was implemented and so no PWV item included for this project. The traffic volumes being low at night and there being no significant back ups from the RRBs, there hasn't been a need for one. However, if the need changes, one can be added in.
0172-0500 Informal	The Rolling Road Block (RRB) went from 6:22 pm to 6:41 pm (19 minutes). It continued even after the taper for the traffic pattern was installed. The crew tucked into the closed lane and let traffic through after the pattern was installed around Exit 27.	The time of the RRB exceeded the allowable 15 minutes and caused a slight back up of traffic. It is understandable that the sign crew wanted to install the pattern around the exit before traffic was let through and the had the opportunity to cut across the closed lane to the exit but it be best to let the traffic through to prevent back up and then proceed with another RRB when at the exit.

PROJECT	FINDING	RECOMMENDATION
0155-0171	I-84 Eastbound Rolling Road Block went from 7:17 pm – 7:33 pm. They used two PWVs and three troopers to close the road. During the RRB, an incident occurred where other State Police needed to proceed through, and they bypassed traffic using the right shoulder. They installed the advanced warning signs, taper, and started the lane closure pattern but the sign crew continued from the closed left lane while TMAs and State Police stayed in the center lane for protection of crew, letting traffic through in the right lane after the allowable 15 minutes. I-84 Westbound RRB went from 7:57 pm – 8:15 pm. The pattern set up was the same as on the Eastbound only with the right and center lanes closed and the traffic let through in the left lane.	Adhere to “Work Zone Safety Rolling Road Block Procedure” Construction Directive Number CD- 2016-2, in regards to opening all lane after 15 minutes interval. Post- Review Meeting: The Chief Inspector said three TMAs are used during Rolling Road Block. After, RRB only one lane is opened while TMAs continue to keep lane adjacent to sign crew closed while the rest of the pattern is installed. This is done for extra protection for the crew since there have been issues with drivers driving too closely.
0155-0171	The sign crew went back out on the Eastbound side at 9 pm to close a second lane (center lane) and then proceed around to the Westbound side to close another lane. They proceeded out with another “mini”-RRB (9:03 pm – 9:04 pm) using State Police, so sign crew could enter closed lane and install second merge and bump out devices to close center lane. No extra TMAs or troopers were used in adjacent lane for extra protection to sign crew while they moved out pattern.	Rolling Road Blocks are to be used for the initial installation and removal of the pattern. Fortunately, the RRB was short in duration and didn’t accumulate a queue.
COORDINATION OF SIGNS		
0134-0147	Maintenance had advance warning signs out within the advance warning for the project. Maintenance and Construction need to coordinate signs so there isn’t confusion about work zones.	Having Maintenance’s signs state END ROAD WORK and then having CONSRUCTION AHEAD on the project’s liability’s sign can be confusing to the motorist. Maintenance should coordinate with the project on placing and/or covering signs.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0172-0500 Formal	There was a liability sign placed on Exit 23 even though the road work is also on Route 2 and then there was an END ROAD WORK sign at the end of the ramp which can perceive that a work zone has ended right when it has just begun. It was unknown whose sign it was and would like to know before removing.	Stating END ROAD WORK soon after stating CONSTRUCTION AHEAD can imply the work zone has ended before it really has ended. However, the liability sign is Maintenance’s for their Vendor in Place project on Route 163 and they will move it beyond the exit.
0155-0171	There are two liability signs approximately 100 ft apart in the Advance Warning Area of the work zone on the Eastbound direction and an “End Road Work” Sign in the Advance Warning Area of on the westbound direction.	Either properly cover construction signs that are not being utilized to reduce driver’s confusion throughout the work zone or coordinate sign installation with adjacent projects to not overlap signs. Post-Review Meeting: Another project adjacent to this one overlapped their liability signs with this project’s work zone. The staff said they will contact the project to coordinate signage.
DRIVER BEHAVIOR		
0096-0200	An errant vehicle entered the closed lane while the pattern was being set up. A State Police officer stopped it from proceeding.	Fortunately, the vehicle was stopped quickly and there wasn’t an incident that occurred, but occurrences like this an example of why good visibility of devices and compliance with traffic plans is important.
FIELD CONDITION MODIFICATION		
0007-0189	The first drum taper for the shoulder closure wasn’t as visible due to the roadway curvature.	If the taper was extended or shifted slightly north, it would have increased visibility.
IMPROPER POSITION OF STATE POLICE		
0172-0500 Informal	Once the pattern is installed, the State Police vehicle was stationed in the merge of the traffic pattern not before the pattern.	State Police requested for presence should be stationed ahead of the work zone to inform motorists of the upcoming work zone and encourage motorists to reduce their speeds. Being stationed in the pattern, may giving warning to slow speeds too late.
0172-0500 Formal	State police was stationed within the traffic pattern not before it.	Unless specifically requested for enforcement, State Police are on projects for presence. They are to make motorists aware of the upcoming roadwork with their flashing lights; therefore, they should be placed ahead of the advance warning signs.
IMPROPER USE OF DEVICES		

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0007-0189	The two arrow boards in the closed lane were flashing an arrow.	The arrow boards should have flashed a straight bar to indicate a closed lane.
0015-0248	The directional arrow placed at the start of the taper on the Southbound side should be placed more within taper.	Traffic control devices giving delineation around the work zone should be spaced according to the traffic plans.
0080-0131/0130-0184	The barricades used on the west end of the Bucks Hill Road closure (Project 130-184) had their chevrons indicating the wrong direction.	To prevent any confusion of which road to turn onto, the sign should be moved further up towards Old Waterbury Road, if space allows.
0108-0186	Some of the delineators on top of the barrier curb on I-395 SB (left side of the travel lane) are white not yellow.	Delineators on the left side of the roadway need to be yellow and white on the right side. This will indicate to motorists that they are traveling in the correct direction through the traffic pattern.
0122-0103	A Changeable Message Sign states the time length of the closure right before the trench in the road and may not be that effective for oncoming traffic. The proposed relocation for it is to be before the road closure but before the exit from Route 9 so exiting traffic.	Traffic exiting Route 9 will not see the CMS before the closure if turning right towards the closure. However, with the limited space to place the CMS, it's understandable that the sign cannot be placed in a more effective position.
0134-0147	At the closure where Route 190 meets the roundabout, a barricade's chevrons were pointed to the left when traffic is to proceed to the right.	Chevrons on barricades indicate where traffic should proceed when there is a closure. The chevrons should have been pointing down to the left where the traffic is to go.
0134-0147	At the Route 190 closure, the traffic drums used in front of the barricades.	The traffic drums could be placed in between the barricades for better delineation instead of just in front of.
0138-0248	There are some TPCBC on I-95 that have yellow delineators in place even though the run of barrier should only have white delineators in place. The opposite is also true in some locations; there does not appear to be any "End Road Work" signs installed on I-95 Northbound or Southbound; the "Road Work Ahead – Fines Doubled" sign is missing on I-95 Southbound.	Delineators should be installed on their correct side of the roadway as noted on the traffic plans.
0138-0248	The traffic lane shift signs on both I-95 NB and SB is mounted rather low behind the barrier curb and tilted.	The traffic lane shift signs on both I-95 NB and SB is mounted rather low behind the barrier curb and tilted.
0151-0326	The flashing arrow on the back of the TMA has both a straight bar and two corners lit.	To indicate a closed lane, either the straight bar or four-corner beacon should be used, not both.

PROJECT	FINDING	RECOMMENDATION
0151-0326	The CMS in the median before Exit 18 is less than 1000 feet apart.	Message signs need to be 1000 feet apart to prevent confusion or overwhelming the motorists with messages. Post Review Meeting: The CMS was placed at that location because it is the only area that's not a steep embankment. There was discussion about Highway Ops turning off the VMS at that site while construction was active for this isolated circumstance.
0151-0326	The flashing arrow boards placed within the taper on the Eastbound side are placed close together.	The flashing arrow boards are to be placed at the beginning of each taper with a 1600-foot tangential in between. Post Review Meeting: Due to the road curvature at that section of the road and limited spacing between exits, the tangent between the tapers appears much shorter than it was.
0172-0500 Informal	The detour signs were directional signs for the left or right but were posted straight up turning message on its side.	ACTION NEEDED: Detour directional signs should be mounted in the correct orientation or a DETOUR sign with the proper directional arrow posted below.
INSUFFICIENT QUANTITY OF EQUIPMENT		
0102-0348	The Crash Truck item was underbid by the Contractor, so they limit the amount of trucks used and supplement traffic control when closing a lane by using more State Police.	Project staff should use discretion on ordering of State Police. It is not recommended to supplement Crash Trucks due to bidding by the Contractor. Minimum number of Crash Units is specified in the contract specifications and MUTCD. If there continues to be issues, the OOC may be contacted for further discussion.
MESSAGE CONFUSION		
0080-0131/0130-0184	The detour sign is directing to turn right to take the detour around the closure. However, the sign states that the closure is a half a mile ahead, when really the closure is a half a mile ahead upon turning left.	The sign stating the distance until the closure should be reposted separately on Benson Road to accurately describe the location of the work, not facing towards Kissawaug Road.
0080-0131/0130-0184	A detour sign for the Bucks Hill Closure directed traffic to turn onto Old Waterbury Road, but the sign placement could be misunderstood to turn onto the I-84 on ramp.	Barricade chevrons should point down to the open travel lane that traffic should proceed to take.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0106-0122	The Changeable Message Sign stated night work started the week prior but there was no work the week the review. Also, it stated there was a detour but there was no detour signed.	The CMS should've been turned off if there was no activity and no detour to take. The messaging can confuse motorists about traveling around the work zone.
0172-0500 Informal	The CMS before Exit 23 was being used and stated "8/4/21 EXIT 27 CLOSED, EXIT 27 CLOSED 8/5/21".	It may be better to state Exit 27 closed on one frame and the dates of the closure on the other to prevent confusion on which dates it's closed.
0172-0500 Informal	The first sign of the closure stated EXIT CLOSED USE NEXT EXIT which would have been Exit 28N.	ACTION NEEDED: The closure sign misdirected motorists to Use Exit 28 S to I-395 S when the detour was at the following exit at 28N to I-395 N. Signs for a detour need to be clear and accurate with their messaging to prevent confusion and misdirection. For an extra measure of clarity, a sign could've been posted near Exit 28 N stating FOLLOW DETOUR, TAKE EXIT 28 S, and a directional arrow forward so motorists know not to exit at that exit.
MISCOMMUNICATION		
0106-0122	There was no construction activity during the night review.	Work Zone Reviews are preferred to be done while construction is active but in certain circumstances a review can be conducted of the work area while inactive.
PEDESTRIAN ACCESS		
0082-0312	The ROAD WORK AHEAD signs were installed on the sidewalks instead of the shoulders. The signs were preventing access for pedestrians	Traffic signs shouldn't obstruct passage for any road user. If there is limited space, posting them on barrier can be explored. Post Review Meeting: The temporary signs placed on the sidewalk on Main Street in Portland will be installed on a narrower base to prevent obstruction to the sidewalk.
0134-0147	There were no pedestrian signs for sidewalks or pathways within the project.	If there are pedestrians that come through the area and they can use the sidewalks/pathways, proper signage should be installed to direct them through the work zone.

PROJECT	FINDING	RECOMMENDATION
0138-0248	There are no temporary pedestrian pathways provided on Veterans Boulevard.	If existing pedestrian pathways are disturbed from construction, temporary ones must be provided or at least direction to avoid the area and seek an alternate route.
0106-0122	The road was fully closed the Friday before Halloween. Some motorists were permitted through to access businesses, but several construction operations were taken place throughout the road and there was no traffic control to direct them around the operations.	The road should never be fully closed. At least one lane of travel in each direction must always be maintained. Having municipal police prohibiting through traffic at either end of the work zone can be good to bring awareness of the work zone but the use of uniformed flaggers to supplement the police could ensure a safer work zone. They could have been stationed within the work zone to direct traffic around the operations and assist pedestrians crossing the street. Although the holiday traffic may have been an infrequent occasion, there still should be measures in place to protect the traveling public through the work zone and something that should be discussed at Work Zone Safety Meetings.
PLAN REVIEWS		
0172-0500 Informal	The Chief Inspector stated the detour was designed by the Contractor and submitted to Traffic Engineering for review, but direction was given for just the District to review.	Detour plans should be reviewed with more scrutiny, field reviews to see if detours consist of state routes with proper clearances, and review of the signs/devices used for the type of routes included are correct.
QUALITY OF DEVICES AND FEATURES		
0015-0248	A lot of the traffic control devices are worn, mishappen, or knocked over.	Traffic control devices that worn, dirty, misshapen, or not properly anchored should be tended to or replaced. Refer to the ATSSA Quality Guidelines for Traffic Control Devices and Features.
0043-0131	Barricade Warning Light on top of "Uneven pavement" Sign was not working.	Warning lights should be operational especially for night-time operations.
0043-0131	A few traffic drums are in unacceptable condition according to ATSSA Guidelines.	Signs and devices in marginal or poor condition need to be replaced. Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0080-0131/0130-0184	Some of the traffic cones were worn, misshapen, and in an unacceptable condition.	Marginal and unacceptable traffic devices and features should be replaced. Refer to the ATSSA Quality Guidelines for Traffic Control Devices and Features.
0083-0264	The line striping on the shoulders on Wheelers Farm Road looked like they could benefit from being restriped.	Consider restriping faded or missing line striping.
0102-0348	The liability sign on the Exit 15 On Ramp was completely faded. It may be an adjacent project's sign and the staff will check into it and check to see where their liability is.	If the sign is this project's, all traffic signs and devices that unacceptable in condition should be replaced. Refer to the ATSSA Quality Guidelines for Traffic Control Devices and Features for examples of what is acceptable/unacceptable. If the sign is not the project's, then advance warning signs for adjacent projects need to be coordinated to eliminate confusion in messaging.
0106-0122	The barricade warning lights attached to the post-mounted diamond-shaped signs weren't working.	The warning lights need to be replaced with working ones. They bring awareness to the construction signs especially at night.
0106-0122	The temporary pavement markings were faded and had poor reflectivity at night.	Temporary pavement markings need to be replaced once milled to delineate the travel lanes.
0106-0122	A few traffic drums are in unacceptable condition according to the ATSSA Quality Guidelines.	Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features to gauge when devices are in poor condition and need replacing.
0108-0186	The construction liability sign on Route 14 Westbound is faded.	Construction signs that are faded are considered of unacceptable quality and should be replaced. Refer to the ATSSA Quality Guidelines for Traffic Control Devices and Features for examples of devices of acceptable quality. Post Review Meeting: The project will be getting new traffic signs for the next stage and signs that are faded will be replaced when other signs are changed over.
0108-0186	The FINES DOUBLED sign posted on I-395 NB was mounted on one post not two.	A post-mounted sign on an interstate would be best to be mounted on two posts to ensure its stability near faster paced vehicles.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0134-0147	There were warning lights on top of the barricades, but it couldn't be determined if they were functioning.	Project staff should confirm that warning lights are functioning.
0138-0248	A section of barrier on I-95 Southbound near the new off-ramp was struck.	The barrier curb should be reset to properly protect the work area.
0138-0248	There are several traffic cones and drums that are either missing, misshapen, damaged, or non-reflective.	Traffic signs and devices that are marginal or unacceptable in condition should be replaced. Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features for examples.
0139-0113	The drums were in marginal condition.	Refer to ATSSA's Quality Guidelines for Traffic Control Features and Devices to know what is acceptable for devices.
0139-0113	An END ROAD WORK sign on Route 159 SB was so faded the messaging could not be read.	Refer to ATSSA's Quality Guidelines.
0139-0113	A stop sign at the end of the I-91 off-ramp before entering onto the bridge had graffiti all over it.	The stop sign should be cleaned or replaced.
0151-0326	On I-84 EB the barricade warning lights on the diamond-shaped signs were not functioning.	Traffic plans call for barricade warning lights to be attached to post-mounted, diamond-shaped signs, but they need to be working as well.
0151-0326	The Changeable Message Sign in the median before Eastbound Exit 21 had lights that were pixelated and the same for the CMS at the EB Exit 19 gore.	The lighting on Changeable Message Signs needs to be consistent so motorists can read the message properly from a distance.
0151-0326	Some of the traffic drums were in worn and missing reflective tape. Several signs and devices were dirty and interfering with the reflectivity.	Traffic devices that are worn, misshapen, or missing reflective tape need to be replaced. Refer the ATSSA Quality Guidelines for Temporary Traffic Control.
0172-0500 Informal	Some traffic cones were dirty on the reflective tape.	ACTION NEEDED: Traffic control devices and features that are dirty need to be cleaned so their reflectively and messaging are effective. If they cannot be cleaned well, they need to be replaced. Reflectivity is imperative for that area along Route 2 where there is little to no roadway illumination. Refer to the ATSSA Guidelines for Temporary Traffic Control Devices and Features for acceptable conditions of devices.

PROJECT	FINDING	RECOMMENDATION
0172-0500 Informal	Exit 27 was closed later in the night to pave the ramp. The traffic signs used for the closure were so dirty the message on them could barely be read.	Refer to the ATSSA Quality Guidelines.
0172-0500 Formal	Some traffic signs and devices are dirty and faded.	Dirty and faded signs and devices can obstruct their effectiveness for motorists. They should be cleaned or replaced. Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features for examples of acceptable quality for devices.
0155-0171	Some of the signs were either dirty or had poor reflectivity.	Replace of clean traffic signs with poor reflectivity. Refer the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features.
0155-0171	Some Warning Lights on top of the diamond-shaped construction signs are not working on both the Eastbound and Westbound.	Replace Warning lights that are not properly working.
0096-0200	Some advance warning signs were unclean and/or damaged.	Traffic control devices and features that are unclean should be cleaned to avoid interference with their reflectivity. Devices that are worn or misshapen should be replaced. Refer to the ATSSA Quality Guidelines for Temporary Traffic Control Device and Features for guidance on what is an acceptable quality for devices.
SIGN COVERAGE NEEDED		
0043-0131	There is "lanes shifted" sign was placed in the transition area of the work zone.	According to the MUTCD, it should be placed in the Advance Warning Area some distance before to give motorists enough time to prepare for the change in the roadway.
SPECIAL PROVISION NON-COMPLIANCE		

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0155-0171	The Contractor proceeded out on the road earlier than planned with a modified Limitations of Operation chart. After the Rolling Road Block on the Eastbound side, the queue was over a mile long.	Traffic Engineering will investigate the start times for taking lanes and if they are appropriate for the traffic volumes on the roadway. Post-Review Meeting: The modified LOOs the Chief Inspector used was shared with the project staff and it was confirmed that the new chart was just for the special exception for reduced volumes due to the COVID-19 Quarantine. Now that pre-COVID volumes have resumed, the modified restrictions have been rescinded. The project staff plan to return to the original Limitations of Operation.
SPEEDING COUNTERMEASURES		
0139-0113	The speed limit was legally reduced to 35 mph.	Hopefully, reducing the speed limit can make traffic safer around the work zone.
0172-0500 Formal	Contractor wants to know why special provisions has removed the REDUCE SPEED signs for the traffic pattern set up.	The special provisions have removed the REDUCED SPEED signs from the traffic pattern because they are not enforceable so no action can come from placing them. Only if the project has the roadway speed legally reduced by OSTA, can it be enforceable. Traffic stated that our traffic control patterns in the Maintenance and Protection of Traffic (Item # 0971001A) special provision follows that of the MUTCD which also doesn't have the REDUCE SPEED signs for lane closure patterns. The MUTCD only has an optional speed advisory plaque to be used for work zones when lanes are shifted.
TRAFFIC DESIGN ISSUES		
0122-0103	The project had consultant design and there were issues with the project's traffic design and constructability.	Designers should be aware of field conditions and willing to modify their designs to accommodate. Project staff should have follow-up conversations with designer and escalate if necessary.
TRAFFIC DEVICE VISIBILITY		
0096-0200	Traffic drums were used on the initial taper of the pattern, but traffic cones were used for other tapers within the pattern.	Although traffic plans state that traffic drums or cones can be used on the taper, it has been found that traffic drums give more visibility in the transition of the pattern which can prevent errant vehicles from mistakenly entering the closed lane.

PROJECT	FINDING	RECOMMENDATION
0172-0500 Informal	Traffic cones are used to close across the right lane when providing access to Exit 27.	ACTION NEEDED: To prevent motorists from entering the closed lane, traffic drums should be used for merges and transverse lane closures. They are larger to be seen better and minimize the space in between each device. They give better delineation for areas of transition.
0172-0500 Formal	Traffic cones were used across the lane to close it instead of using traffic drums.	On a merge or lane closure across a lane, traffic drums should be used to ensure motorists see the closure and don't enter the closed lane.
TRAFFIC PATTERN TIDINESS		
0172-0500 Formal	Some traffic cones in the pattern were knocked over probably by an errant vehicle.	The traffic cones need to be reset so openings in the traffic pattern don't confuse motorists to enter the closed lane.
TRAFFIC PLAN NON-COMPLIANCE		
0007-0189	There was no liability sign on Route 9 SB or on the Route 9 Exit 21 on ramp.	There should be liability signs on the mainline or on exits right before work area to notify motorists of the work zone.
0007-0189	There were no signs on left/median side.	On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway.
0007-0189	The first lane closure was shorter than typical compared to TCP #2 (20 drums) and the second lane closure taper may also be a bit short.	Refer the traffic standard sheets to know how long tapers should be.
0015-0248	The traffic drums were not spaced properly apart or aligned for clear delineation.	Traffic control devices giving delineation around the work zone should be spaced according to the traffic plans.
0015-0248	There was no END ROAD WORK sign on the Southbound side.	All traffic signs noted on the traffic plans need to be posted to properly keep motorists informed of the work area.
0043-0131	The contractor was missing the two "End Road Work" signs (Sign Nos. 80-9612) located approximately 500' downstream from the work zone.	The contractor should take note of this and setup the two signs when setting up the pattern and work zone signs from now on.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0043-0131	The contractor did not setup a downstream taper after the work zone.	The contractor should continue placing traffic drums to create a taper for approximately 100' after the work zone with the traffic drums placed at 40' spacing. Post Review Meeting: The inspection staff said that the downstream taper was installed later after the initial traffic pattern was placed once the concrete barrier curb was installed.
0043-0131	The contractor installed sign nos. 80-9484 and 80-9483 instead of Sign Nos. 80-9446 and 80-9445, respectively.	The contractor should remove the existing signs and replace with the proper signs that are called for from the plans. Post Review Meeting: After the traffic pattern was installed the sign crew went back around and replaced the three-lane shift signs with two-lane shift signs.
0082-0312	The ROAD WORK AHEAD sign was in the activity area not in advance of it. It either needs to be relocated to the advance warning area or removed.	Again, traffic signs need to be placed in their proper position to be most effective.
0096-0200	With reviewing the traffic again, one of the advance warning signs had fallen.	Ensure signs are securely mounted and devices are properly anchored, so they are displaced.
0102-0348	There was no END ROAD WORK sign on the mainline of I-95 Southbound or no liability sign on the mainline of I-95 Northbound.	All traffic signs noted on the traffic plans should be installed to ensure motorists are properly informed of the work zone specifics.
0102-0348	There were temporary signs placed on the Exit 15 On Ramp before the liability sign.	The temporary signs were for the previous stage and either need to be removed or covered. Post Review Meeting: Since the post review meeting, the Contractor removed the temporary signs on Exit 15 On Ramp and replaced the faded liability sign.
0106-0122	There was no END ROAD WORK sign on the northbound side.	Unless there is an approved field changed, all traffic signs should be installed according to plan.
0108-0186	There was no END ROAD WORK sign after passing under the bridge on Route 14 or on I-395.	All signs on the traffic plans need to be installed to ensure motorists are properly informed about the work zone.

PROJECT	FINDING	RECOMMENDATION
0122-0103	At this intersection of Warsaw Road and Elm Street there is no detour sign to direct traffic to turn right onto Elm Street to remain on the detour route. The WZ team didn't even know to turn and continued down Warsaw Road. It would be beneficial to have another detour sign posted to advise to turn there.	An additional detour sign at Warsaw Road and Elm Street directing to turn right could help motorists stay on the detour route and successfully reaching the other side of the closure.
0138-0248	The left turn lane from Ferry Boulevard NB to Barnum Avenue Cutoff was closed, but the traffic pattern didn't start at the beginning of the lane but began well after the start.	The closure should start from the beginning of the left-turn lane so that traffic doesn't enter the lane and then have to quickly merge into the open lane.
0139-0113	Two signs were missing: Sign E (END ROAD WORK) at SR 190 EB Off-ramp and Sign E (END ROAD WORK) at SR 190 WB.	Refer to traffic control plans to have all the proper signs placed.
0139-0113	There was no Changeable Message Sign installed like according to the plans. One should have been installed in the vicinity of STA 140+00 on SR 190.	Devices need to be installed according to the plans and CMS help to inform motorists of work being done.
0172-0500 Formal	There was no END ROAD WORK sign.	Motorists should be informed when the work zone has ended so they can resume normal driving habits.
0172-0500 Formal	On the mainline, the FINES DOUBLED sign was installed only on the left side of the highway.	Construction signs are placed on both sides of the roadway. When only one sign is required for the placed (i.e. the FINES DOUBLED sign), it will be placed on the right side of the roadway, not the left.
TRAFFIC SIGN OBSTRUCTION		
0080-0131/0130-0184	Several of the post-mounted traffic signs were covered by tree branches.	Selective clearing should be done so that all traffic signs and devices are clearly visible to traffic.
0082-0312	Traffic signs were obstructed by trees.	Selective clearing needs to be done so all signs and devices can be easily seen by motorists.
0083-0264	The temporary signal ahead sign on Wheelers Farm Road is blocked by tree branches.	Selective clearing should be done for signs and devices obstructed by overgrown plants.
0108-0186	The ROAD WORK AHEAD sign was obstructed by tree branches.	Selective clearing should be done when tree branches and shrubbery obstruct traffic control devices and features.
0108-0186	The liability sign on I-395 SB is twisted away from the roadway.	The sign should be fixed or replaced so its messaging can be properly displayed by motorists.

PROJECT	FINDING	RECOMMENDATION
0122-0103	The construction liability sign is posted after the road closure. The Work Zone Safety team discussed with the Chief Inspector if the sign could be moved before the closure but with limited space and the plans depicting that the sign is to be posted there, it may not be able to be moved.	When approaching a work zone, a driver should be informed of the work ahead and liability. Although, the plans show to place the liability sign after the blockade, another sign should be placed before the blockade.
0134-0147	A FINES DOUBLED sign on Route 319 was obstructed by tree branches.	Selective clearing may need to be done so all signs are visible, and their messages can be fully read.
0138-0248	The “Road Work Ahead” sign on I-95 Northbound is blocked by tree branches.	The branches should be cut, or the sign relocated for better visibility.
0139-0113	Signs placed near low-hanging trees or overgrown bushes may have their messaging obstructed.	Selective clearing may be needed so signs aren’t obstructed, and motorists can clearly see their messaging.
TRAFFIC SIGN VISIBILITY		
0138-0248	The stop sign on Veterans Boulevard is far outside of the driver’s line of sight due to the work on the corner.	A temporary stop sign should be installed closer to the roadway to be more visible to drivers.
TRAVEL HAZARD		
0015-0248	Material for the project was stored within the clear zone without positive protection.	Any materials or equipment need to be stored outside of the clear zone, for this roadway it would be 16 feet from the road, or positively protected.
0083-0264	The light used for illumination in the work area on the connector shines directly into oncoming traffic on Wheelers Farm Road. Attached is a picture of the condition.	The angle of the light should be revised, if possible.
0106-0122	On two occasions, equipment parked in the clear zone with no positive protection around it.	Inactive equipment needs to be stored outside the clear zone (based on speed limit of the roadway - at least 16 feet from the edge of the roadway) or be positively protected (e.g., behind barrier curb).
0106-0122	The catch basin tops are higher than the milled surface close to the roadway.	Exposed Catch Basin/Drainage tops should be delineated with high-visibility paint.
0139-0113	The Contractor was not working at the time of the review. They have environmental restrictions where they can’t work under the bridge until the end of July.	Although the Contractor is not working, any disturbances on the roadway need protection and proper guidance around it.

<u>PROJECT</u>	<u>FINDING</u>	<u>RECOMMENDATION</u>
0172-0500 Informal	Changeable Message Signs that weren't in use are stored within the clear zone were only delineated with traffic drums.	ACTION NEEDED: Any equipment stored in the clear zone needs to be positively protected or be removed from the clear zone. This can prevent severe to fatal crashes from occurring.
0172-0500 Formal	The traffic cones are placed slightly in the travel lane oppose to the pavement marking.	Traffic cones should be placed on the pavement marking and moved out only equipment is passing and replaced back. Putting cones in the travel lane, narrows the lane.
STATE POLICE ASSIGNMENT CONFLICT		
0122-0103	The project uses State Police when Municipal Police are unavailable. However, a Resident Trooper said that to ensure State Police fill the request, put the request as OPA instead of HCP.	State Police used for presence on a construction project should only be requested under the HCP code. Post Review Meeting: The project no longer uses State Police at night, so no there's no issue with the requests being filled.

Summary

Findings from reviews are always presented to the project personnel to be remedied as soon as possible but also serves as a training opportunity. Periodically, the findings are compiled and presented to the construction inspection staff statewide in the annual training sessions with the intent to assist in preventing poor practices. The following is a summary of the potential courses of action that could be focused upon to mitigate discrepancies or promote successful practices based on 2021 field reviews.

Course of Action:

1. Most of the findings are minor issues that may have been overlooked in the field and can be addressed by bringing awareness to situation. On occasion, the findings may be issues that need to be brought to the attention of outside party (i.e. coordination of traffic signs between projects or Maintenance Operations).

Topics found during the 2021 season include:

- a. Additional devices needed – *The spacing between the traffic devices on the taper is too wide and could allow an errant motorist to enter the close lane. If the number of devices called for on the plans are installed, adding additional devices to a pattern is permitted. Staff should be made aware that additional devices are acceptable.*
- b. Increase of advance planning, coordination, and communication – *When starting a project that's adjacent to other projects (either construction or maintenance), traffic signs and patterns may overlap or opposing lane closure need to be coordinated to prevent confusion to motorists or hazards from abrupt lane changes (e.g. left lane closed on one project and the right lane closed on adjacent project). A listing of personnel to contact for Work Zone Safety Meetings will assist.*
- c. Contract non-compliance – *The most common non-compliance issue found were missing traffic signs. The second most common was the improper installation of signs. The most significant non-compliance issue was proceeding out on the road before permitted by the Limitations of Operation. This caused congestion and long queues which can result in back-of-queue crashes. Compliance to the special provisions and traffic plans prevents state-liability if incidents occur. This should continue to be stressed to inspection staff.*
- d. Field condition modification to standard drawings – *There are a few occasions where the traffic plans may omit consideration of actual field conditions (i.e. traffic pattern lengths for curved roadways) and proper warning or delineation is not clearly defined to approaching motorists. In these cases, adding additional devices to extend a pattern around the road curvature is the best solution to*

properly guide motorists through a lane closure without having to abruptly changing lanes afterwards.

- e. Improper use of traffic control devices – *Traffic signs or devices were found to be used in the wrong place, in the wrong mode, with the wrong message, or even the wrong type. Use of resources like ATSSA training that educates on the right types of devices and how to use them can be helpful refreshers to avoid these situations.*
- f. Message confusion – *Traffic signs and Changeable Message Signs with incorrect information or poor sightline placement can misdirect as well as misinform motorists. Inspection staff needs to ensure that messages are clear and accurate.*
- g. Miscommunication between units – *When scheduling work zone reviews, project staff need to be forthcoming of changes in work schedules to assist the Work Zone Review Team prior to field reviews.*
- h. Pedestrian access – *Design plans need to provide direction for how to maintain and protect pedestrian access if access was existing prior to construction. Pedestrian access should be discussed during Work Zone Safety meetings, so Contractor and inspection staff agree on maintaining safe pedestrian access throughout the duration of the project.*
- i. Quality/condition of devices and features – *When construction signs and devices are in poor condition, they lose visibility and effectiveness to motorists. Training and using resources like ATSSA Quality Guidelines give examples of devices that in poor condition to know which devices need replacing.*
- j. Directive non-compliance – *All work zone related policies should be reviewed during the Work Zone Safety meetings for all parties to know what is expected during construction. Although directives are referenced in the Work Zone Safety Meeting outline, attaching to the meeting minutes can help ensure that the information is passed along to all interested parties.*
- k. Traffic sign and device visibility and pattern tidiness - *Traffic signs need their messages unobstructed and devices need to be visible to motorists as they proceed through the work zone to properly delineate areas closed to travel from those that are open. Periodic drive-throughs of the work zone through the work shift to check on proper placement of devices would assure an organized work zone.*
- l. Traffic plan non-compliance – *Along with contract compliance, traffic plan compliance is imperative for compliance. The work zone has been mathematically determined for proper placement of all signs and devices. Review of all needed devices and drive-throughs of the work zone will help assure compliance.*
- m. Travel hazard – *The clear zone for a roadway needs to be unobstructed to eliminate hazards to an errant vehicle. Reminders to the Contractor to positively protected or removed to another location can prevent clear zone intrusion.*

- n. State Police Assignment Conflict – *State Police should not be able to select which type of classification for assignments to fill. This needs to be brought to the attention of the State Police liaison to resolve with DESPP.*
2. Any best practices that are found during field reviews are noted as well. The WZR Team does not just focus on the non-compliant issues or areas of work zones that are deficient but find practices that increase Work Zone Safety and can be useful in the program statewide. These can be implemented through directives, specification revisions, as well as best practices training.
 3. If the issues have significant impacts or constantly reoccurring, the findings are included in the Work Zone Safety and Mobility Process Review. In the Work Zone Process Review, a more systematic plan can potentially be developed including more perspective from other units which may assist with a proposed resolution. Those findings may include:
 - a. Driver behavior – *Unsafe driver habits can be brought the Highway Safety Unit within Policy and Planning to be addressed through campaigns or education.*
 - b. Improper positioning of State Police in Work Zones – *Having the presence of State Police to assist with traffic control through work zones will be futile if the police are not positioned well to be effective for traffic calming. Issues like these should be relayed to the DESPP in order for state police training of those filling requests.*
 - c. Insufficient quantity of traffic control devices – *Device quantities can be identified during the plan reviews or noted in post construction reviews.*
 - d. Speeding countermeasures – *The use of Work Zone technology (i.e. radar speed displays) or law enforcement (i.e. ticketing) can help combat speeding in the work zones.*
 - e. Design issues/discrepancies – *Coordination with Engineering to correct design issues to eliminate any hazards or liabilities.*

Work Zone Reviews give the Department the best practical insight of Work Zone Safety for roadway projects throughout the State. They assist the Department by bringing to attention whether current practices need modifying or if general knowledge is lacking. The best strategy to increase knowledge or implement new practices is through increased training, engineer evaluations, or specific research. Our field review process has also evolved to meet situational circumstances and help remain relevant with the changing world of construction along with associated impact to the road users.

Appendix: 2021 Work Zone Safety Field Review Reports*

** Individual Review Reports can be obtained by sending a request to the Division of Construction Operations – Quality Assurance Unit Work Zone Safety Team*

A. Formal Field Reviews

1. 0015-0248, Route 1, Bridgeport
2. 0043-0131, I-95, East Haven/Branford
3. 0080-0131/0130-0184, Benson Road & Bucks Hill Road, Middlebury
4. 0082-0312, Route 66, Middletown/Portland
5. 0083-0264, Wheelers Farm Road & SR 796, Milford
6. 0096-0200, I-84, Newtown
7. 0102-0348, I-95, Norwalk
8. 0122-0103, Route 80, Deep River
9. 0134-0147, Routes 190 & 319, Stafford
10. 0139-0113, Route 190, Suffield/Enfield
11. 0172-0500, Route 2, Lebanon

B. Informal Field Reviews

1. 0007-0189, Route 9, Cromwell
2. 0106-0122, Route 1, Orange
3. 0172-0500, Route 2, Colchester

C. In-Depth Field Reviews

1. 0108-0186, Route 14 & I-395, Sterling
2. 0138-0248, I-95 & Routes 1 & 130, Stratford
3. 0151-0326, I-84, Waterbury
4. 0155-0171, I-84, West Hartford