

SDDOT CONSTRUCTION MANUAL  
PROJECT MANAGEMENT SECTION  
**CHAPTER 15 – WORK ZONE TRAFFIC CONTROL**

**LANE CLOSURES ON INTERSTATE AND HIGH-SPEED MULTILANE HIGHWAYS**

The following guidelines establish limits on the length and duration of lane closures on interstate and high speed four-lane divided highways. This will better serve our customer, the traveling public, by reducing unnecessary delays and improving safety by limiting exposure to highway work areas where incidents may occur.

The guidelines for lane closure length and duration below are provided so that the public has uniform and safe traveling conditions through interstate and high-speed multilane highway work zones across the state. Local and unique situations may require deviations from these guidelines. Such deviations must be approved by the Director of Operations or the Construction and Maintenance Engineer.

Requests for longer lane closures may be submitted via email and must include justification for the request. Exceptions will be determined on a case-by-case basis; however, they will not be granted if the sole reasoning is that the contractor's operations will be faster or more efficient with less impact to the traveling public, as this is generally true for all lane closures.

Additional measures or constraints may be needed for lane closures on I-90 between Exits 52 and 67 at Rapid City and on the interstate loop around Sioux Falls, such as peak hour restrictions or queue warning systems. The Area Engineer will determine if limits such as peak hour restrictions should be used. See the section on Queue Warning Systems in the Chapter for more information on the use of these systems.

**Lane Closure Length**

Lane closures on Interstate and high-speed multilane highway projects should be no longer than 5 miles. High speed is defined as having a posted speed limit 45 mph and higher. Lane closures up to 10 miles in length may be allowed for one day or less for construction work with very high production rates (e.g., shoulder chip seals). Interstate lane closures shorter than 5 miles should be used if 5 miles is greater than the length of work that can be accomplished in one day's production.

More than one lane closure may be permitted; however, there will be a minimum of a three-mile section between lane closures, excluding the tapers.

The length of lane closures for structure work on interstate should be limited based on the number of structures, the distance between structures, and the type of work being done. The intent is to limit the amount of interstate reduced to one lane to reduce the impact on traffic. Limiting lane closures to one structure or 1 mile unless other structures are within two miles of each other is one example of how to accomplish this. A three-mile gap is still required between lane closures. Certain sections of interstate with higher ADT may have increased potential for incidents with multiple lane closures for separate structures. Area staff will need to determine the appropriate limitations on lane closures for structure work. These limitations must be clearly indicated in the plan notes (there is not a standard note for this, one will need to be written for the individual project). Limitations on lane closures for structure work may also be established through the contract time provision used for the project.

Projects on which two-way traffic is being carried on one set of lanes are exempt from the lane closure length limits above. Two-way traffic operations greater than 12 miles in length must be approved by the Region Engineer.

### **Lane Closure Duration**

Interstate lane closures should be removed when work will not be occurring for a period of 3 or more calendar days. Activities that do not involve workers being present, such as curing time for concrete, constitute work. Lane closures should not be set up on Friday if no work will be occurring on Saturday or Sunday. In these cases, the lane closure should be installed on Monday.

Projects with lane closures on interstate must include lane rental, working day, or similar contract time provisions, unless the Area Engineer determines it is not applicable or in the best interest of the department and/or traveling public. There must be documentation of the reason for not including such provision. Discussions with the Specifications Engineer and the Construction and Maintenance Engineer may be held to determine appropriateness of contract time provisions for projects on a case-by-case basis. Use of lane rental, working day, or similar contract time provisions may be considered for projects on non-interstate highways to incentivize the contractor to use shorter durations of lane closures.

### **WORK ZONE SPEED REDUCTIONS**

The intent of reducing driver speeds within the work zone is to promote safe and efficient traffic flow, as well as to enhance the ability of traffic to safely react to highway work zones and disruptions in traffic flow.

Realistic design speeds and work zone speed limits should be established during the planning and design of the temporary traffic control plan. Reduced speeds should only be used where necessitated by road conditions. When used, work zone speed reductions should only be posted in the vicinity of work being performed.

### **Work Zone Speed Limit Reductions**

South Dakota Codified Law (SDCL) 32-25-19.1 allows the secretary of public safety and the secretary of transportation, after consultation with the director of the highway patrol, to establish limited speed zones through highway work areas on the state trunk highways. The speed limit for traffic moving through a construction work zone may be requested to be reduced based on engineering judgement.

Typical work zone speed limits for lane closures are set at 65 mph or 10 mph below the original posted speed limit. When traffic is immediately adjacent to construction work being performed, the speed may be reduced to 45 mph when workers are present. Specific site conditions or work may justify other regulatory or advisory speed limits.

The speed limit on the set of lanes carrying two-way traffic may be up to 65 mph, as determined through engineering evaluation and traffic analysis.

The length of the 45-mph zone should be kept to within  $\frac{1}{4}$  mile of the active work area where workers are present. This means the beginning of the 45-mph zone should be no more than  $\frac{1}{4}$  mile upstream of workers and the end of the 45-mph zone should be no more than  $\frac{1}{4}$  mile downstream of workers.

If the beginning or end of the 45-mph zone does not coincide with the beginning or end of the lane closure, SPEED LIMIT 65 signs (or the work zone speed limit at that location) should be used to designate the lane closure speed limit where workers are not present. SPEED LIMIT 45 signs must be removed when workers are not present.

Work on structures where lane widths are limited and/or movable concrete barriers are used may require a 45 MPH speed limit 24/7. This 45 MPH speed limit would be posted for the full length of lane closure for the structure work.

Facilities with normal posted speed limits of 75 or 80 mph need to include a step-down speed of 65 mph in advance of any 45-mph speed zone.

When there is a 3-mile section between the work zones, the speed limit on the gap section will be the prevailing speed limit, unless site conditions, engineering judgment or traffic analysis justifies other speed limits.

A DOT 299 Work Zone Speed Request must be filled out and sent to the Operations Traffic Engineer to request the appropriate speed limit reduction. The DOT 299 will include information on the work being done on the project, the speed limit requested, and whether it will be in effect 24 hours a day, only while lane closures are present, or only while workers are present. The begin and end locations for the reduced speed limit as well as the approximate start and end dates for the reduced speed limit will also be included, along with justification for the reduction.

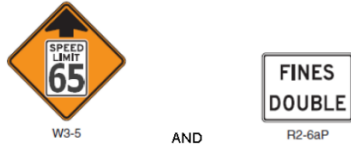
The proposed requests should be reviewed with the Region Traffic Engineer prior to submittal. It is also required that approval be obtained from the appropriate District Highway Patrol, with this individual's name included in the DOT 299.

After reviewing the DOT 299, the Operations Traffic Engineer will send it to the Director of Operations, the Secretary of Transportation, the Secretary of Public Safety, and the Superintendent of the Highway Patrol via email for their approval. The Operations Traffic Engineer will keep an electronic copy of each DOT 299 and all email approvals on file.

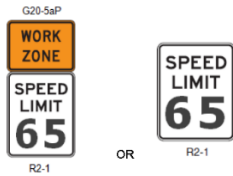
While approvals are generally obtained rather quickly, it is recommended that the requests be sent in as soon as possible, but at least one week prior to the anticipated start date for the speed limit reduction. If approvals have not been obtained, the speed limit is not enforceable and should not be posted in the work zone. The Operations Traffic Engineer will notify the requestor when confirmation of approval has been received.

SDCL 32-25-19.1 requires the beginning and end of each limited speed zone established to be conspicuously posted with signs showing the maximum speed permissible. Work zone speed limits on interstate and high speed divided highways will be installed as shown on standard plate 634.63.

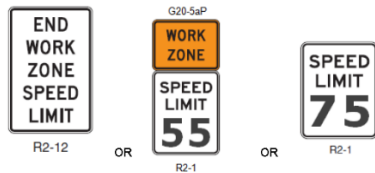
For all other situations, work zone speed limits should be posted by first including a W3-5 Reduced Speed Limit Ahead sign. This sign should be mounted with an R2-6aP FINES DOUBLE plaque if the speed limit will be in place for areas where workers are present, as SDCL 32-25-19.1 requires signs showing that a fine will be double the usual speeding fine to be erected in advance of the regulatory speed limit signs.



The next sign will be the R2-1 SPEED LIMIT sign. A WORK ZONE (G20-5aP) plaque may be mounted above the SPEED LIMIT sign.



The last sign will be an R2-12 END WORK ZONE SPEED LIMIT sign, the next construction reduced speed limit sign, or the normal posted speed limit sign.



Requests for limited speed zone reductions for off-system locations are not covered under SDCL 32-25-19.1 and should be handled with the local city or county authority.

### Advisory Speeds

Advisory speed plaques may be used in combination with a warning sign to indicate a recommended speed through the work zone or a specific area within the work zone. Examples include advisory speed plaques with BUMP warning signs and advisory speed plaques used with Reverse Curve signs for median crossovers. Advisory speeds are typically used for areas where a short, specific condition exists where it is recommended that traffic travel slower through, along, or over this area.

When performing work that impacts the geometry of exit or entrance ramps on interstate, angles and required operating speeds should be considered when the interstate ramp traffic control is installed, and adjustments made in the field as needed. Advisory speed plaques may be used with temporary EXIT signing as needed. Advisory speed plaques cannot be used alone.

## **DOT COP PROGRAM**

The DOT Cop program allows the department to pay off-duty Highway Patrol Officers to monitor and enforce our highway work zones. The Highway Patrol Officers sign up on a volunteer basis and use their patrol cars. They are required to be present in the work zone while working DOT Cop hours; enforcement is at their discretion.

While it is recognized that law enforcement can be effective at reducing speeding and undesirable driving behaviors in the work zone, keep in mind that law enforcement officers face many of the same types of hazards that highway workers face out on the roadway.

There are no criteria for which routes are eligible for the DOT Cop program, but most Areas focus their efforts on the interstate. DOT Cops should be considered for:

- Complex or very short-term changes in traffic patterns with significant potential for road user confusion or worker risk from traffic exposure.
- Existing traffic conditions and crash histories that indicate a potential for substantial safety and congestion impacts related to the work zone activity, and that may be mitigated by improved driver behavior and awareness of the work zone.
- High-speed roadways where unexpected or sudden traffic queueing is anticipated, especially if the queue forms a considerable distance in advance of the work zone or immediately adjacent to the work space.
- Night work operations that create substantial traffic safety risks for workers and road users.
- Work zones where radar speed feedback signs have been deployed but a reduction in vehicle speeds has not been achieved.

DOT Cops present an additional duty for enforcement agency manpower and equipment resources in a region. Therefore, if enforcement is to be used, it should be to address specific hazards. For work zones where traffic demands do not justify the use of enforcement or where enforcement needs exceed enforcement resources, other speed management technologies and supplements can be considered for implementation in the work zone.

The joint internal DOT Cop process for DOT and Highway Patrol is as follows:

Around March 1 of each year, the Region Traffic Engineer will ask the Engineering Supervisors in their Region for a list of projects that will be taking place between April 24 and November 23 of that year. Just because a project is listed does not guarantee that DOT Cops will patrol it. However, if there are issues with speeding through a work zone, the DOT can request Highway Patrol presence in that work zone, which they are often willing to provide.

After receiving the list of projects, the Region Traffic Engineer will send that list to the corresponding Highway Patrol DOT Cop contact for that District, along with the payroll authorization form (available from the BHR DOT Cop contact), asking for any officers interested in working DOT Cop hours between April 24 and November 23 to complete the payroll authorization and return it to their District's DOT Cop contact.

The Highway Patrol DOT Cop contact will return the documents to the BHR DOT Cop contact for time sheets by April 14 for officers to be able to start on April 24. Documents can be sent in after that, but they will have to wait until BHR notifies them that they can start working.

BHR will add the HP Supervisors designated to approve timesheets in TKS for the appropriate officers. If additional documents are received after that date, the Highway Patrol DOT Cop contact will forward those to the BHR DOT Cop contact as they are received and wait to hear from BHR for when those officers can begin working.

Note: The Bureau of Human Resources has requested that all payroll authorization forms for DOT Cops come from the Highway Patrol DOT Cop contacts for each District. If employees receive any payroll authorization forms from the SD Highway Patrol, they should send these to the appropriate Highway Patrol DOT Cop contact.

By the end of each pay period (the 8th and the 23rd of each month), officers will enter the DOT Cop hours they worked that pay period in TKS and sign their timesheet. The HP Supervisors will sign the timesheets of the officers assigned to them as their Manager.

Around the end of October, the Region Traffic Engineer will remind the Highway Patrol DOT Cop point of contact that November 23rd will be the last day to charge any DOT Cop hours.

The DOT Operations Support Office will notify the Region Traffic Engineers at the beginning of March as a reminder to initiate the process and to let them know the approximate number of hours budgeted for each Region. The Operations Support Office will then periodically contact the Region Traffic Engineers to let them know how many hours their Region has remaining. The number of DOT Cop hours for each Region is based on the Operations Support office's budget for the program. There are typically 250 hours per Region. If a Region does not think they will use all these hours, they should let the Operations Support office and the other Regions know in case they would be able to use them.

Highway Patrol DOT Cop Contacts:

District 1

Lt. Myron Norman (HP012)  
Myron.Norman@state.sd.us  
(605) 626-2286

District 2

Lt. Isaac Kurtz (HP022)  
Isaac.Kurtz@state.sd.us  
(605) 661-8605

District 3

Lt. Angel Duran (HP032)  
Angel.Duran@state.sd.us  
(605) 394-2286

For Contractor requests for speed enforcement, the process is as follows:

The Contractor Superintendent or Project Manager initiates the process by sending a complete description of the problem and the request to the Project Engineer with the following information included:

- Location of the project
- Complete description of the problem and concerns of the Contractor
- The urgency of the response needed
- Typical problem time of day and day(s) of the week
- Contact information of the Project Superintendent if additional information is needed

The Project Engineer should evaluate the request and the situation on the project and discuss the request with the Engineering Supervisor and/or Area Engineer. Consideration should be given to whether the situation is speed related or if it is caused by other issues such as congestion or a need for changes in the traffic control plan.

The request should be discussed with the Region Traffic Engineer. The Region Traffic Engineer can provide guidance on whether DOT Cop program funds are available and may be utilized for the request. If DOT Cop funds are not available, work zone enforcement may still be utilized at the discretion of the Highway Patrol during their normal work hours.

When contact is made with the Highway Patrol to request speed enforcement, all pertinent information listed above as well as the DOT's evaluation of the situation should be shared so they can adequately allocate their limited resources.

The Project Engineer and Contractor should continue to evaluate the situation and discuss with the Project Superintendent to determine if the situation has improved or if further action is needed.

This information should be shared with the Contractor's Project Managers and Superintendents at week staff meetings or preconstruction meetings.

## **WORK ZONE ITS**

Intelligent Transportation Systems (ITS) involves the use of electronics, computers, and communications equipment to collect information, process it, and take appropriate actions. The following are guidelines for use of various work zone ITS devices and technology.

The use of any of the following measures does not eliminate the need for standard advance warning signs or other traffic control devices. First and foremost, the use of proper temporary traffic control is critical to warn drivers of work zone hazards. Some work zones may then need supplemental measures to further improve safety if crash or other data suggests such a safety hazard exists.

### **Queue Warning Systems**

Queue warning systems are used to alert drivers to traffic conditions (e.g., stopped traffic, slowing traffic) ahead using sensors to monitor traffic speeds and initiating a portable changeable message sign to display a warning to drivers. These systems can be effective at reducing crashes within congested work zones, including secondary (or back of queue) incidents.

Queue warning systems should be considered for all major projects on interstate between the Rapid City exits and on the interstate loop around Sioux Falls. An estimate of the expected queue length is needed for placement of the sensors.

Typical messages displayed when the queue warning system is activated include:

SLOW TRAFFIC AHEAD / REDUCE SPEED

STOPPED TRAFFIC AHEAD / PREPARE TO STOP

Variable speed limits have been used in conjunction with a queue warning system for interchange reconstruction projects in the Sioux Falls area. The work zone speed limits were displayed on digital speed limit signs. The speed limits displayed would be the standard 10-mph reduction of 55 for the lane closure and 45 when workers are present during off peak times when no congestion was occurring. During peak times when congestion was present, the digital speed limit displays would reduce the 65 or 55-mph zones to 45 mph the queue warning system detected traffic traveling between 30 mph and 5 mph. the digital speed displays would also reduce the 45-mph zones to 30 mph when the queue warning system detected traffic traveling slower than 5 mph or at a stopped condition. The system would always display a 45-mph zone between any 65-mph zone and a 30-mph zone.

### **Radar Speed Feedback Signs**

Radar Speed Feedback Signs (RSFS) display real-time vehicle speeds, alerting drivers to the speed they are traveling and reminding them of the posted or advisory speed limit.

RSFS should be used in work zones where there is a need for drivers to reduce their speed, as determined by the Region Traffic Engineer. Consider the use of RSFS in work zones where the following conditions exist:

- Interstate projects where work zone speed reductions to 45 mph are utilized or where there is closure of one or more travel lanes and workers are present in the adjacent lanes
- Where queueing, slowed traffic (beyond the posted or work zone speed limit), or rear end collisions are anticipated in an open lane (not signal or flagger controlled)
- Work zone crashes of concern are occurring
- Where an excessive number of vehicles exceed the posted speed limit
- Speed differential issues, which can be signified by queue formations
- When higher than normal traffic volumes are expected (such as during the Sturgis Motorcycle Rally)
- Night work operations
- Work area ingress and egress by construction vehicles requires the traveling public to reduce their speeds
- Horizontal curvature at median crossovers designed to a lower design speed than existing or prevailing speeds

The RSFS should be mounted above, below, or beside the regulatory speed limit sign. If the RSFS is used to supplement an advisory speed, it should be mounted beside the warning/advisory speed combination sign.



The following guidelines should be used for the placement of RSFS within a work zone:

- RSFS should be placed upstream (in advance of) the work zone activity area.
- The RSFS unit and any associated solar panels should be installed so as not to restrict lateral clearance or sight distances of other traffic control devices in the area.
- RSFS should be placed on the right-hand side of the highway and aligned to provide maximum legibility to approaching traffic.
- RSFS should be placed on the shoulder where sufficient space exists, or in the lane closed to traffic where shoulder widths are too narrow.

Within advisory speed zones or work zone speed limit zones, temporary RSFS are typically trailer-mounted, but vehicle mounted or other temporary sign mounting systems may be allowed. Truck- or trailer-mounted RSFS are not crashworthy. Therefore, these devices should be shielded where possible and removed when not needed or used. The devices must be delineated with a minimum of two drums.

The devices will read “YOUR SPEED” as a static message centered on the sign. Legend and background colors of this static sign will match the regulatory or advisory speed sign it is paired with. The changeable portion of the RSFS will have a black background with an amber illuminated legend.

The changeable message portion of the sign will display the speed of the approaching vehicle as two digits in MPH. The changeable message portion of the sign must not flash. The RSFS will be blank when no vehicles are present. Numeral height should be 18” for Interstate and at least 15” for other roadways.

RSFS installed in temporary speed zones should operate when the speed zone is in effect.

### **Portable Dynamic Message Signs**

Portable dynamic message signs (DMS) have the flexibility to display a variety of messages. They can be used to warn drivers of unexpected situations. A PCMS is used to supplement standard static signing, not to replace required advance warning signs.

Portable DMS are often used to warn drivers 7 to 10 days in advance of changing project conditions that will have a significant impact to daily users, such as road closures, detours, pilot car flagger, or travel delays. Portable DMS may also be included on projects where there is the potential for incidents that could require additional messaging or re-routing of traffic.

Portable DMS must be delineated with channelizing devices. If not placed behind a shoulder taper or other line of channelizing devices on the project, then the portable DMS trailer must be delineated with at least two retroreflective drums.

Messages on portable DMS must not contain more than two phases (screens). Allowable abbreviations for portable DMS messages are found in the MUTCD. Other information regarding message length and composition can be found in the SDDOT Guidelines for DMS, located on the intranet under Forms/Manuals/Reports.

## **Permanent Dynamic Message Signs**

The dynamic message signs (DMS) permanently installed along interstate may be used for work zone traffic messages if they are located in an area that would provide appropriate warning or information to drivers. Contact the appropriate Area Engineer, Region Traffic Engineer, or the Operations Traffic Engineer for programming the interstate DMS.

## **POSITIVE PROTECTION**

According to language contained in Final Rule 23 CFR 630 Subpart K, use of positive protection devices is based on an engineering study. An engineering study may be used to develop positive protection guidelines for the agency, or to determine the measures to be applied on an individual project to contain and/or redirect vehicles. Use of positive protection will be considered in work zone situations that place workers at increased risk from motorized traffic and where positive protection devices offer the highest potential for increased safety for workers and road users. Positive protection devices include, but are not limited to, the use of vehicle mounted attenuators and temporary barriers.

Temporary barriers are devices designed to prevent or reduce work zone penetration by vehicles while minimizing injuries to vehicle occupants. Temporary barriers are designed to provide positive separation of motorists from workers, bicyclists, and pedestrians.

Barrier itself is a hazard. Therefore, prior to including positive protection in a traffic control plan, careful consideration must be given to alternatives that would avoid or minimize exposure for workers and road users. Use of temporary barriers may also present challenges for contractor mobility or ingress/egress, and can create additional mobility challenges for the motorist in the areas where access points are created.

Strategies to avoid temporary barrier use should be considered. These strategies include:

- Removal of the hazard or fixed object from the clear zone
- Detouring traffic
- Minimizing exposure time
- Maximizing the separation between traffic and workers
- Scheduling or sequencing phases of work (e.g., sequence to install permanent guardrail first when planned as part of a project, accelerated construction techniques)
- Designing a full road closure or ramp closure with traffic detoured offsite
- Designing a road or lane closure with onsite diversion (e.g., median crossover, temporary pavement, use of full depth shoulders, using ramps as a diversion around a work zone at an interchange)
- Adding other options such as closing additional travel lanes to perform certain activities, performing work during non-peak travel periods, or using a slope wedge in lieu of open trenching

Guidelines for using positive protection in a work zone are based on the premise that positive protection will reduce the severity of potential crashes. Positive protection in work zones is considered warranted when:

- Consequences of striking a fixed object or running off the road are believed to be more serious than striking the positive protection.

- Probabilities of striking a worker or pedestrian are believed to be greater than striking the positive protection.

Projects that rarely require temporary barrier are listed below:

- Mobile, short duration, short term, and intermediate term work where typically the worker exposure for the installation and removal time for barrier offsets the safety benefits
- Projects that involve such maintenance work as asphalt overlays or surface treatment activities
- Work zones with short activity areas with insufficient length of need for barriers
- Work zones where use of barriers would reduce the acceleration/deceleration space required for the ingress and egress of construction vehicles

Conditions where the use of temporary barrier may be considered include:

- Unprotected features (walls, piers, sign structures, foundations, etc.)
- Interim unprotected features or objects (non-standard slopes, stockpiles, ditches within the clear zone, etc.)
- Pavement edge drop offs
- Non-traversable slope or steep/rough embankments
- Staged bridge construction
- Staged pipe or culvert construction
- Temporary pedestrian routes near high speed travel lanes
- Separation of opposing traffic, including multiple lane separations
- Where existing traffic barriers and bridge railings are removed during a construction phase

The protective requirements of a temporary traffic control situation should have priority in determining the need for temporary traffic barriers. The following factors should be considered before using temporary barriers:

- Speed/volume of traffic
- Vertical/horizontal roadway alignment
- Severity of hazard/excavation/obstacle
- Duration of exposure
- Duration of temporary traffic control zone
- Hazard presented by barrier itself once it is in place
- Hazard presented to workers and traffic during barrier placement
- Position of workers behind the barrier

### **SIGNING FOR ROUTE RESTRICTIONS**

Chapter 16 provides guidance on the signing details to be used for route restrictions with or without a designated detour.