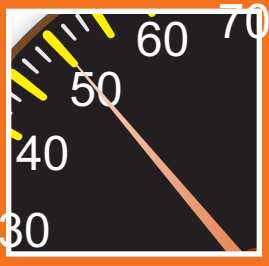
Guidelines

on Managing Speeds in Work Zones



This document summarizes available guidance on setting speed limits and managing speeds in work zones. The *Manual on Uniform Traffic Control Devices* (MUTCD) states that "reduced speed zoning (lowering the regulatory speed limit) should be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so." However, the determination of work zone speed limits is typically based on state laws, agency policies and engineering judgment. Many factors impact the decision to reduce the regulatory speed limit in a work zone, implement speed limit management strategies and utilize speed reduction strategies. The information presented in this guide is intended to aid agencies and highway contractors in understanding these factors and the interactions among them.

This document is organized into the following sections:

- Do Slower Speeds Improve Work Zone Safety?
- How Are Drivers Told They Need to Slow Down?
- When Are Slower Speeds Important in Work Zones?
- Should Reduced Speed Limits/Advisories Continue After the Work Shift is Over?
- What If Speed Limits in Work Zones Need to Be Changed Frequently to Match Conditions?
- Is Posting Reduced Speed Limits Enough to Get Drivers to Slow Down Voluntarily in Work Zones?
- How Does Law Enforcement Affect Speeds In Work Zones?
- What If Law Enforcement Is Not Available?
- What Other Safety Tools Can be Used to Improve Work Zone Safety?
- Decision Tool for Managing Speeds in Work Zones.
- An Example Approach to Managing Speeds in Work Zones.

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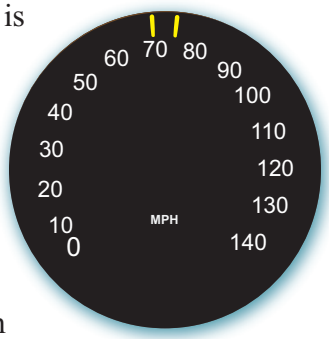
Refer to http://www.workzonesafety.org for a copy of this document.

Guidelines on Managing Speeds in Work Zones

In a recent survey, American Association of State Highway and Transportation Officials (AASHTO) members and other highway construction industry experts identified the need for better guidance on setting speed limits and managing speeds in work zones. A fundamental principle of temporary traffic control is that road user movement should be inhibited as little as practical. However, reducing vehicle speeds in work zones is often important when workers are exposed to moving traffic without positive protection (e.g., barrier wall) or when roadway restrictions and work operations present increased risks to roadway users. Unfortunately, getting drivers to slow down through a work zone is neither easy nor inexpensive.



In some work zone situations, slower speeds are not needed to maintain the safety of workers and road users (such as when the workers and other hazards are not present). In other work zone situations, slower speeds may be needed only during certain conditions (such as a lane closure). When slower speeds are not needed, devices used to reduce speeds should be covered, turned off or removed so that traffic can flow at normal speeds.

Do Slower Speeds Improve Work Zone Safety?

It is generally accepted that the safety of both workers and road users is improved in work zones when traffic is going slower. Logically, crashes and their resulting injuries are likely to be less severe at lower speeds. In addition, a driver traveling at a slower speed has more time to react and recover in emergency situations. Slower speeds also reduce wind effects of large trucks and provide workers more time to react should a vehicle intrusion occur. However, slower speeds in work zones may also reduce the roadway capacity and cause localized congestion, which, in turn, can increase the potential for rear-end crashes.

While the speed of traffic can affect crash frequency and severity, speed variance is also an important factor. Traffic moving along at a uniform pace, albeit somewhat faster, may be safer than traffic moving at slower, non-uniform speeds, which increases the potential for conflicts between vehicles. Likewise, abrupt reductions in speed, especially if unexpected by drivers, increase the risk of rear-end collisions and other conflicts, such as vehicles swerving out of their travel lane.

How Are Drivers Told They Need to Slow Down?

Drivers are told that they need to slow down in work zones through the use of reduced speed limits, speed advisories and other techniques. Regulatory speed limit signs are used to inform drivers of the legal speed limit in a work zone, while advisory speed plaques mounted below warning signs inform drivers of the recommended safe maximum speed for specific conditions. ***When in effect, reduced speed limits should be enforced and public relations campaigns should be used to alert drivers of enforcement efforts.*** It is important to cover or remove any existing regulatory speed limits or advisory speeds that conflict with the temporary work zone speed limits or advisories.

When Are Slower Speeds Important in Work Zones?

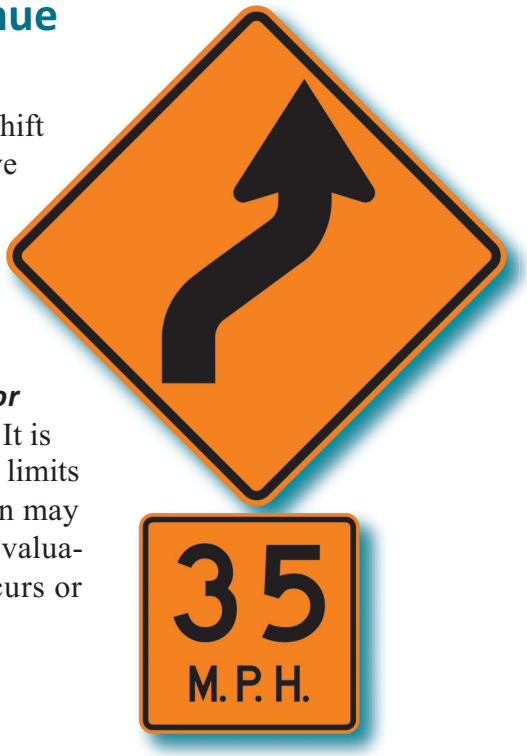
Overall, the goal is to identify a speed that is safe and reasonable for the current conditions. ***Slower speeds are needed in work zones when workers are exposed to moving traffic without positive protection or when roadway restrictions and work operations present increased risks to roadway users***. Reduced speed limits should be considered for the following work zone conditions:

- workers are located near an open travel lane without positive protection;
- temporary traffic barrier or pavement edge drop off near an open travel lane;
- narrow lanes;
- lane closures;
- temporary crossovers; and
- unexpected conditions (such as access/egress points, traffic congestion and crash history).

Reduced speed limits and advisories should only be used in the specific portion of the work zone where conditions or restrictive features are present. The *Manual on Uniform Traffic Control Devices* (MUTCD) recommends a maximum speed limit reduction of 10 mph unless restrictive conditions in the work zone justify a greater reduction. Individual state laws and practices vary considerably regarding the amount of allowable speed limit reduction and the conditions under which reductions may be used.

Should Reduced Speed Limits/Advisories Continue After the Work Shift Is Over?

Reduced speed limits or advisories should be left in place after the work shift is over only if roadway restrictions still present a hazard. Failure to remove these signs when they are not needed leads to reduced credibility of speed limits, decreased compliance with speed control and other temporary traffic control devices in the work zone, greater variation in vehicle speeds and negative public opinion of work zones. ***In order to maintain the credibility of work zone speed limits and advisories, signs and other devices and technologies used to reduce speeds should be covered or removed when no work is occurring and other hazards are not present***. It is also important to keep accurate records of when reduced regulatory speed limits and advisories are installed or removed in a work zone. This information may be needed for effective speed enforcement and may also be relevant in evaluating safety and mobility issues in the work zone whenever a crash occurs or congestion develops.



What If Speed Limits in Work Zones Need to Be Changed Frequently to Match Conditions?

Covering or removing signs can be a very tedious task to complete on a daily or weekly basis. This task may also interfere with normal traffic flow and expose workers to traffic hazards. The following new technologies can be used more easily to vary the speed limit to match conditions:

- static speed limit signs with flashing beacons (flashing beacons are activated when the reduced speed limit is in effect, similar to school zone beacons);
- roll-up speed limit signs that can be mounted on portable sign stands; and
- variable speed limit signs.

Currently, some state laws and procedures may prevent the use of some of these devices. While indications are that these technologies are effective, additional research is needed to further examine their effectiveness and practicality.

Is Posting Reduced Speed Limits Enough to Get Drivers to Slow Down Voluntarily in Work Zones?

One of the biggest misconceptions in work zone speed management is that simply lowering the speed limit will actually reduce drivers' speeds. Unfortunately, numerous studies have shown that posting a reduced speed limit sign by itself does not slow drivers down. ***Drivers reduce their speeds through the work zone only when they perceive a need to do so, based on conditions in the work zone or the perception of enforcement activities.*** Typically, drivers slow down when large equipment and work crews are located close to moving traffic, when roadway restrictions such as temporary crossovers or narrowed lanes are in place or when temporary traffic barriers are near the edge of the lane. It is the situation they see, and not the reduced speed limit sign itself, that causes drivers to reduce their speeds. However, such voluntary speed reductions are typically less than 10 mph and often closer to 5 mph (Table 1). Thus, when normal operating speeds on the roadway are high, these voluntary speed reductions alone may not produce the desired speeds through the work zone. Unfortunately, simply posting even lower speed limits does not necessarily further reduce speeds.

Table 1. Potential Voluntary Speed Reductions for Various Work Zone Conditions.

Work Zone Condition	Potential Voluntary Speed Reduction*
Work Zone Reduced Speed Limit Sign	0 to 3 mph
Barrier Near Inside Travel Lane	0 to 3 mph
Lane Encroachment	1 to 5 mph
Lane Closure	1 to 7 mph
Construction Vehicle Access/Egress Location	5 to 6 mph
Temporary Crossover	4 to 9 mph
Two-Lane, Two-Way Barrier Separated Traffic	7 to 9 mph

** The speed reductions listed are based on a study conducted in Texas. Operating speeds upstream of the work zones ranged from 60 mph to 77 mph.*

How Does Law Enforcement Affect Speeds in Work Zones?

The presence of law enforcement in work zones can yield up to a 15 mph decrease in some situations (though average speed reductions of about 5 to 10 mph are more common). Locating law enforcement officers in marked vehicles in a work zone will typically reduce speeds in the immediate vicinity as long as the enforcement is present. ***To achieve continuous and lasting speed reductions throughout the work zone, especially where drivers do not perceive the need to slow down, active enforcement that results in citations to speeders is necessary.*** Thus, speed enforcement can achieve reasonable compliance with posted work zone speed limits. Since law enforcement personnel are not always available, several states have implemented legislation to allow the use of automated speed enforcement to issue citations in work zones.

What If Law Enforcement Is Not Available?

When law enforcement is not available, other speed management technologies can be used to encourage compliance. These technologies include:

- speed display trailers;
- portable changeable message signs (PCMS) with radar;
- citizen band (CB) radio information systems;
- transverse rumble strips;
- drone radar;
- narrowing lanes with channelizing devices; and
- transverse pavement markings.

Most of these technologies reduce speeds by only a few miles-per-hour; however, in some cases radar activated speed displays have been shown to reduce speeds by 10 mph (Table 2). Even when only very small speed reductions are achieved, these techniques may effectively alert drivers to an upcoming change in the highway environment and thus achieve the safety benefit of an alerted driver.

Table 2. Potential Speed Reductions for Various Speed Management Techniques.

Speed Management Technique	Potential Speed Reduction*
CB Radio Information Systems	0 to 2 mph
Narrow Lanes With Channelizing Devices	0 to 5 mph
Transverse Pavement Markings	0 to 5 mph
Portable Changeable Message Sign With Radar	0 to 6 mph
Drone Radar	2 to 3 mph
Transverse Rumble Strips	2 to 5 mph
Speed Display Trailers	2 to 10 mph

** The speed reductions listed are based on a number of studies, and the results vary considerably.*

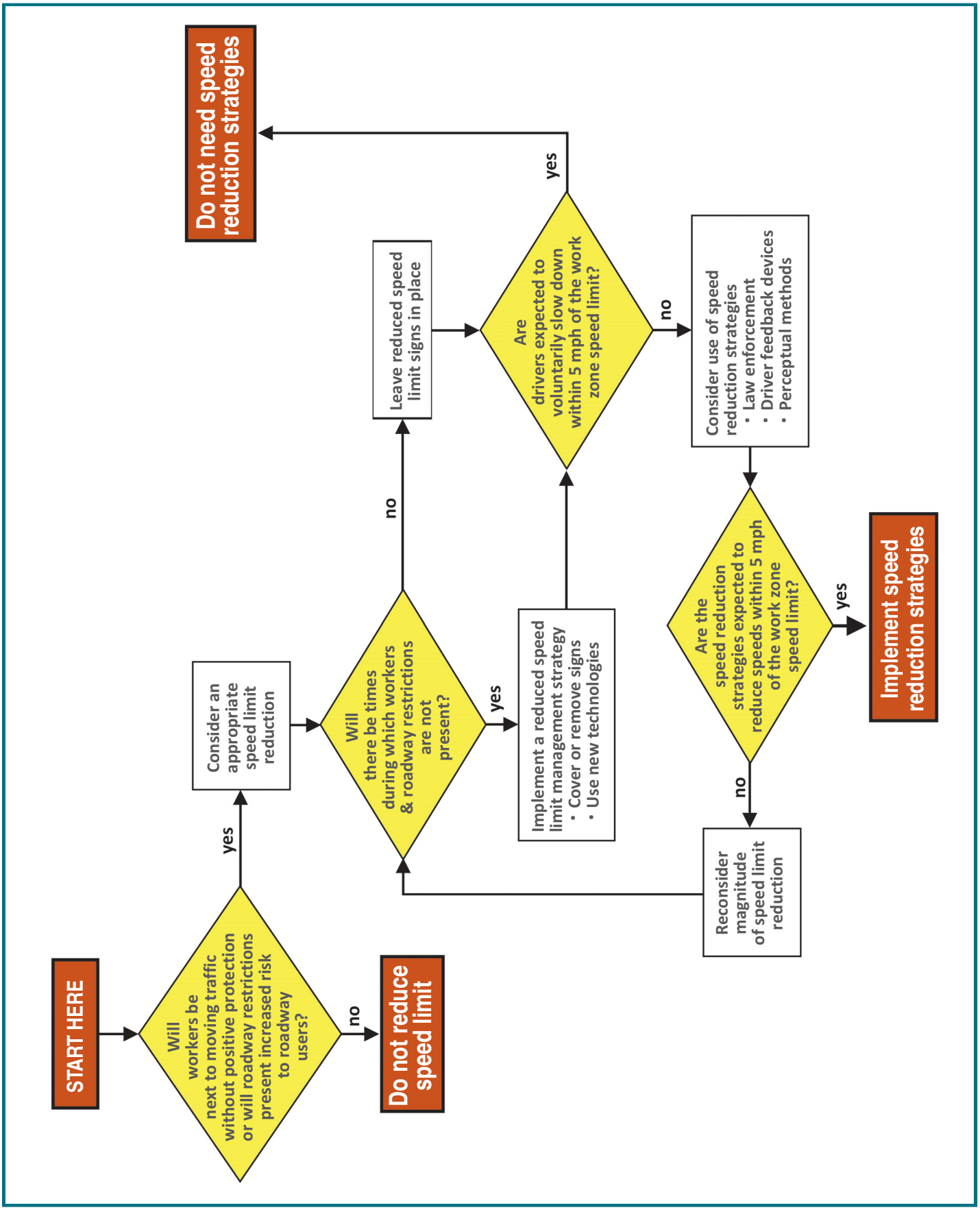
What Other Safety Tools Can be Used to Improve Work Zone Safety?

Tools that reduce vehicle speeds in work zones are not the only strategies and techniques used to improve safety for workers and road users. Some states have enacted laws that increase penalties for work zone violations (e.g., double fine laws and suspension of license). Other tools include removing or reducing the interaction between workers and motorists, improving the visibility of the work zone, improving travel path delineation, using intrusion countermeasures, managing worker safety, and providing public information.

Decision Tool for Managing Speeds in Work Zones

Chart 1 provides a decision tool to assist practitioners with managing speeds in work zones.
Engineering judgment, as well as individual state laws and practices, should be used to determine the appropriate speed limit, speed limit management strategies, and speed reduction strategies for each work zone. In cases where state practices do not provide specific guidance on speed limit reductions in work zones, practitioners may reference National Cooperative Highway Research Program (NCHRP) Research Results Digest Number 192 which contains a procedure for determining work zone speed limits.

Chart 1. Decision Tool for Managing Speeds in Work Zones.



An Example Approach to Managing Speeds in Work Zones

The New York State Department of Transportation's (NYSDOT) guidance on setting speed limits and managing speeds in work zones is summarized below and is included herein only as an example of one state's policies and procedures. More information regarding NYSDOT's policies and procedures can be found in Chapter 16 of the NYSDOT Highway Design Manual and NYSDOT Engineering Instruction (EI) 08-030.

Setting Speed Limits in Work Zones

- Speed limit reductions in work zones should be used only when necessary and should be appropriate to the conditions or restrictive features present.
- Advisory speeds that warn drivers of potential hazardous conditions are preferred to regulatory speed reductions.
- When an advisory speed or reduction in the regulatory speed limit is warranted, the speed limit should not be reduced more than 10 mph below the preconstruction posted speed limit, unless an engineering study shows that the geometric conditions warrant a greater speed reduction.
- Advisory or regulatory speed limit reductions shall be posted only when the conditions necessitating the reduced speed are actually present.
- Work zone traffic control should be designed to provide work zone geometric transitions, sight distance, lane width, and superelevation that result in a work zone speed limit that meets or exceeds the design speed or preconstruction posted speed limit plus 5 mph in order to minimize speed differential of vehicles entering the work zone.
- Chart 2 is used by NYSDOT to assist in determining the need for reduced regulatory speed limits in work zones.

Managing Speeds in Work Zones

Beginning in 2006, NYSDOT focused on reducing operating speeds in excess of posted work zone speed limits through the use of:

- state police presence and enforcement in "major active work zones";
- radar speed display signs or radar-equipped PCMS in "major active work zones"; and
- "Loss of License" signs.

A "major active work zone" is defined as a work zone having the following conditions:

- work on a fully controlled access roadway with preconstruction speed limit of 55 mph or greater and
- workers on foot in the roadway and not predominantly separated from traffic by positive protection such as temporary concrete barrier.

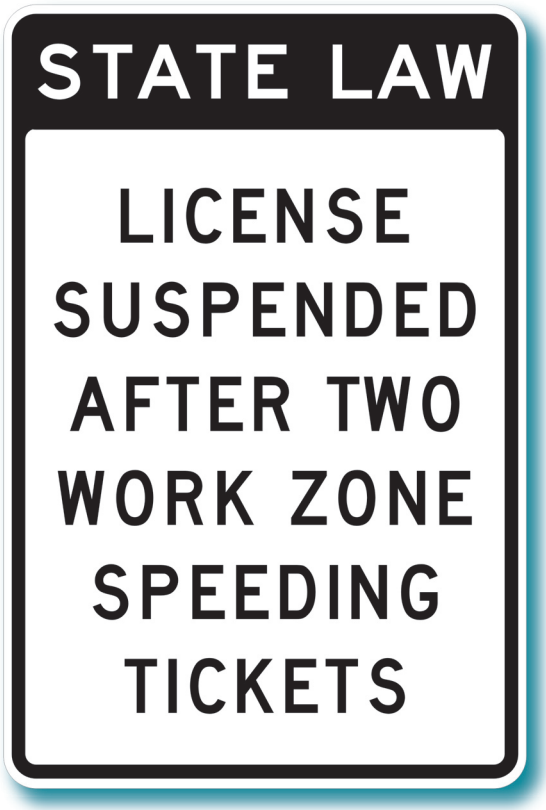
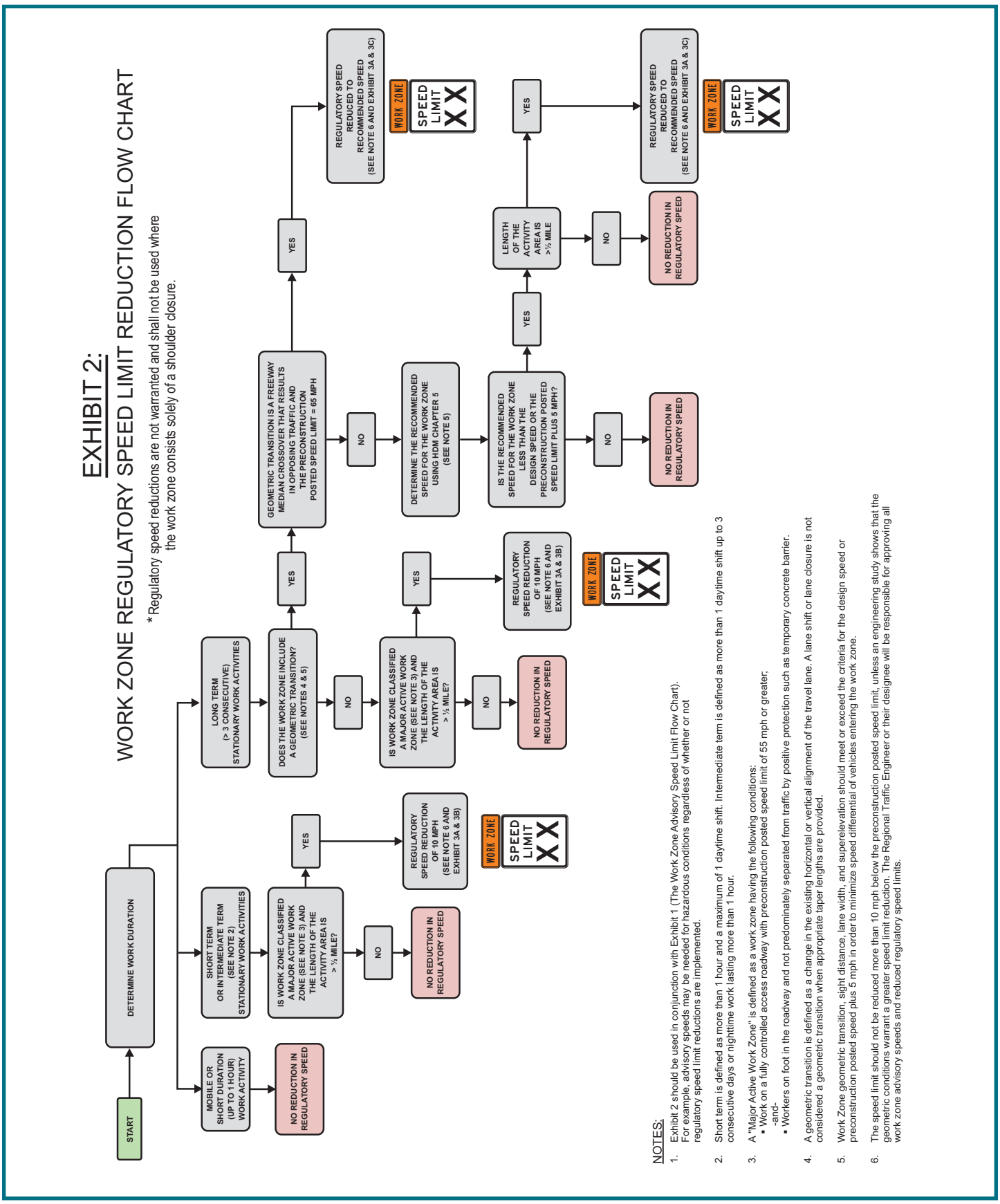


Chart 2. Example Procedure – NYSDOT Work Zone Regulatory Speed Limit Reduction Flow Chart.



NOTES:

1. Exhibit 2 should be used in conjunction with Exhibit 1 (The Work Zone Advisory Speed Limit Flow Chart). For example, advisory speeds may be needed for hazardous conditions regardless of whether or not regulatory speed limit reductions are implemented.
2. Short term is defined as more than 1 hour and a maximum of 1 daytime shift. Intermediate term is defined as more than 1 daytime shift up to 3 consecutive days or nighttime work lasting more than 1 hour.
3. A "Major Active Work Zone" is defined as a work zone having the following conditions:
   - Work on a fully controlled access roadway with preconstruction posted speed limit of 55 mph or greater;
   -and-
   - Workers on foot in the roadway and not predominately separated from traffic by positive protection such as temporary concrete barrier.
4. A geometric transition is defined as a change in the existing horizontal or vertical alignment of the travel lane. A lane shift or lane closure is not considered a geometric transition when appropriate taper lengths are provided.
5. Work Zone geometric transition, sight distance, lane width, and superelevation should meet or exceed the criteria for the design speed or preconstruction posted speed plus 5 mph in order to minimize speed differential of vehicles entering the work zone.
6. The speed limit should not be reduced more than 10 mph below the preconstruction posted speed limit, unless an engineering study shows that the geometric conditions warrant a greater speed limit reduction. The Regional Traffic Engineer or their designee will be responsible for approving all work zone advisory speeds and reduced regulatory speed limits.

How Can I Locate More Information Regarding This Topic?

Federal Highway Administration Work Zone Mobility and Safety Program website. http://ops.fhwa.dot.gov/wz/index.asp.

Federal Highway Administration Speed Management Safety website. http://safety.fhwa.dot.gov/speedmgt/.

Federal Highway Administration Work Zone Peer-to-Peer Program. http://ops.fhwa.dot.gov/wz/p2p/index.htm.

Manual on Uniform Traffic Control Devices. http://mutcd.fhwa.dot.gov/.

Engineering Countermeasures for Reducing Speeds: A Desktop Reference of Potential Effectiveness. Federal Highway Administration, May 2009. http://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/.

Procedure for Determining Work Zone Speed Limits. NCHRP Research Results Digest Number 192. Transportation Research Board, National Research Council, Washington, D.C., September 1996. Available upon request from NCHRP staff.

Finley, M.D., L. Theiss, N.D. Trout, and G.L. Ullman. Studies to Improve the Management of Regulatory Speed Limits in Texas Work Zones. Research Report 0-5561-1. Texas Transportation Institute, College Station, Texas, December 2008. http://tti.tamu.edu/documents/0-5561-1.pdf.

Highway Design Manual Chapter 16 – Maintenance and Protection of Traffic in Highway Work Zones. New York State Department of Transportation, Albany, New York, January, 20, 2006. https://www.nysdot.gov/divisions/engineering/design/dqab/hdm.

Engineering Instruction (EI) 08-030 Work Zone Speed Limit Reductions. New York State Department of Transportation, Albany, New York, September 9, 2008. https://www.nysdot.gov/main/business-center/consultants/forms-publications-and-instructions/engineering-information-issuance-system/ei-repository/ei08030.pdf.

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