



40.1.1 Introduction

The guidance in Chapter 40 is intended for the placement of smart work zone equipment as part of construction projects. The use of smart work zone devices should be discussed with BHO Traffic Engineers prior to planning and deployment. Smart work zones are designed to mitigate construction related impacts, such as delay, increased travel times, and congestion-related crashes.

40.1.2 Needs Assessment

As part of the Transportation Management Plan (TMP) process, smart work zones are one alternative identified as a traffic mitigation strategy.

40.1.2.2 Criteria

Initial screening criteria to determine if a smart work zone is needed are provided below.

1. The Backbone user delay spreadsheets in the Lane Closure System (LCS) show delay, queues, and user costs for one and two lane closures along statewide freeways. If a particular work zone shows recurring delays of more than 15 minutes and/or sustained traffic volumes that exceed typical work zone capacity of 1,500 vehicles per hour per lane, then a smart work zone may be considered. Consider smart work zone cost in comparison to the anticipated user delay cost for the construction project.
2. It may be beneficial to install the permanent ITS equipment prior to the project so that it may be used as part of a smart work zone. Refer to the TOIP for proposed locations of permanent ITS as part of upcoming construction projects.

40.1.2.3 Types and Design Considerations

If one or more of the criteria are met, the designer can determine the type of smart work zone to implement. All smart work zone alternatives and placement should be discussed with BHO Traffic Engineering Section and the STOC.

- **Travel Time and/or Delay System**

This portable, automated, real-time smart work zone system informs drivers what the estimated travel time and/or delay is between drivers' current location and a specific destination beyond them. The system collects real-time traffic flow data using roadside non-intrusive sensors, calculates travel time and delay between different points, and displays the travel time and delay information on portable changeable message signs at pre-determined locations. This information will allow drivers to decide whether to change routes, provides them opportunity to notify others of their estimated arrival time, and generally provides drivers sufficient information to calm tempers. Consideration should be given to posting an alternate route. The system should be carefully monitored for accuracy and adjusted accordingly so accurate information is being given to drivers. PCMS can also be used to notify the driver of the current speed range within the work zone, known as itellizone.



- **Dynamic Late Merge**

When properly designed and deployed for a specific project, a DLM System should alert drivers of an upcoming traffic slow-down and inform them to use both lanes until the merge point. By encouraging use of all available lanes until the merge point, the system will reduce the length of a queue by around 40%. Reduced queue length allows better access to upstream interchanges. The DLM system also promotes more orderly merging, which may improve capacity at the merge point, reduce road rage incidents, and reduce the speed differential between lanes.



- **“Your Speed ” Signs**



Also known as radar speed display signs. This is a work zone strategy that attempts to influence drivers to reduce their speed. The speed limit is displayed along with the detected speed of an approaching vehicle. Some studies have shown it to reduce average and 85th-percentile speeds by 3 – 7 miles per hour, but the sign may lose effectiveness over time if left in place at the same location for a prolonged period.

- **Variable Speed (pre-determined speed limit changes)**

Can be used to easily lower the speed limit during construction hours and increase the speed limit when construction is not taking place, such as on weekends. This helps to eliminate the need to cover and uncover static signs and also helps to eliminate driver confusion if two different speed limit signs are accidentally left visible for drivers. Use of such device shall be discussed with the Regional Traffic Engineer.



- **Variable Speed (automatically changed speed limit)**

This system advises drivers of an appropriate vehicle speed to allow them to travel through the work zone with minimal braking. The system determines the average speed of downstream traffic and advises upstream traffic of an optimum speed to approach the queue. It is anticipated that the system will smooth the transition between faster and slower moving traffic, and provide an increase in capacity of the roadway through the work zone area. Automatic variable regulatory speed limits have not been used in Wisconsin due to potential conflict with State Statutes, but a speed advisory system using similar technology has been used with good results. Use of such device shall be discussed with the Regional Traffic Engineer.



- **PCMS**

Portable Changeable Message Signs are useful for displaying traveler information to the traveling public about work zone conditions. See Chapter 35 for more information.

- **Surveillance**

Portable surveillance can be used to view traffic conditions in a work zone. These images may be helpful in changing messages on PCMS according to traffic conditions



- **Detection**

Volume and speed data can be collected in a work zone using Wavetronix units. This data is useful in collecting work zone capacity data and speeds, which could help determine if other smart work zone strategies are needed. For more information on system detector stations, see Chapter 10 of this manual.



- **Moveable Barrier**

If there is a directional split of peak traffic demand (60% or more of the traffic in one direction), moveable barrier may be a good option. Moveable barrier provides the ability to change the number of lanes (capacity) according to directional traffic demand during construction.



Table 40.1 Smart Work Zone Design Process Checklist

1. Complete TMP to determine if smart work zones are recommended as a mitigation strategy (see 40.1.2)
2. Review criteria to determine if a smart work zone is needed (see 40.1.2.2)
3. Determine the smart work zone type and placement best suited for the location (see 40.1.2.3 and consult with BHO-TES and BHO-STOC).
4. Discuss the power, communications, and any integration needs with BHO-STOC (see 40.2).
5. Discuss purchasing options with BHO-TES and BHO-STOC to determine if it's best to have the contractor provide the equipment, utilize existing state owned equipment, or purchase the equipment through BHO-STOC (see 40.3).
6. Determine the construction details, special provisions, and standard specification bid items needed for the proposed design, along with those that need to be modified and created to provide a complete construction plan (Appendix 70).