ORIGINATOR State Traffic Engineer		6-6-20
CHAPTER 6	Work Zone Traffic Control	
SECTION 6	Control of Traffic	
SUBJECT 20	One-lane Bridges	

PURPOSE

The purpose of this subject is to provide some general guidelines for the selection of traffic signal control vs. stop sign controls at long-term (nonflagging) one-lane bridge construction sites. Since each one-lane bridge site is unique, a site-specific investigation of the factors affecting the selection *should* be done. A number of variables can influence the selection, so a definitive breakpoint between the two options cannot be defined. This subject will provide a discussion of the variables which *should* be analyzed and provide some general guidelines on the selection process.

FACTORS INFLUENCING THE CONTROL SELECTION

The following factors *should* be considered when evaluating the type of control at one-lane bridge sites.

1. Average Daily Traffic (ADT). This is a good general indicator in the selection process. Usually, below 1,000 ADT, or 100 vehicles per hour, a STOP sign control can be used without experiencing operational problems. Above 3,000 ADT, a traffic signal is usually a better choice for more efficient operation. These ADT values are not absolute and the other factors must be considered in the selection process.

2. Peak-Hour Traffic. If the bridge site is located near a larger city or on a recreational travel route or carries special event traffic, the peak-hour traffic will be a greater factor than the ADT. The bridge control must be able to accommodate the peak-hour traffic within a reasonable amount of time delay.

3. Directional Traffic Distribution. This again will be a factor if the bridge site is located just outside a large city on a route which is a major radial commuting route, or is a major recreational route.

4. Width Restriction. The width *may* influence the speed of traffic, increasing the clearance time necessary for a single vehicle to cross the bridge. The additional clearance time will reduce the capacity of both a stop-control and signal-control bridge site.

5. Time Duration of Project. For shorter projects (1-2 weeks), it *may* be acceptable to tolerate slightly oversaturated stop-control conditions, rather than implement a signal-control scheme.

6. Distance Between Stoplines. This will greatly affect the one-lane capacity because it will dictate the clearance time necessary for a vehicle to cross the bridge. The stoplines *should* be kept as close as possible to the ends of the bridge allowing for necessary storage of construction equipment and placement of traffic control devices. Typically, each stopline *should* be placed about 150-250 feet from the end of the bridge. This allows workspace (usually less then 100') for the contractor off the end of the bridge and a taper for the single lane transition. With this constraint the typical stopline-to-stopline distance is 300-500 feet, plus the length of the bridge. See SDD's 15D33 (Traffic Control, One Lane Road with Temporary Signals) and 15D32 (Traffic Control, One Lane Road Stop Condition) for more details on dimensions and traffic control layout.

   On projects which involve bridge approach resurfacing of several hundred feet, the bridge work involving the one-lane controls *should* be staged first, thus allowing the closest stopline-to-stopline distance possible. Then, after the bridgework is completed, the one-lane bridge controls can be removed. The approach resurfacing can be completed by using a flagging operation.

   Further discussion under Special Cases.

7. Sight Distance Between Stoplines. This factor, in itself, could dictate the control type. If adequate sight distance is not available (if bridge is overpass on a sharp crest, or construction equipment or temporary concrete barrier is expected to block sight), then traffic signal control must be used to assign right-of-way across the one-lane bridge. The stop-control situation, which is self-regulating, would fail without adequate sight distance, because it relies on motorists to see each other in order to determine which vehicle has the right-of-way.

8. Location of Nearby Side Roads, Driveways or Ramps. Other traffic entering the work zone from off the main roadway could dictate the need for special signal control. This could include the need for additional phases and turn restrictions from the side road. Further discussion under Special Cases.

9. Speed Through Work Area. Similar to width restriction, this will influence the clearance time and have a great impact on the capacity. Generally, an average

clearance speed through the zone of 25 MPH is used. However, 15 MPH *should* be used if high truck volumes are expected.

10. Cost/Maintenance of Control. The availability to run power to the site for signal control is a consideration. Also, the expense to install a signal for a short project *may* not be cost-effective. A portable generator *may* need to be considered if electric power is not available.

11. Emergency Vehicle Pre-emption (EVP). The need to provide efficient emergency services *should* be considered. This would be a consideration near a city where the bridge under construction is the only or only reasonable access to a populated area where the need for services is considerable. A signal-controlled bridge with an EVP system would allow emergency vehicles a safe and faster crossing of the bridge.

STOP SIGN CONTROL

Usually this control is used for shorter length bridges (less than 100 feet), with very low traffic volumes. Stop signs **shall** be placed on both approaches. Yield signs **shall** not be used on state trunk highways, connecting highways, or any other roadways declared as through highways. The drivers themselves determine the assignment of vehicle right-of-way on the bridge. Therefore, sufficient sight distance must be available through the bridge site in order for a driver to see an oncoming vehicle or a vehicle waiting at the opposite stopline. Lack of adequate sight distance could be a problem if the bridge is located on a vertical crest (such as an overpass), or if specific construction equipment or concrete barrier is expected to block vision.

Proper operation of a self-regulating stop-control scheme requires courtesy on the part of drivers to alternate the right-of-way with oncoming traffic. Situations can occur when drivers are not courteous, thus creating a "platooning" effect in one direction, forcing the oncoming traffic to wait until all vehicles have cleared. This can substantially increase the capacity of the stop-control scheme, but can cause frustration and cause competitiveness for the use of the single lane.

TRAFFIC SIGNAL CONTROL

This option must be used where adequate sight-distance between stoplines is not available. Signals are generally used for higher traffic volumes and longer bridges. Because it is difficult to implement a temporary loop detector, the signals are generally pretimed. Multiple timing plans for peak-hour, midday and nighttime hours *should* be considered if traffic is variable.

SPECIAL CASES

1. Long Bridges (More than 400-500 Feet). Attempting to use a one-lane operation across the entire bridge length *may* lead to significant traffic delays. With the

addition of the 150-250 foot approach setback, the entire work zone length could exceed 800 feet. The clearance time required for each direction of traffic would be excessive lost time and would reduce the capacity of the operation, leading to back-ups and delays. Special provisions *may* need to be included in the contract to limit the length of the work zone for a given stage. This *may* require the contractor to complete the bridgework in four or more stages, instead of the normal 2-stage schedule.

2. Intersecting Sideroads/Driveways/Ramps. Occasionally, a public or private entrance *may* be located between the bridgework zone and one of the signal stoplines. The entrance *may* need to be signalized to prevent a driver from turning onto the roadway and entering the one-lane bridge operation when oncoming traffic has the right-of-way. The green phase for the entrance can be "piggybacked" onto the clearance phase for the mainline traffic proceeding across the bridge in the same direction as the driver turning from the entrance. This technique will add only a few seconds of additional time to the cycle length. A regulatory sign could also be used to implement a turn restriction which would not allow a driver leaving the entrance to turn in the direction of the bridge. This would mean the driver would have to perform a U-turn in order to proceed in the intended direction. This turn restriction application would be most applicable for extremely low-volume turn movements toward the bridge site.

3. Series of Bridges. Two or more bridges work zones *may* be located in close proximity to require some coordination between the controls. This *may* occur with marsh crossings, or when a railroad overpass is located near a river crossing. It *may* be possible to coordinate the platoons of traffic crossing each bridge in opposite directions so they meet in the two-lane section between the bridges. This would allow vehicles to proceed through both work zones without stopping twice.