

WORK HOURS ARE RESTRICTED ON BULL HILL RD AND US 460 FROM 9:00 AM TO 3:30 PM M-F.  
LCAMS APPROVAL IS REQUIRED BEFORE ANY ANY WORK ZONES CAN BE SET UP ON BULL HILL RD OR US 460.

**Typical Traffic Control  
Shoulder Operation with Minor Encroachment  
(Figure TTC-5.2)**

**Standard**

- For required sign assemblies for multi-lane roadways see Note 1, TTC-4.
- Sign spacing should be 1300'-1500' for Limited Access Highways. For all other roadways, the sign spacing should be 500'-800' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.
- When work takes up part of a lane on a high volume roadway, vehicular traffic volumes, vehicle mix, speed and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment analysis permits a remaining lane width of 10 feet, the lane should be closed. If the closure operation is on a Limited Access Highway, the minimum lane width is 11 feet.

**Option:**

- The ROAD WORK AHEAD (W20-1) sign on an intersecting roadway may be omitted where drivers entering from that roadway will encounter another advance warning sign prior to this activity area.

**Standard:**

- A shadow vehicle with either an arrow board operating in the caution mode, or at least one high-intensity amber rotating, flashing, or oscillating light shall be parked 80' - 120' in advance of the first work crew.
- Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity amber rotating, flashing, or oscillating lights. Vehicle hazard warning signals can be used to supplement high-intensity amber rotating, flashing, or oscillating lights.
- Taper length (L) and channelizing device spacing shall be as follows:

Speed Limit (mph)	Lane Width (Feet)				Remarks	Speed Limit (mph)	Lane Width (Feet)				Remarks
	9	10	11	12			9	10	11	12	
25	305	105	115	125	L=0.5W	60	450	350	550	600	L=0.5W
30	330	150	160	180	L=0.5W	55	495	350	605	660	L=0.5W
35	385	205	225	245	L=0.5W	50	540	600	660	720	L=0.5W
40	440	270	290	320	L=0.5W	45	585	650	715	780	L=0.5W
45	500	350	380	420	L=0.5W	40	630	700	770	840	L=0.5W

Limited Access Highways shall use a 1000' merging taper regardless of the posted speed, a 750' shifting taper for posted speeds < 65 mph and a 1000' shifting taper for posted speeds > 65 mph.  
Shoulder Taper = 1/4 L Minimum

- Channelizing device spacing shall be as follows:

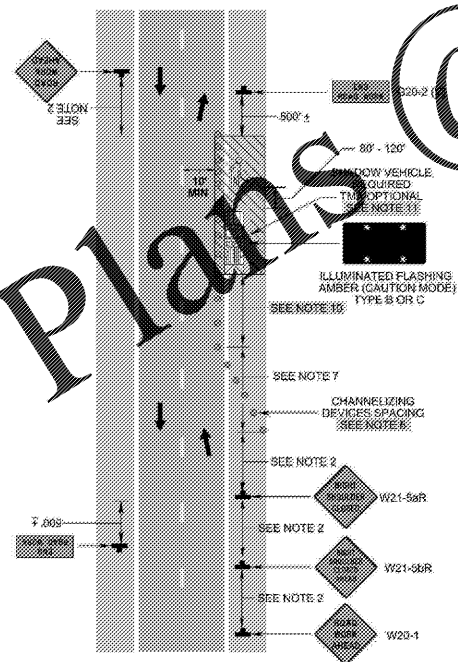
Location Spacing	Speed Limit (mph)	Location Spacing	Speed Limit (mph)
30	35	36	36
Transition	20	40	80

\*Construction access spacing may be increased to this distance, but shall not exceed one access per 1/2 mile.

- On roadways with paved shoulders having a width of 8 feet or more, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
- The buffer space length The buffer space length shall be as shown in Table 6H-3 on Page 6H-5 for the posted speed limit.
- A truck-mounted attenuator (TMA) shall be used on Limited Access highways and multi-lane roadways with posted speed limit equal to or greater than 45 mph.
- When a side road intersects the highway within the temporary traffic control zone, additional traffic control devices shall be placed as needed.

1: Revision 1 - 4/1/2015  
2: Revision 2 - 9/1/2019

**Shoulder Operation with Minor Encroachment  
(Figure TTC-5.3)**



**Typical Traffic Control  
Lane Closure on a Two-Lane Roadway Using Flaggers  
(Figure TTC-23.2)**

**Notes:**

- Sign spacing distance should be 350'-500' where the posted speed limit is 45 mph or less, and 500'-800' where the posted speed limit is greater than 45 mph.
- Crew should be alerted when establishing the limits of the work zone to ensure maximum possible sight distance in advance of the flagger station and transition, based on the posted speed limit and at least equal to or greater than the values in Table 6H-2. Temporary spacing, however, should have a clear line of sight from the graphic flagger station to the flagger.
- To maintain efficient traffic flow in a flagging operation on a two-lane roadway, the maximum time between flagger stations should be 8 minutes for high volume roadways (average daily traffic of 500 or more vehicles per day) to a maximum of 12 minutes for low volume roadways (less than 500 vehicles per day). For additional information see Section 6E.07.

**Standard:**

- Portable Temporary Route Signs (PTRS) shall be used as noted in Section 6E.09.
- Flagging stations shall be located far enough in advance of the work space to permit approaching traffic to reduce speed and/or stop before passing the work space and allow sufficient distance for departing traffic in the left lane to return to the right lane before reaching opposing traffic (see Table 6H-3 on Page 6H-5).
- All flaggers shall be state certified and have their certification card in their possession when performing flagging duties (see Section 6E.08). Qualifications for Flaggers.
- Cone spacing shall be based on the posted speed and the values in Table 6H-4 on Page 6H-4.
- A shadow vehicle with at least one high-intensity amber rotating, flashing, or oscillating light shall be parked 80'-120' in advance of the first work crew.

**Option:**

- A NEW (W21-V18) sign may be required in this area to give advance warning of the operation ahead by slowing approaching traffic prior to reaching the flagger station or queue buffer.

**Guidance:**

- If the queue of traffic reaches the BE PREPARED TO STOP (W3-4) sign then the sign, and if used the PTRS, should be repositioned at greater distances.
- When a highway-rail crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the temporary traffic control zone should be extended so that the transition area precedes the highway-rail crossing (see Figure TTC-56 for additional information on highway-rail crossings).

**Standard:**

- At night, flagger stations shall be illuminated, except in emergencies (see Section 6E.06).

**Option:**

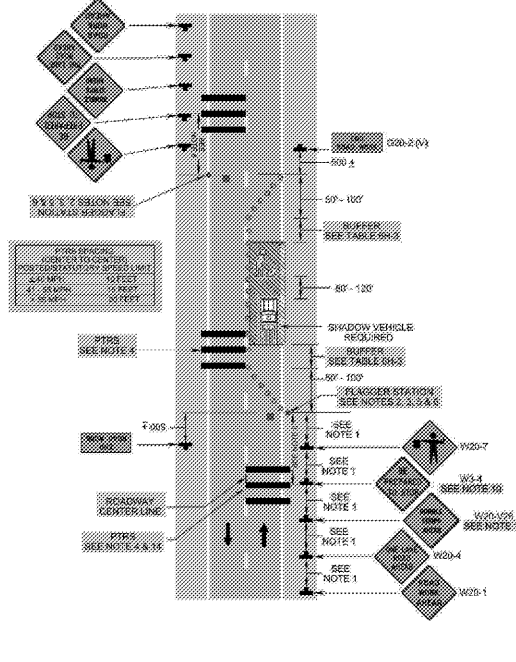
- Cones may be eliminated when using a pilot vehicle operation or when the total road width is 30 feet or less.
- For low-volume situations with short work zones on straight roadways where the flagger is unable to read users approaching from both directions, a single flagger, positioned by his vehicle to read to users approaching from both directions, may be used (see Chapter 6E).

**Standard:**

- When used, three portable temporary route (PTRS) signs shall be installed across the travel lane adjacent to the BE PREPARED TO STOP (W3-4) sign. The portable temporary route signs shall be monitored and adjusted as necessary during the work shift to assure proper placement on the roadway. When the PTRS are installed, the ROAD WORK AHEAD (W20-V20) sign shall also be utilized.

1: Revision 1 - 4/1/2015  
2: Revision 2 - 9/1/2019

**Lane Closure on a Two-Lane Roadway Using Flaggers  
(Figure TTC-23.3)**



**Typical Traffic Control  
Outside Lane Closure Operation on a Four-Lane Roadway  
(Figure TTC-16.2)**

**Standard:**

- On divided highways having a median wider than 8', right and left sign assemblies shall be required.

**Guidance:**

- Sign spacing should be 1300'-1500' for Limited Access Highways. For all other roadways, the sign spacing should be 500'-800' where the posted speed limit is greater than 45 mph, and 350'-500' where the posted speed limit is 45 mph or less.
- When closing a lane, a PTRS should be used in advance of the first warning sign if all of the left side signs cannot be installed.
- Crew should be alerted when establishing the limits of the work zone to insure maximum sight distance in advance of the transition, based on the posted speed limit and at least equal to or greater than the values in Table 6H-3. For Limited Access highways a minimum of 1000' is required.
- All vehicles, equipment, workers, and their activities should be restricted to one side of the pavement.

**Standard:**

- Taper length (L) and channelizing device spacing shall be as follows:

Speed Limit (mph)	Lane Width (Feet)				Remarks	Speed Limit (mph)	Lane Width (Feet)				Remarks
	9	10	11	12			9	10	11	12	
25	305	105	115	125	L=0.5W	60	450	350	550	600	L=0.5W
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40	440	270	290	320	L=0.5W	45	585	650	715	780	L=0.5W
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Limited Access Highways shall use a 1000' merging taper regardless of the posted speed.  
Shifting Taper = 1/4 L Minimum

- Channelizing device spacing shall be as follows:

Location Spacing	Speed Limit (mph)	Location Spacing	Speed Limit (mph)
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\*Construction access spacing may be increased to this distance, but shall not exceed one access per 1/2 mile.

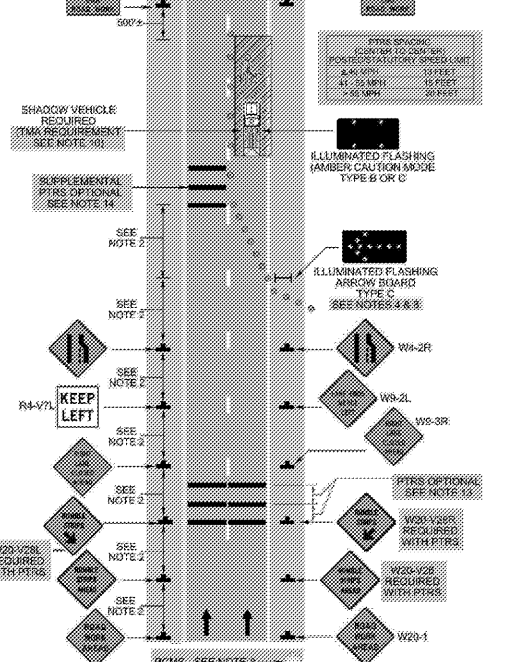
- On roadways with paved shoulders having a width of 8 feet or more, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
- The buffer space length The buffer space length shall be as shown in Table 6H-3 on Page 6H-5 for the posted speed limit.
- A truck-mounted attenuator (TMA) shall be used on Limited Access highways and multi-lane roadways with posted speed limit equal to or greater than 45 mph.
- When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.

**Option:**

- PTRS and their supporting signs may be used, see Sections 6E.09 and 6E.25. Transition temporary route signs may be used by long access distances, see Sections 6E.09 and 6E.25.  
\*The supplemental PTRS may be eliminated.

1: Revision 1 - 4/1/2015  
2: Revision 2 - 9/1/2019

**Outside Lane Closure Operation on a Four-Lane Roadway  
(Figure TTC-16.3)**



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