Mobile Operations
(15 minutes or less)

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Mobile Operations

(Mobile Operations – 15 minutes or less)

Mobile operations are work activities that move along the road either intermittently or continuously. Safety for mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Portable devices should be used. For example, appropriately colored and marked vehicles with flashing or rotating lights, perhaps augmented with signs or arrow displays, may be used in place of signs and channelizing devices.

For mobile operations to be successful, the advance warning area for these operations must move with the work area or be repositioned periodically to provide advanced warning for the motorist.

Intermittent Mobile Operations – These mobile operations often involve frequent short stops, each as much as 15 minutes long that are similar to stationary operations. Warning signs, flashing vehicle lights, and/or channelizing devices should be used.

With operations that move slowly (less than 3 MPH), it may be feasible to use stationary signing that is periodically retrieved and repositioned in the advance warning area. In addition, vehicles may be equipped with such devices as flashing vehicle lights, truck mounted attenuators, and appropriate signs.

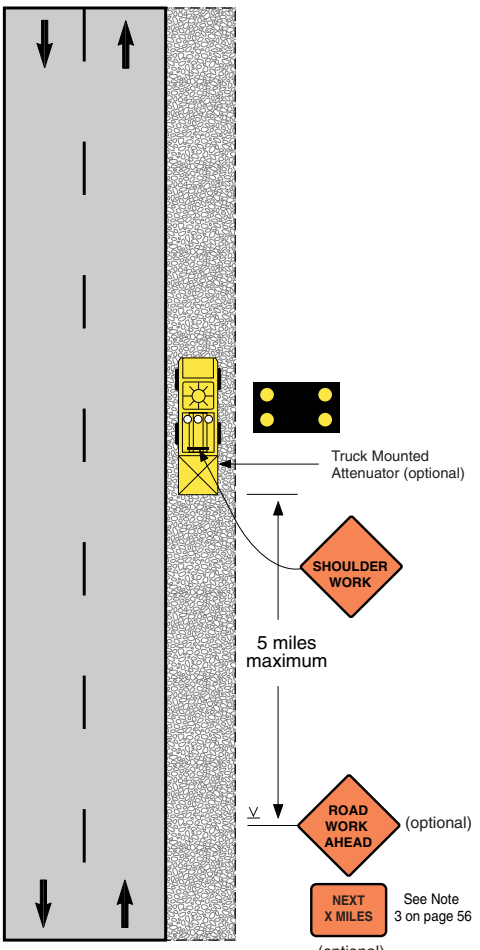
Flaggers may be used, but caution must be exercised so they are not exposed to unnecessary hazards.

Continuously Moving Mobile Operations – These mobile operations include work activities in which workers and equipment move along the road without stopping, (e.g. pavement striping, mowing, street sweeping, or herbicide spraying), usually at slow speeds.

For some continuously moving operations where volumes are light and visibility is good, a well-marked and well-signed vehicle may suffice. If volumes and/or speeds are higher, a shadow or protection vehicle, equipped as a sign truck, should follow the work vehicle. The advance warning area moves with the work area.

Mobile Operation on the Shoulder

(Mobile Operations – 15 minutes or less)



Notes:

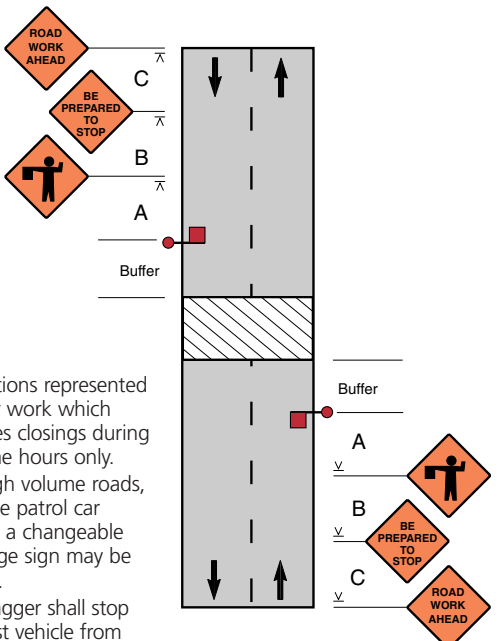
1. If the operation requires encroachment on the travelway, a mobile or stationary lane closure should be used, unless a 10-foot minimum lane width is maintained and the volume is less than 1500 ADT.
2. For operations that move slowly (less than 3 mph) and in situations where multiple work locations in a limited distance make it practical to place stationary signs, the maximum spacing from the advanced warning sign to the beginning of the work is 5 miles.
3. The LENGTH OF WORK sign or a supplemental panel (Next x Miles) may be used for work zones of more than 2 miles in length.
4. This note intentionally left blank.
5. If the distance between work locations is one mile or more, and if the work vehicle travels at traffic speeds between locations, warning signs are not required if the work vehicle displays a flashing or revolving yellow light.
6. Other acceptable advanced warning signs include SHOULDER WORK, UTILITY WORK AHEAD, MOWING, WORKER signs, and ROAD MACHINERY AHEAD.
7. Table below shows recommended roll-ahead distances between a protection vehicle with or without a truck-mounted attenuator (TMA) and the work area for both stationary and mobile operations. Roll-ahead distance for the protection vehicle may vary depending upon recommendations of the TMA manufacturer.

Roll-ahead Distances for TMAs and protection vehicle

Speed	Stationary	Mobile
≤45 mph	100 ft	150 ft
50-55 mph	150 ft	200 ft
60-65 mph	200 ft	275 ft

Temporary Road Closure

(Mobile Operations – 15 minutes or less)



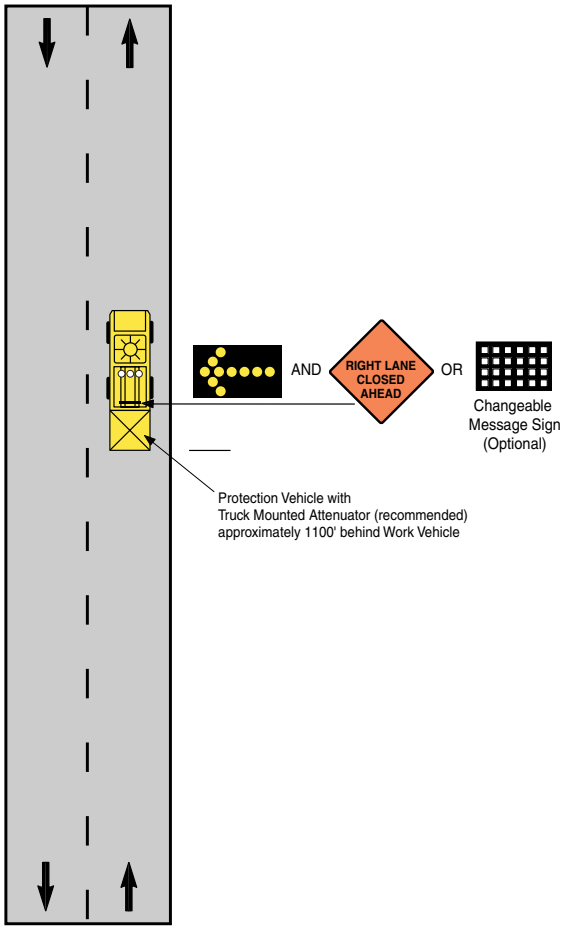
Notes:

1. Conditions represented are for work which requires closings during daytime hours only.
2. For high volume roads, a police patrol car and/or a changeable message sign may be added.
3. The flagger shall stop the first vehicle from the shoulder as shown. After stopping the first vehicle if the view of the flagger is obstructed, then he/she should move to the centerline to stop additional traffic.
4. Flaggers shall use approved flagging procedures according to the MUTCD and as shown on page 68.

Speed Limit (mph)	Sign Spacing A, B, C (ft)	Buffer
25	200	55
30	200	85
35	350	120
40	350	170
45	500	220
50	500	280
55	500	335

Mobile Operation on a Two-Lane Road

(traveling over 3 mph or
Mobile Operations – 15 minutes or less)



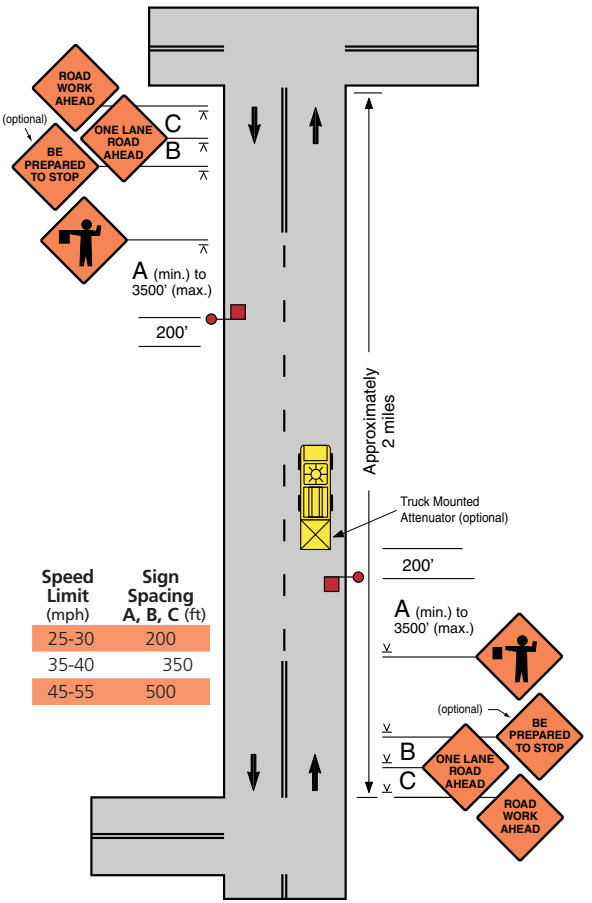
Mobile Operation on a Two-Lane Road (cont.)
(traveling over 3 mph or
Mobile Operations – 15 minutes or less)

Notes:

1. Where practicable and when needed, the work and protection vehicles should pull over periodically to allow traffic to pass. If this can not be done frequently, as an alternative, a "DO NOT PASS" sign may be placed on the rear of the vehicle blocking the lane.
2. The distance between the work and protection vehicle may vary according to terrain, paint drying time, and other factors. Protection vehicles are used to warn traffic of the operation ahead. Whenever adequate stopping sight distance exists to the rear, the protection vehicle should maintain the minimum roll ahead distance and proceed at the same speed as the work vehicle. The protection vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.
3. Additional protection vehicles to warn and reduce the speed of oncoming or opposing traffic may be used. Police patrol cars may be used for this purpose.
4. A truck-mounted attenuator (TMA) is recommended to be used on the protection vehicle and may be used on the work vehicle.
5. Sign legends shall be covered or turned from view when work is not in progress.
6. Stationary advance warning signs similar to that on the protection vehicle may be used to provide additional advance warning for the operation. These signs might include: SLOW MOVING TRAFFIC, ROAD WORK AHEAD, PAINT CREW AHEAD, etc. These signs should be considered where speed and/or volumes are high, where sight distance is limited.
7. When at an intersection, flaggers shall be required as shown on page 51. Use of cones are optional.

Mobile Operation on a Two-Lane Road Using Flaggers

(traveling 3 mph or less or Mobile Operations – 15 minutes or less)



Speed Limit (mph)	Sign Spacing A, B, C (ft)
25-30	200
35-40	350
45-55	500

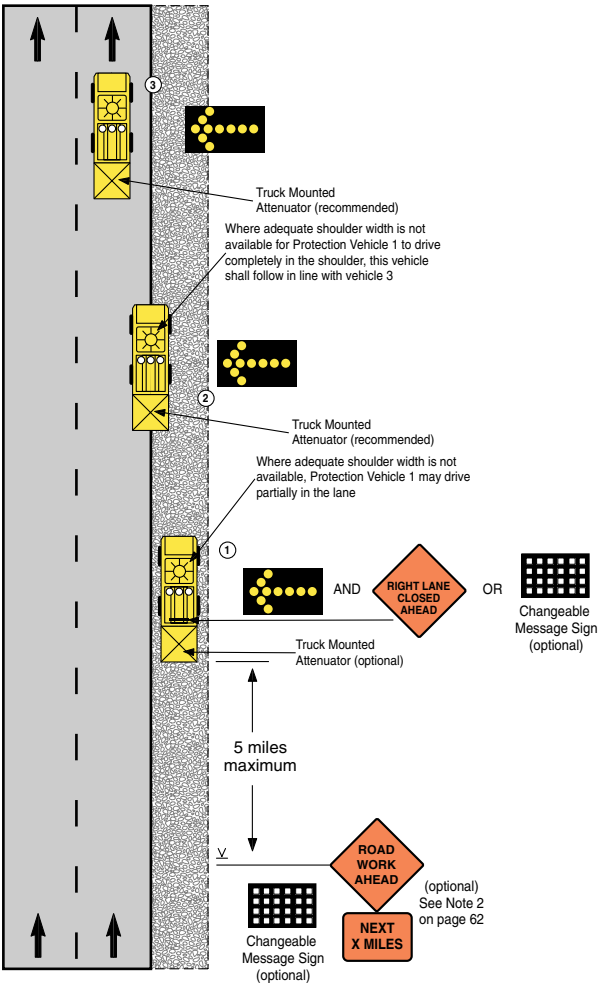
Mobile Operation on a Two-Lane Road Using Flaggers (cont.) (traveling 3 mph or less or Mobile Operations – 15 minutes or less)

Notes:

1. The distance between road work ahead signs should not exceed approximately 2 miles.
2. Where feasible, well defined end points (e.g. intersections, major driveways, city limits, etc.) should be used to establish the limits of the work zone.
3. FLAGGER warning signs should be repositioned periodically as the operation moves.
4. If there is a sideroad intersection within the work area, additional traffic control, such as flaggers and appropriate signage, may be needed on the sideroad approaches.
5. Additional protection vehicles to warn and reduce the speed of oncoming or opposing traffic may be used. Police patrol cars may be used for this purpose.

Mobile Operation on a Two-Lane Divided Road

(Mobile Operations – 15 minutes or less)

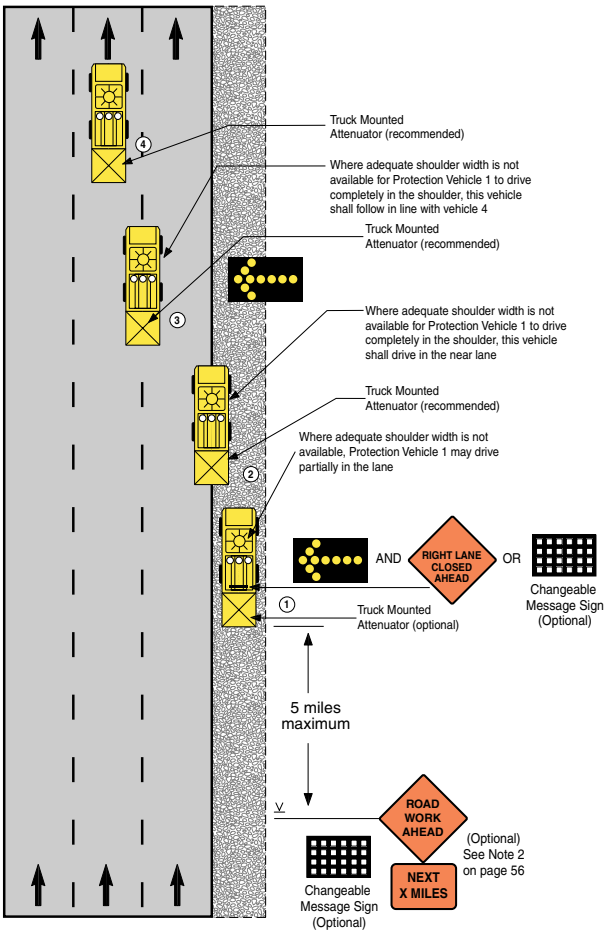


Notes:

see notes #5 and #6 on page 64.

Mobile Operation on a Multi-Lane Divided Road

(Mobile Operations – 15 minutes or less)



Mobile Operation on a Multi-Lane Road (cont.)
(Mobile Operations – 15 minutes or less)

Notes:

1. Protection vehicle #1 should travel at a varying distance from the work operation so as to provide adequate sight distance for traffic approaching from the rear.
2. Stationary advance warning signs may be used to provide additional advance warning for the operation. These signs might include: SLOW MOVING TRAFFIC AHEAD, ROAD WORK AHEAD, PAINT CREW AHEAD, etc. These signs and/or a changeable message sign should be used where speeds and volumes are high, or where sight distance is limited.
3. If stationary signs are used and the activity is spread out over a distance of more than 2 miles, the LENGTH OF WORK Sign or a supplemental panel should be used.
4. Work should normally be done during off-peak hours.
5. Protection Vehicle (PV) spacing:
   - 120'-1000' between Work Vehicle and nearest PV
   - Approximately 500' between middle PV's
   - 1000' - 2000' between PV#2 and PV#1

   Urban roadways may require shorter distances. Exact spacing will be determined by the crew leader.
6. In an urban, non-interstate area, the number of protection vehicles may be reduced.

Pedestrian and Worker Safety

Pedestrian Safety

If pedestrian travel paths (sidewalks or footpaths) are closed or disrupted by a construction, maintenance, or utility operation, then pedestrian traffic control is needed. This includes the use of signs, channelizing devices, flags, etc. to direct pedestrian movement through or around the work site.

The major considerations in planning for pedestrian safety in temporary traffic control zones on streets and highways are:

- Pedestrians should not be led into direct conflicts with work site vehicles, equipment, or operations.
- Pedestrians should not be led into direct conflicts with mainline traffic moving through or around the work site.
- Pedestrians should be provided with a safe, convenient travel path that replicates as nearly as possible the most desirable characteristics of sidewalks or footpaths.
- Pedestrians need protection from potential injury and a smooth, clearly defined travel path. Obstructions should be clearly marked, especially at night.

Worker Safety

The safety of workers in a work site is just as important as the safety of the public traveling through the work zone. The best protection for both is good work zone traffic control.

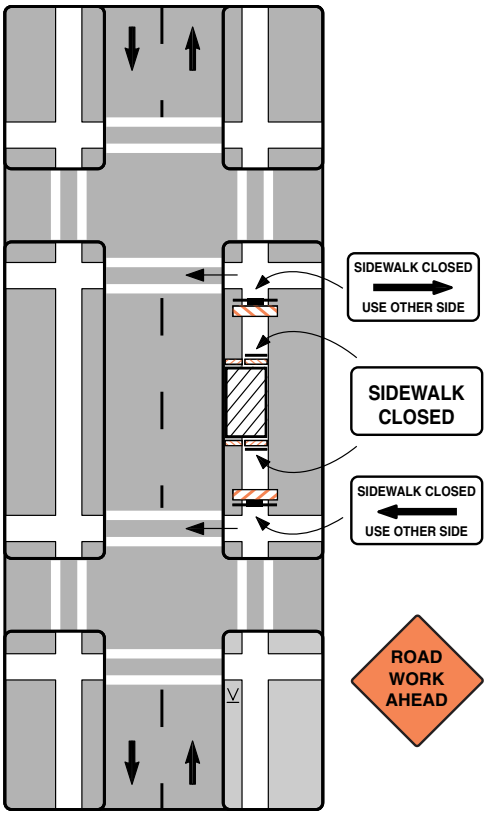
All workers should be trained in how to work next to traffic in a way that minimizes their vulnerability. In addition, workers with specific traffic control responsibilities should be trained in traffic control techniques, device usage, and placement.

Workers exposed to traffic shall be attired in INDOT approved apparel including, but not limited to safety vests and hats.

For nighttime work, similar outside garments shall be retroreflective and shall be designed to identify clearly the wearer as a person and be visible through the full range of body motions (i.e. retroreflective material on the front, back, and both sides of the garment).

Sidewalk Closure

(Pedestrian Detour)

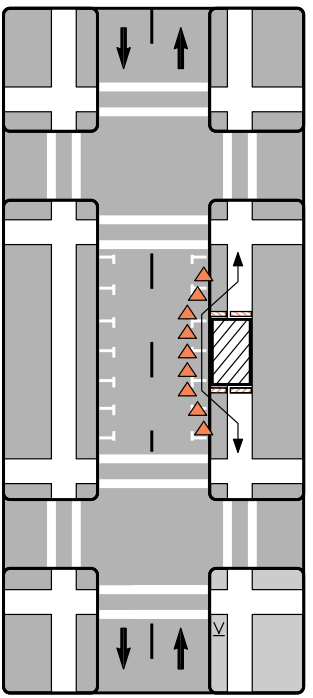


Notes

1. Additional advance warning may be necessary.
2. Only the traffic control devices controlling pedestrian flows are shown. Other devices may be needed to control traffic on the streets. Use lane closure signing, ROAD NARROWS or LANE NARROWS signs as needed.
3. For nighttime closures, Type A flashing warning lights may be used on barricades supporting signs and closing walkways.

Sidewalk Closure

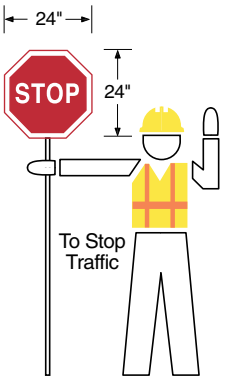
(Pedestrian Walkway Provided)

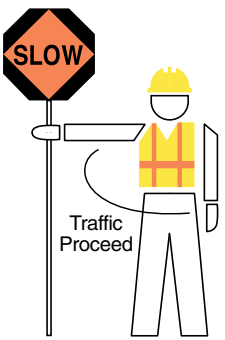


Notes:

1. Additional advance warning may be necessary.
2. Only the traffic control devices controlling pedestrian flows are shown. Other devices may be needed to control traffic on the streets. Use lane closure signing, ROAD NARROWS or LANE NARROWS signs, as needed.
3. For nighttime closures, Type A flashing warning lights may be used on barricades supporting signs and closing walkways. Type C steady-burn lights may be used on channelizing devices separating the temporary walkway from vehicular traffic.
4. Where high speeds are anticipated, use a barrier to separate the temporary walkway from vehicular traffic. Refer to Section 6D-1 of Part VI of the MUTCD for information on barriers.
5. Signs may be placed along a temporary walkway to guide or direct pedestrians; for example, KEEP RIGHT or KEEP LEFT signs.

Flagging Procedures





Properly Trained Flaggers

- give clear messages to drivers as shown
- allow time and distance for drivers to react
- coordinate with other flaggers

Properly Equipped Flaggers

- approved sign paddles
- paddles are not to be used in a signalized intersection
- approved safety vest, shirt or coat
- brightly colored hat for better visibility
- retroreflective night equipment

Proper Flagging Stations

- good approach sight distance
- highly visible to traffic
- never stand in moving traffic lane
- always have an escape route

Proper Advance Warning Signs

- always use warning signs
- allow reaction distance from signs
- remove signs if not flagging

Flags should only be used in emergency situations or for controlling traffic at a signalized intersection. Flags used for signaling shall be a minimum of 24" x 24", red in color and mounted on a staff, about 3' long.

Acknowledgments

This pocket guide was adapted for use in Indiana by the Indiana Department of Transportation (INDOT) and the Indiana Local Technical Assistance Program (LTAP) from one produced by the Institute for Transportation Research and Education (ITRE) at North Carolina State University. INDOT and LTAP acknowledge and thank ITRE and the many agencies and associations in North Carolina and South Carolina that were involved in the original development of this pocket guide on work zone traffic control.

The Indiana team that reviewed the ITRE version of the *Work Zone Safety Handbook* and adapted it to reflect Indiana practice included representatives of the operations safety coordinators, maintenance, safety, and traffic sections of INDOT; Allen County; Montgomery County, Tipton County; City of Lebanon; Town of Flora; and the Indiana LTAP Center at Purdue University.

Information and Training

For further information and training opportunities in basic work zone traffic control, flagging, and other street and highway design, operation, and maintenance topics contact the Indiana LTAP Center, a project of the Purdue University Civil Engineering Department, funded as a Local Transportation Assistance Program by the Federal Highway Administration, and Indiana Department of Transportation.

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