Introduction

Work Zone Traffic Control

The purpose of work zone traffic control is to provide a safe work area for workers within the roadway, while facilitating the safe and orderly flow of all road users (motorists, bicyclists and pedestrians including persons with disabilities in accordance with the Americans with Disabilities Act of 1990) through the work zone.

This manual is intended to provide New York State Department of Transportation (NYSDOT) employees, utility companies, municipalities, and contractors who are involved with the design, set-up and maintenance of highway work zones, or anyone working within the state right-of-way, with the basic principles and elements constituting a safe work zone. The information presented in this manual is based on the requirements set forth in the National Manual of Uniform Traffic Control Devices and the NYS Supplement, review of work zone manuals from a selection of state and federal agencies, and discussions with members of the NYSDOT Work Zone Traffic Control Committee.

This manual includes basic information on work zone traffic control, including a description of traffic control devices, illustrations of acceptable, commonly used devices, and the proper flagger attire and methods. Color diagrams (typical applications) depicting typical traffic control set-ups for two-lane and multilane highways are intended to show the minimum requirements for a safe work zone set-up. Traffic control or protection can be enhanced for situations that may require additional measures such as high traffic or pedestrian volume, high speeds, restricted sight distance, poor or confusing alignment.

This is a “living document” that will evolve as recommendations are received from the Regions. Work zone traffic control diagrams will be added, and deleted, as necessary, and all will be posted on the NYSDOT internet site (Work Zone Traffic Control Manual).

Please address any questions, comments, and/or recommendations regarding this manual to Charles Riedel 518.457.2185 or MD Haque 518.457.7784. Office of Traffic Safety & Mobility, NYSDOT.
Fundamental Principles

The principles listed below provide a guiding philosophy of good temporary traffic control and enhance the safety of motorists, pedestrians and workers within and near temporary traffic control zones.

- Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
- Inhibit traffic movement as little as possible.
- Provide clear and positive guidance to drivers and pedestrians as they approach and travel through the temporary traffic control zone.
- Inspect traffic control elements routinely and modify when necessary.
- Pay increased attention to roadside safety near temporary traffic control.
- Train all persons that select, place and maintain temporary traffic control devices.
- Establish proper legislative authority to implement and enforce needed traffic regulations, speed zoning, parking controls, and incident management.
- Keep the public well informed.
- If there is a side road intersection/driveway or ramp within the work area, additional traffic control, such as flaggers and appropriate signs, may be needed on the side road/driveway approaches or ramps.

The Work Zone

The work zone is the distance between the first advance warning sign and the point beyond the work area where traffic is no longer affected.

- Advance warning area tells traffic what to expect ahead.
- Transition area moves traffic out of its normal path.
- The Activity area provides space for the work, traffic, and buffer space and/or protective vehicles between the two.
  - Buffer areas separate traffic from workers and provide a recovery area for errant vehicles. **No equipment, vehicles or material shall be placed in this area.**
  - Protective vehicle area provides a temporary barrier vehicle and roll-ahead distance for worker safety. If a vehicle is not being used, then the roll-ahead distance is not necessary. **No equipment, vehicles or material shall be in the roll-ahead distance.**
  - Work area is set aside for workers, equipment and material storage.
- Termination area lets traffic resume normal driving.
Components of a Work Zone Traffic Control Area

- **Termination Area**
  - Lets traffic resume normal operations

- **Activity Area**
  - Is set aside for actual work, workers, equipment, vehicles, material storage, buffer space, and barrier vehicle

- **Transition Area**
  - Moves traffic out of its normal path

- **Advance Warning Area**
  - Tells traffic what to expect ahead

- **Buffer Space (Lateral)**
  - Provides protection for traffic and workers
  - 10 ft. Minimum for Conventional Roadway
  - 11 ft. Minimum for Expressway/Freeway

- **Buffer Space (Longitudinal)**
  - Provides protection for traffic and workers
  - No workers, equipment, or vehicles in this area

- **Merging Taper (L)**
  - Moves traffic out of its normal path

- **Downstream Taper**
  - 100% of the lane where space is available

- **Work Space**
  - Is set aside for workers, equipment, and material storage

- **Roll Ahead Distance**

- **Shoulder Taper (L/3)**
  - Begins closure to traffic

**NOT TO SCALE**
Taper Length Criteria for Work Zones

The five types of roadway tapers (or transitions) used in work zone traffic control are the following:

1. **Merging Taper (L)** - When a lane is closed and vehicles in that lane must merge with traffic in an adjacent lane.
2. **Shifting Taper (L/2)** - When there is a lateral shift in the path of the lanes, but there is no reduction in the number of travel lanes.
3. **Shoulder Taper (L/3)** - When the shoulder is closed to traffic.
4. **One-lane, Two-way Taper** - When one lane of a two lane, two-way roadway is closed to traffic and where alternate one-way operation in one lane is in effect.
5. **Downstream Taper** - When transitioning traffic back to the normal traveling conditions.

### FORMULAS FOR DETERMINING TAPER

<table>
<thead>
<tr>
<th>Speed Limit ‘S’ (mph)</th>
<th>Taper Length ‘L’ (ft)</th>
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<tbody>
<tr>
<td>40 mph or less</td>
<td>( L = WS(S) )</td>
</tr>
<tr>
<td></td>
<td>( \frac{60}{60} )</td>
</tr>
<tr>
<td>45 mph or more</td>
<td>( L = WS )</td>
</tr>
</tbody>
</table>

\( L = \) Taper length in feet  
\( W = \) Width of offset in feet  
\( S = \) Posted speed limit, off peak 85\(^{th}\) percentile speed prior to work starting or the anticipated operating speed in mph

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**One-Lane Two-Way Tapers**
<table>
<thead>
<tr>
<th>Speed</th>
<th>25 MPH</th>
<th>30 MPH</th>
<th>35 MPH</th>
<th>40 MPH</th>
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<tr>
<td></td>
<td>Width (Ft.)</td>
<td>Taper Length L (Ft.)/ # Skip Lines/ # of Cones</td>
<td>Taper Length L/3 (Ft.)/ # Skip Lines/ # of Cones</td>
<td>Taper Length L (Ft.)/ # Skip Lines/ # of Cones</td>
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<td>20 / 1 / 2</td>
<td>20 / 1 / 2</td>
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<td>100 / 3 / 4</td>
<td>120 / 3 / 4</td>
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<td>140 / 3 / 5</td>
<td>180 / 5 / 6</td>
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<table>
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<th>45 MPH</th>
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<tr>
<td></td>
<td>Width (Ft.)</td>
<td>Taper Length L (Ft.)/ # Skip Lines/ # of Cones</td>
<td>Taper Length L/3 (Ft.)/ # Skip Lines/ # of Cones</td>
<td>Taper Length L (Ft.)/ # Skip Lines/ # of Cones</td>
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<td>540 / 14 / 14</td>
<td>540 / 14 / 14</td>
<td>180 / 5 / 6</td>
</tr>
</tbody>
</table>
Buffer Spaces

The buffer space is a crucial safety feature of a work zone. It serves to separate traffic flow from the work area or potentially hazardous area and provides recovery space for an errant vehicle. In the past, buffer spaces (both longitudinal and lateral) were an optional feature in NYS work zone traffic control. However, **in NYS a longitudinal buffer space is no longer optional in most cases.** A few exceptions have been made depending on the type of work operation and the use of protective vehicles. If there is any question as to whether a buffer space is required for a specific operation, please contact the DOT Regional Traffic Engineer. **Neither work activity nor the storage of equipment, vehicles, or material shall occur in this area.**

A lateral buffer space may also be used to separate passing traffic from the work area. Its use and width is based on conditions at the work site.

### LENGTH OF LONGITUDINAL BUFFER SPACE “B”

**BASED ON TABLE 6C-2 FROM THE NMUTCD**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Distance (ft)</th>
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<td>200</td>
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<tr>
<td>35</td>
<td>250</td>
</tr>
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<tr>
<td>65</td>
<td>645</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
</tr>
</tbody>
</table>

Note: Use posted speed limit if 85th percentile is unknown
Proper placement of protective (shadow/barrier) vehicles is essential during all types of operations. The vehicle must be placed close enough to the operation to prevent motorists from intruding into the work space, but not so close as to have the protective vehicle pushed ahead into the work space if hit from behind. This distance is known as the roll-ahead distance. The weight of the protective vehicle, the speed of traffic, the speed of the work operation, and the vehicle make-up of the traffic stream (all passenger vehicles or a large number of tractor trailers) will determine the roll-ahead distance to be used. The roll-ahead distances shown on our typical applications use a 24,000 lb protective vehicle and a 15,000 lb impacting vehicle.

There shall be no equipment, vehicles, or workers within the roll-ahead area.

Types of Protective Vehicles

There are two types of protective vehicles: **Barrier and Shadow**

**Barrier Vehicle:** A barrier vehicle is for stationary work operations to protect workers on foot in the roadway from errant vehicles. The barrier vehicle is unoccupied with the parking break set and front wheels turned away from oncoming traffic and employees in the work area, if possible. A barrier vehicle does not require a Truck Mounted Impact Attenuator (TMIA) in all cases. If a TMIA is used, it shall be attached to a large dump truck, a large rack truck or other vehicle having a gross weight of at least 24,000 pounds. Where the posted speed limit is 55 mph or less, the TMIA shall be a Test Level 2 attenuator. Where the posted speed is more than 55 mph, a Test Level 3 attenuator shall be used, if available. Barrier vehicles may be loaded with sand, gravel or fine aggregate to enhance the vehicle’s gross weight.

**Shadow Vehicle:** A shadow vehicle is for mobile operations only. The shadow vehicle shall be equipped and meet the same size and weight requirements as a barrier vehicle. The driver shall remain in the vehicle and adjust the vehicle’s spacing as work progresses.

**Advance Warning Vehicle:** This vehicle is stationed a considerable distance in advance of a moving or stationary maintenance operation. Its purpose is to display sign messages which will advise motorists of what to expect ahead. If the vehicle is able to stay completely on the shoulder, a pick up truck may be used. However, if the vehicle encroaches into the travel lane, it then becomes a Barrier/Shadow Vehicle and shall be equipped accordingly.
## Computed Roll-Ahead Distances for Protective Vehicles

<table>
<thead>
<tr>
<th>Vehicle Weight (lb)</th>
<th>Prevailing Speed (mph)</th>
<th>Weight of Impacting Vehicle To Be Contained (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4,500 lb</td>
</tr>
<tr>
<td>10,000</td>
<td>60-65</td>
<td>100 Ft.</td>
</tr>
<tr>
<td></td>
<td>50-55</td>
<td>100 Ft.</td>
</tr>
<tr>
<td></td>
<td>45 or less</td>
<td>75 Ft.</td>
</tr>
<tr>
<td>15,000</td>
<td>60-65</td>
<td>75 Ft.</td>
</tr>
<tr>
<td></td>
<td>50-55</td>
<td>75 Ft.</td>
</tr>
<tr>
<td></td>
<td>45 or less</td>
<td>50 Ft.</td>
</tr>
<tr>
<td>24,000</td>
<td>60-65</td>
<td>75 Ft.</td>
</tr>
<tr>
<td></td>
<td>50-55</td>
<td>50 Ft.</td>
</tr>
<tr>
<td></td>
<td>45 or less</td>
<td>50 Ft.</td>
</tr>
</tbody>
</table>

Notes:
(a) Weights of typical vehicles: mid-size auto, 2,250 lb; full-size auto 3,500 lb; loaded ¾-ton pickup truck, 6,000 lb; loaded 1-ton cargo truck, 10,000 lb; loaded 4-yard dump truck, 24,000 lb.
(b) Distances are appropriate for the shadow vehicle speeds up to 15 mph.
(c) Values suggested as the appropriate buffer distance for vehicles equipped with TMIs.

Source:
## Computed Roll-Ahead Distances for Protective Vehicles

### BARRIER VEHICLE STATIONARY OPERATION

<table>
<thead>
<tr>
<th>Vehicle Weight (lb)</th>
<th>Prevailing Speed (mph)</th>
<th>Weight of Impacting Vehicle To Be Contained (a)</th>
</tr>
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<tbody>
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<td>4,500 lb</td>
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<tr>
<td>10,000</td>
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<td>50 Ft.</td>
</tr>
<tr>
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<td>25 Ft.</td>
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<tr>
<td></td>
<td>45 or less</td>
<td>25 Ft.</td>
</tr>
<tr>
<td>15,000</td>
<td>60-65</td>
<td>25 Ft.</td>
</tr>
<tr>
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<tr>
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<td>45 or less</td>
<td>25 Ft.</td>
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<tr>
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<td>25 Ft.</td>
</tr>
<tr>
<td></td>
<td>45 or less</td>
<td>25 Ft.</td>
</tr>
</tbody>
</table>

Notes:

(a) Weights of typical vehicles: mid-size auto, 2,250 lb; full-size auto 3,500 lb; loaded ¾-ton pickup truck, 6,000 lb; loaded 1-ton cargo truck, 10,000 lb; loaded 4-yard dump truck, 24,000 lb.

(b) N/A

(c) Values suggested as the appropriate buffer distance for vehicles equipped with TMIAs.

Source:

Work Area Duration

Work duration is a major factor in determining the number and types of devices used in work zone traffic control areas. As a general rule, the longer the operation will last, the more traffic control devices are needed.

**Mobile Work:** Work that moves intermittently or continuously.

Examples:
- Placing cones and/or signs for stationary work zones
- Herbicide spraying
- Sweeping operations
- Paint striping operations
- Placing traffic counters

Mobile work zones provide the lowest level of traffic control and safety and should only be used where the work at any specific location will be completed within 15 MINUTES. There may be cases where site specific conditions justify longer duration use of mobile work zones to minimize the exposure of traffic and the workers to each other. In such cases, an exception may be approved by responsible person(s) designated by the region after consideration of relevant factors such as speeds, sight distance, staging of the work, degree of obstruction to traffic, traffic volumes, and the relative severity and duration of exposure to workers and traffic.

**Short Duration:** Work that occupies a location for up to 1 hour.

Examples:
- Placing traffic counters
- Re-lamping traffic signals/ streetlights
- Pot hole Repair
- Minor guiderail repair
- Sign Repair

Due to the short work time, simplified traffic control set-ups are allowed to reduce the hazards of traffic exposure to workers. Careful consideration of traffic and roadway conditions must be given to each work zone prior to selecting the most appropriate traffic control set-up. Shoulder work and work on low speed, low volume roadways may only require a single warning sign, cones, and a flagger, while a high speed, high volume road would require a more detailed lane closure utilizing more safety control devices such as a barrier vehicle, signs, channelizing devices and a flashing arrow panel.

**Short-Term Stationary:** Daytime work that occupies a location for more than 1 hour within a single daylight period.

Examples:
- Guiderail Repair
- Bridge Inspection/Repair
- Ditch Maintenance
- Concrete Roadway Repair

Short term stationary work areas are typically occupied by materials, equipment and workers, but the work area is cleared at the end of the work day and normal traffic flow restored. Traffic control typically includes signs on portable supports, cones or drums
forming a taper and separating the work space from traffic and flashing arrow boards or PVMS as needed. Buffer space or Barrier vehicles are required and impact attenuators are required on the barrier vehicles if prevailing speeds are 45 mph or greater. Traffic control is removed at the end of the work day.

**Intermediate-Term Stationary:** Work that occupies a location more than one daylight period up to 3 consecutive days, or night time work lasting more than 1 hour. Typically, the work area is occupied by excavations, materials, and/or equipment at times when workers are not present. Temporary traffic control requirements for these type operations are found in the 619 series of NYSDOT Standard Sheets.

**Long-Term Stationary:** Work that occupies a location for more than 3 consecutive days. Typically, the work area is occupied by excavations, materials, and/or equipment at times when workers are not present. Temporary traffic control requirements for these type operations are found in Section 619 of the NYSDOT Standard Sheets.

**Night work:** Extra care should be taken when scheduling work at night. Lighting of the work area and/or flagging stations is required. Appropriate devices include retro reflective signs, large channelizing devices, light dimming arrow panels and additional lights on work equipment. Consult your RTE for additional specific nighttime requirements.

**Incident Management Situations:**

**Examples:**
- Traffic accident
- Debris on the highway
- Initial response to flooding and emergency road and bridge repairs

The immediate response to an emergency situation must be handled safely and make use of available devices and equipment available at that moment. Given the opportunity, however, longer-term (longer than 1 hour) emergencies should be treated in a matter similar to a work zone of other temporary traffic control work sites and proper traffic control should be established as soon as possible.

Response to an emergency situation is inherently more dangerous than a planned situation. Carefully consider the personal safety risks against the public safety needs when selecting a response to the emergency. If the risks outweigh the public safety benefit, wait for assistance from police and other NYSDOT personnel and equipment.
Advance Warning Signs

All work zone signing (ground or truck mounted) shall conform to the NMUTCD and NYS Supplement. Special conditions or emergencies may require additional signing. Refer to the MUTCD and the NYS Supplement for guidance on the proper location, message, spacing, sequence, mounting height and size of signs used for traffic control.

Materials
Rigid and flexible “roll-up” signs may be used for mobile, short duration and short term stationary work. Rigid signs must be mounted at least 5 feet above grade (7 feet where there are pedestrians or parked cars) for visibility and to avoid windshield penetration if they are impacted. Flexible signs must be mounted at least one foot above grade. Mesh signs shall not be used. Use retro reflectorized rigid signs for night work because they present a flat, uniform reflective surface. Sign stands/posts must meet NCHRP 350 crash testing standards. Ex: Breakaway posts and hinges.

Installation
All signs should face at approximately right angles to on-coming traffic and be as close to vertical as possible to avoid reflecting sun glare into the driver’s eye. In mobile and short duration work zones, signs may be mounted on vehicles. Orange flags can be mounted on warning signs to enhance their visibility.

Credibility
Signs shall be maintained, clean and with the legend fully intact. They shall remain in place only when needed. Signs which do not reflect actual conditions promote driver disobedience of all signs and therefore should be covered, removed or turned away so they are not visible to traffic in any travel lane. Sign covers must be opaque, and cover the sign face completely. Partially visible signs may divert attention away from traffic and other devices.

If unneeded signs are to be stored at roadside, try to store them out of the clear zone or as far from traffic as practical. If stored close to traffic, lay the signs flat and fold up the legs of the sign supports.

Where operations are performed in stages, only use those devices that apply to the conditions present during the stage in progress. Signs set up over a long distance should be periodically checked.
Guidance for Proper Signing

• Install one or more work zone warning signs whenever the work results in a changed condition which may require a higher level of driver caution. One sign (usually “Road Work Ahead”) may be adequate for minor changes such as removed guide rail, removed edge line or roadside work which does not encroach on the shoulder or travel lane. Use “Road Work Ahead” as the first sign in a warning sign series on minor side roads where distance information is not necessary. Use more signs as the impact on traffic increases. For work which obstructs traffic, a 3 sign series is typical. The first sign is a general warning sign to get the motorist’s attention. The second sign warns of the specific condition and the third sign advises the driver of any action to be taken.

• General warning signs such as “Road Work XX Ft” should be limited to the first sign of a series. Subsequent warning signs in that series should identify specific conditions. Use signs shown in the MUTCD/WZTCM for lane and shoulder closure, alignment and intersection signs, flagger and worker symbol signs, road closed, detour, etc.

• Location of advance warning signs should consider exiting and entering traffic. Advance posting distances indicated in the MUTCD and WZTCM are starting points and should be adjusted as appropriate for site specific conditions. Avoid starting a warning sign series upstream from a major exit or intersection, except when it is desirable to divert traffic off the route at that point or where the intersection is within 1000 feet of the work site.

• Where single advance warning signs are provided on ramps or minor intersecting roads, the “Ahead” wording rather than a specific distance is preferred because it is easier to adapt to site conditions and reduces sign inventory needs.

• Warning signs must be located to provide adequate visibility distance to drivers; not blocked by foliage, roadway features, or other signs and traffic control devices; and not located where glare from light sources behind the sign may reduce visibility. Actual distance from a warning sign to the condition should be close to the stated distance on the sign, but accuracy should not be at the expense of sign visibility.

• Signs must be adequately spaced to provide time for the driver to read each one. Sign spacing varies with the type of highway and the prevailing speeds and is specified in the MUTCD and WZTCM. See Advance Warning Sign Spacing Table on the next page for details.
ADVANCE WARNING SIGNS
(Typically a 3 Step Process)

SIGN #3
Gets Drivers Attention
ROAD WORK AHEAD

SIGN #2
 Tells Driver of problem to expect
RIGHT LANE CLOSED 1 MILE

SIGN #1
Instructs Driver of what action needs to be taken to avoid problem
Shoulder/Lane Taper OR Point of Restriction

See table Below for A, B, and C distances.

| ADVANCE WARNING SIGN SPACING TABLE |
|------------------------------------|------------------|
| Road Type                          | Distance Between Signs |
|                                    | A    | B    | C    |
| Urban (30 MPH or Less)             | 100 Ft. | 100 Ft. | 100 Ft. |
| Urban (35-40 MPH)                  | 200 Ft. | 200 Ft. | 200 Ft. |
| Urban (45 MPH or Greater)          | 350 Ft. | 350 Ft. | 350 Ft. |
| Rural                              | 500 Ft. | 500 Ft. | 500 Ft. |
| Expressway/Freeway                 | 1,000 Ft. | 1,500 Ft. | 2,600 Ft. |

**URBAN:** (Meets one or more of the following criteria)
- Sidewalks
- Bicycle Usage
- Curbing
- Closed Drainage Systems
- Driveway densities greater than 24 driveways/mile
- Minor Commercial Driveways densities greater than 10 driveways/mile or greater
- Major Commercial Driveways
- Numerous ROW Constraints
- High Density of Cross Streets
- 85th percentile speeds of 45 MPH or less

**RURAL:** Any area not exhibiting more than one of the above characteristics.

**EXPRESSWAY:** Divided Highway for through traffic with full or partial control of access and generally with grade separations at major crossroads.

**FREEWAYS/INTERSTATE:** Local or interregional high-speed, divided, high-volume facilities with full or partial control of access.
Height and Lateral Location of Signs - Typical Applications

**RURAL DISTRICT**
- **ROAD WORK AHEAD:**
  - Height: 1.8 to 3.7 m (6 to 12 ft)
  - Lateral: Not less than 1.5 m (5 ft)

**RURAL DISTRICT WITH ADVISORY SPEED PLATE**
- **DETOUR 500 FT OR DETOUR 150 m**
  - Height: 1.8 to 3.7 m (6 to 12 ft)
  - Lateral: Not less than 1.8 m (6 ft)

**URBAN DISTRICT**
- **ROAD CLOSED 500 FT OR ROAD CLOSED 150 m**
  - Height: Not less than 0.6 m (2 ft)
  - Lateral: Not less than 2.1 m (7 ft)

- **RIGHT LANE CLOSED 1000 FT OR RIGHT LANE CLOSED 300 m**
  - Height: Not less than 0.6 m (2 ft)
  - Lateral: Not less than 2.1 m (7 ft)

**Paved Shoulder**
- Width: Not less than 1.2 m (4 ft)
Methods of Mounting Signs Other Than on Posts

- **High-Level Warning Device (Flag Tree)**
  - 2.4 m (8 ft) minimum (see Section 6F.54)

- **Orange Flag (optional)**
  - 0.3 m (1 ft) MIN. above the traveled way

- **PORTABLE AND TEMPORARY MOUNTINGS**
  - 0.3 m (1 ft) MIN. above the traveled way

- **BARRICADES**
  - Flasher (optional)
**Channelizing Devices**

Channelizing devices are used to warn and alert drivers of conditions in work zones, to protect workers, and to guide and direct drivers and pedestrians safety. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and barriers. Cones are used most commonly for Short Duration/Short Term maintenance & Utility work. Cones used at night shall be retro reflectorized. Drums are most commonly used where they will remain in place for a prolonged work period Ex: Long Term Stationary Operations (> 3 Days). Ballast shall not be placed on top of channelizing devices.

Cone Spacing in the Work Area (straight a way) shall be a maximum of 40 feet (1 Skip Line)

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**Warning lights (optional)**

* Note: If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 900 mm (36 in) to be detectable to users of long canes.
Channelizing Devices
(Continued)

TYPE I BARRICADE  **

TYPE II BARRICADE  **

TYPE III BARRICADE  **

DIRECTION INDICATOR BARRICADE  **

* Warning lights (optional)
** Rail stripe widths shall be 150 mm (6 in), except that 100 mm (4 in) wide stripes may be used if rail lengths are less than 900 mm (36 in). The sides of barricades facing traffic shall have retroreflective rail faces.

Note: If barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 900 mm (36 in) above the ground surface.
Flashing Arrow Panels

- Arrow panels are traffic control devices used for additional advance warning and where a lane is closed and traffic must merge with traffic in an adjacent lane. They are generally used for lane closure, and slow moving maintenance activities. Use flashing arrow panels for all lane closures on highways where the posted speed limit equals or exceeds 45 mph.

- **The arrow display should NEVER be used on two-lane, two-way roads.** Arrow displays should only be used where traffic can be moved to another lane without danger of meeting on-coming traffic…multi-lane, single direction roadways.

- The four corner flash mode may be used to provide additional advance warning where an arrow display is not appropriate. *THE FLASHING BAR DISPLAY IS NOT PERMITTED.*

- Locate arrow panels to maximize the distance between the arrow panel and the point where drivers first must see and understand the arrow. Provide at least ½ mile legibility (more if possible) for highways with speed limits of 45 mph or greater. Trailer mounted arrow panels should be 4 feet high by 8 feet wide, mounted at a height of 7 feet. Provide at least 1500 foot legibility if used where speed limits are below 45 mph.

- For stationary lane closures, place the arrow panel on the shoulder inside the taper near the beginning of the taper. Avoid placing it near ramps, median crossovers, and intersections where it may confuse drivers. Use only one arrow panel for each **stationary** lane closure. Too many arrow panels can encourage drivers to change lanes unnecessarily.

- For mobile maintenance activities where a lane is closed, an arrow panel must be placed in the closed lane at the rear of the activity. If possible, use two arrow panels for mobile/moving work zones; one on the first shadow vehicle in the closed lane, and the second on a shadow vehicle, pick-up truck or trailer on the shoulder upstream of the first one. The arrow panel should be placed on a vehicle separate from a work vehicle and positioned between the last work vehicle and approaching traffic.

- In areas of restricted sight distance, it may be necessary for the arrow panel vehicle to lag behind or stop and wait behind the activity to maintain optimal visibility to approaching traffic. As sight distance improves behind the activity, the arrow panel vehicle should close the gap. However, the distance between the arrow panel vehicle and the work activity should be kept short enough to discourage drivers from re-entering the lane.
Advance Warning Arrow Display Specifications

Operating Mode

I. At least one of the three following modes shall be provided:
   - Flashing Arrow
   - Sequential Arrow
   - Sequential Chevron

II. The following mode shall be provided:
    - Flashing Double Arrow

III. The following mode shall be provided:
     - Flashing Caution

Panel Display (Type C panel illustrated)
(Right arrow shown; left is similar)

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Minimum Size</th>
<th>Minimum Legibility Distance</th>
<th>Minimum Number of Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1200 x 600 mm (48 x 24 in)</td>
<td>0.8 km (1/2 mi)</td>
<td>12</td>
</tr>
<tr>
<td>B</td>
<td>1500 x 750 mm (60 x 30 in)</td>
<td>1.2 km (3/4 mi)</td>
<td>13</td>
</tr>
<tr>
<td>C</td>
<td>2400 x 1200 mm (96 x 48 in)</td>
<td>1.6 km (1 mi)</td>
<td>15</td>
</tr>
<tr>
<td>D</td>
<td>None*</td>
<td>0.8 km (1/2 mi)</td>
<td>12</td>
</tr>
</tbody>
</table>

*Length of arrow equals 1200 mm (48 in), width of arrowhead equals 600 mm (24 in)
Portable Variable Message Signs (PVMS)

These devices provide added (supplemental) warning and real time information concerning changing conditions. Use PVMS, if available, on high-speed, high-volume roadways (and on other roadways as needed) to supplement static signs to alert drivers to nighttime maintenance activities, road closures and workers exposed to traffic. PVMS shall not be used by themselves except in emergencies. Radar equipped PVMS should also be deployed in major active work zones where workers are exposed to traffic on high speed limited access highways for a minimum of 4 hours.

- Place PVMS well upstream of work areas, road closures or detours to allow time for driver response or diversion to other routes.

- Simple, specific messages are essential to ensure that they can be read and understood. Provide specific instructions and information ("Paving Ahead / Right Lanes Closed", or "Exit 45 Closed / Use Exit 46"). Check the “Policy and Guidance for use of VMS” manual which is available from the Regional Traffic office for standard messages or consult with the Traffic Group.

- Limit messages to 2-part, 3-word text if possible. Longer messages cannot be read at typical freeway speeds. Don't display general messages ("Drive Safely" or "Have A Nice Day") or cautionary messages ("Caution" or "Road Work Ahead").

- When not needed, turn off VMS, and, if possible, store outside the clear zone.
Traffic Controllers (Flagger)

Flagger
A flagger may be necessary to alert traffic, or to stop traffic intermittently, as required by the progress of work in a work zone. The flagging operation provides protection for other workers and the public. A flagger should be alert, neat appearing and act responsibly.

The flagger’s only job is work zone protection and traffic control. The flagger must never assist the crew with work activities, or engage in any distraction, and must remain on duty until properly relieved. Use stop-slow paddles, where feasible. Flags may be used at intersections or where the back-side message is inappropriate for opposing traffic and where conditions such as high wind make the use of a paddle impractical.

Flaggers should be used in the following situations:
- One lane is alternately used for both directions of traffic.
- The roadway is closed for a brief period of time.
- Traffic speeds need to be substantially reduced.
- Inadequate sight distance hinders advance warning.
- Information, such as changing conditions, needs to be conveyed to motorists.
- Opposing traffic needs to be controlled at an intersection.
- Installing and removing other traffic control devices.
- Where conditions require unusual precautions.

General
No employee is to be utilized as a flagger until the employee has shown conclusively to their Supervisor that they realize fully the importance of the job, and understands the duties and responsibilities associated with it.

Flaggers must:
- Always face oncoming traffic.
- Never leave their position until relieved.
- Know where crew members and equipment are, be aware of changes, and never stand among workers and equipment.
- Be courteous, yet authoritative.
- Minimize conversations with motorist and pedestrians.
- Be positioned to compensate for limited sight distance, to provide maximum advance warning, and remain clearly visible to traffic at all times.
- Maintain continuous communication with any other flaggers.
- Try to maintain color contrast with background; consider sun glare on motorist.
- Establish eye contact with drivers to whom they must give direction.
A flagger’s activities bring them into continuous contact with the public. As they are the ones the public sees in most cases, it is important that the flaggers conduct themselves in a manner which will bring credit both to themselves and the Department. Courtesy should be exercised at all times. Even under trying conditions, a flagger should be courteous, though firm.

The flagger’s supervisor shall determine when flaggers are to be used, how many are needed, where they are to be stationed for a specific operation, and the methods of communication between multiple flaggers.

Traffic controllers must use the following equipment and personal protective gear:

- Hard hat.
- High Visibility Apparel (Vest, T-Shirt or 3 Season Jacket): Must meet approved ANSI/ISEA 107-2004, Performance Class II standards.
- 24 inch stop/slow paddle, Red flag (24in by 24in). The paddle is the preferred device but the flag may be used at intersections where the stop/slow paddle would offer contradicting information to drivers traveling in opposite directions/legs of the intersection or during emergency situations.
- A red wand flashlight, if working at night, and portable lighting is unavailable.

Traffic Observers (Spotters)

A spotter is a person with the same qualifications of the flagger. A spotter may be required to warn workers of errant vehicles, danger from traffic, or to assist drivers of work vehicles in entering or leaving work sites or in performing U-turns.
Use of Hand-Signaling Devices by Flaggers

PREFERRED METHOD
STOP/SLOW Paddle

610 mm (24"

MIN.

EMERGENCY SITUATIONS ONLY
Red Flag

900 mm (36"

610 mm
(24"

610 mm
(24"

TO STOP TRAFFIC

TO LET TRAFFIC PROCEED

TO ALERT AND SLOW TRAFFIC
Rolling Road Block Use Guidelines

A rolling road block (also known as a “Slow Roll” or a “Rolling Slowdown”) is a means of slowing and controlling traffic to clear a section of roadway and allow a work operation which requires short duration access to an entire roadway (typically a freeway or other controlled access highway).

A rolling road block typically involves:
- A shadow vehicle in each lane
- A shoulder of 8 foot or greater width, possibly assisted by police
- Slowing and pacing upstream traffic at the reduced speed to create a downstream gap in traffic of sufficient duration to accomplish the work in the roadway.

Typically used when:
- Cable, overhead sign structure, bridge beam, traffic counter tubes, pavement monitoring devices; etc.) is being strung/placed across the highway or to change a traffic pattern in a temporary traffic control zone.
- A simpler variation has also been used for post-storm clean-up on elevated segments of freeways with close echelon plowing to pull built-up snow from median barriers to the right side of roadway.

Prior to implementing a Rolling Road Block:

- The Regional Traffic Engineer should be contacted before selecting a rolling road block for traffic control in case there may be other preferable traffic management alternatives such as detours and/or other planned events which could further impact traffic operations.

- The Regional Traffic Command Center (TMC) and the appropriate State Police troop and local police agencies must be notified at least 24 hours prior to the closure.

- The region should also consider requiring advance deployment of Portable Variable Message Signs (PVMS) warning of the event several days prior to the event to allow motorists to plan adjustments to their route or time of travel.
Planning the Rolling Road Block

When determining where/when to start the rolling road block, consider the following:
- Duration of work
- Clearance time for last uncontrolled vehicle to pass by work area
- Projected travel time of rolling road block - 15 mph = 1 mile in 4 minutes
- Number and location of entrance ramps requiring closures
- Start in a tangent section with adequate sight distance
- Periods of lightest traffic to minimize impacts
- Communication and preparation meeting

Work duration should be kept to a minimum, no more than 15 minutes. The permittee/contractor should be required to demonstrate that they will deploy the resources necessary to complete the work within the specified time period.

The selection of the speed of the roadblock should consider the work duration and the location of upstream on-ramps which need to be closed, but should generally be 15 mph or greater. 15 minute duration would require closure of at least 5 miles of mainline roadway at a 20 mph pace and 3.75 miles at a 15 mph pace plus buffer space, set-up and deceleration distance.

Any on-ramps within the required distance must be closed and traffic either detoured or adequate storage for queued traffic provided on the ramp.

The work requiring the rolling road block shall be scheduled during periods of light traffic in order to minimize impacts, typically early Saturday or Sunday mornings (between 6:00 and 8:00 AM) in daylight conditions. The work shall also be scheduled to avoid inclement weather, adverse environmental or roadway conditions which could ultimately affect visibility, vehicle handling or the time needed to accomplish the work within the highway.

A preconstruction/preparation meeting with all parties involved is required prior implementing the rolling road block. All logistics including communication issues and scheduling issues shall be resolved during this meeting. Also, contingency plans for concerns which could stop the road block or delay the operation shall be made. Cell phones or walkie-talkies, if radios are not workable, shall be used to communicate during the rolling road block implementation.

For permit work, the permittee or its contractor should provide or ensure a common communication system to all parties. On contract work, the contractor should provide a common communication system to all parties. The common communication system shall include, workers, clearance vehicle, all rolling road block drivers, traffic controllers at on-ramps and, if participating, police. Work should not begin until the Department’s representative on-site is confident that the work can be completed within the specified time and the communication system is adequate to accommodate all reasonably foreseeable scenarios.
Police participation is optional and at the discretion of the Regional Office and the State Police troop or other local police agency. In general, police participation should be unnecessary unless there are site specific enforcement concerns.

**Police Cars - If Deployed**

- A police car should never be used to close an open lane of traffic.

- A police car may be positioned in front (downstream) of a TMA equipped shadow vehicle and/or on a closed on-ramp. Flashing lights should be placed immediately downstream of the shadow vehicles forming the rolling road block to discourage drivers from passing the road block.

- Position the police car where it is visible to traffic through the lateral gap between the shadow vehicles to enhance the visibility of the police car. However, gaps between the shadow vehicles should not be wide enough to encourage vehicles to pass between them.

- A police car may also be positioned, with lights flashing, on an on-ramp which will be closed to discourage ramp traffic from passing the flagger. If there are multiple on-ramps within the road block limits, deploying the police car at the downstream ramp may better enable it to stop a vehicle which has breached the gap between the work area and the road-block.

The drawings show the closure of a two lane roadway, however, three and four lane roadways can be closed by either adding additional shadow vehicles or by closing lanes using a typical lane closure set-up, which will reduce the number of shadow vehicles needed. At some sites, it may be preferable to use typical lane closures to reduce the traffic flow to one lane before deploying the rolling road block.
Advance Warning

- All traffic control devices used to warn or guide traffic shall comply with the National Manual on Uniform Traffic Control Devices (MUTCD).

- Advance warning signs or portable VMS (SLOW TRAFFIC AHEAD/BE PREPARED TO STOP) should be on the right side of the roadway one mile upstream of initial position of road block vehicles. Permanent VMS controlled by the TMC can also be used, if appropriate.

- An additional portable VMS either on a trailer hitched to a truck or mounted on the truck should be located on the right shoulder 1500 feet upstream of the initial roadblock location and should move as necessary to remain approximately 1500 feet upstream of the queue.

- A police car (if available) on the shoulder near the upstream end of the queue can enhance queue warning.

- Advance warning signs or VMS on both sides of the road is desirable. If there is not enough room on the shoulder, a lane closure to accommodate the VMS may be appropriate, especially for three lane, or wider, roadways. If a VMS is used on the left side of the roadway, it should be placed ½ mile upstream of the initial road block position and not directly across the roadway from the first VMS. Offsetting the VMS boards from each other will avoid confusion which can result from two VMS boards directly across the roadway from each other displaying different portions of their message at any given instant.

- All required VMS and advance warning signs shall be in place prior to implementing the rolling road block.

- Advance warning signs shall be placed on affected on-ramps and the crossroad to warn approaching vehicles of stopped traffic on the ramp or of a ramp closure. The signing will depend on site specific conditions including the expected length of queued traffic and the length of the ramp. If the queued traffic on the ramp will affect traffic operations on the crossroad, signing will be needed on the crossroad. A W20-7 flagger sign and a W3-4 BE PREPARED TO STOP sign would be the minimum advance warning needed on the ramp.
Implementation

The rolling road block should be staged from the right shoulder if no on-ramp or rest area is available. The upstream shadow vehicle should close the shoulder (if shoulder is 8 ft. or wider) or the right lane (if the shoulder is less than eight feet wide). The second downstream shadow vehicle should then close the next lane to the left and so on.

**Step 1:** The rolling road block shall form near the designated starting point and any on-ramps shall be closed simultaneously or very shortly after, depending on how far downstream the on-ramp is (see Step 2).

**Step 2:** On-ramp traffic shall be stopped and held by a properly trained traffic controller (flagger).

**Step 3:** A clearance vehicle initially positioned immediately downstream of the rolling road block shall follow the last vehicle traveling in advance of rolling road block to ensure that there are no moving or parked cars and no open on-ramps or other access points, and to notify the work crew that road is closed and free of traffic.

**Step 4:** Work in the roadway begins. The clearance vehicle should stop and hold its position immediately upstream of the work site until the work is done to provide a visual cue to the approaching roadblock whether the work is done and the roadway cleared.

The road block shall proceed downstream at the pre-determined speed and be in constant communication with the work site. The speed of the roadblock can then be adjusted to accommodate the pace of the work. A truck either with a mounted VMS or towing a trailer mounted VMS positioned on the right shoulder should maintain an approximately 1500 foot following distance behind (upstream of) the end of the queue. As the road block passes an on-ramp, ramp traffic can be released when the mainline queue dissipates or moves downstream and mainline traffic flow can safely accommodate the merge from the on-ramp. The procedure and timing of the release of vehicles held on the ramps should be determined at the preconstruction/preparation meeting.

**Step 5:** Once the need for closure has ended, the work crew shall notify the rolling road block and the clearance vehicle should pass the site. The blocking vehicles should gain speed and pull over to right side of roadway starting from the left lane. Police, if used, should continue with flow of traffic to ensure controlled acceleration of released vehicles. Inactivate or modify PVMS as appropriate.

5/30/2014
**NYSDOT**
**WORK ZONE TRAFFIC CONTROL**

**ROLLING ROAD CLOSURE ON FREeways OR EXPRESSways**

**FEBRUARY 2012**

1. **BLOCK ROAD & START ROLL**

2. **CLOSE RAMP BEFORE CLEARANCE VEHICLE PASSES & HOLD UNTIL MAIN LINE QUEUE DISSIPATES**

3. **CLEARANCE VEHICLE MAKES SURE RAMP IS CLOSED & ROADWAY IS CLEAR**

4. **WORK BEGINS ONCE CLEARANCE VEHICLE ARRIVES, STOPS, & NOTIFIES CREW**

5. **WORKERS NOTIFY BLOCKERS AND CLEARANCE VEHICLE WHEN WORK IS COMPLETE. CLEARANCE VEHICLE PASSES WORK AREA, BLOCKERS RELEASE THE QUEUE.**

**PORTABLE VMS FOLLOWS 1500FT UPSTREAM OF TRAFFIC QUEUE**