

**Maryland
State Highway Administration
Basic Temporary Traffic Control
(BTTC)
Training Course**



July 2009

About this Course

The purpose of this course is to provide minimum training required to safely work on roadways. It includes the following sections:

- Section 1:
 - ◆ Background Information
- Section 2:
 - ◆ Temporary Traffic Control Devices
- Section 3:
 - ◆ Temporary Traffic Control - Design and Layout
- Section 4:
 - ◆ Typical Field Layout - Installation and Removal

SECTION 1

Background Information



Background Information

- Need for Work Zone Traffic Control
- Importance of Work Zone Traffic Control
- Worker's Responsibilities
- Worker Safety
- Parts of Work Zone Traffic Control Zone
- Work Zone Crash Information
- Reference Books
- Available Training

Need for Work Zone Traffic Control

- Construction
 - ◆ Roadway reconstruction, resurfacing and widening
 - ◆ Bridge deck replacement
 - ◆ Replacement and repair of public utilities
- Major Maintenance
 - ◆ Pavement and pavement joint repairs



Need for Work Zone Traffic Control

- Minor Maintenance
 - ◆ Shoulder repair
 - ◆ Guardrail repair
 - ◆ Mowing operations
 - ◆ Pavement striping
- Utility Operations
- Emergency Operations



Importance of Work Zone Traffic Control

- Make traffic safety a high priority
- Separate and protect
 - ◆ work force
 - ◆ motorists
 - ◆ pedestrians/bicyclists
- Warn motorists and pedestrians of hazards
(Note: Drivers have about 5 - 7 seconds to detect and recognize a hazard and make correct driving response)
- Provide motorists and pedestrians with proper travel path

Importance of Work Zone Traffic Control

- Achieve smooth flow of traffic
- Safety and Mobility of motorist.
- Maintain good public relations
- Good work zone traffic control is required.

Worker's Responsibilities

- Know that a SHA Approved traffic control plan is needed for each operation
- Know what traffic control devices are needed for your work
- Make sure that all traffic control devices meet standards
- Make sure these devices are clean
- Install these devices as shown on the SHA Approved traffic control plan/standard

Worker Safety

- Workers should be properly trained
- Wear SHA approved High Visibility Apparel, so that motorists can see you
- Be careful when working in shaded areas or on bright sunny days (motorists' eyes need time to adjust when traveling from lighted areas to shaded areas. Also, motorists sometimes are temporarily blinded by sunlight.)
- Know where traffic is at all times and stay as far away from moving traffic as possible

Worker Safety

- If possible, have someone watch traffic for you, if you cannot watch traffic yourself
- Plan and have an escape route when working close to traffic
- Pull or park work vehicle as far off the roadway as possible before exiting work vehicle and be careful of other vehicles that may cross over the edge line
- Periodically check traffic control devices and flow of traffic

Work Zone Crash Information

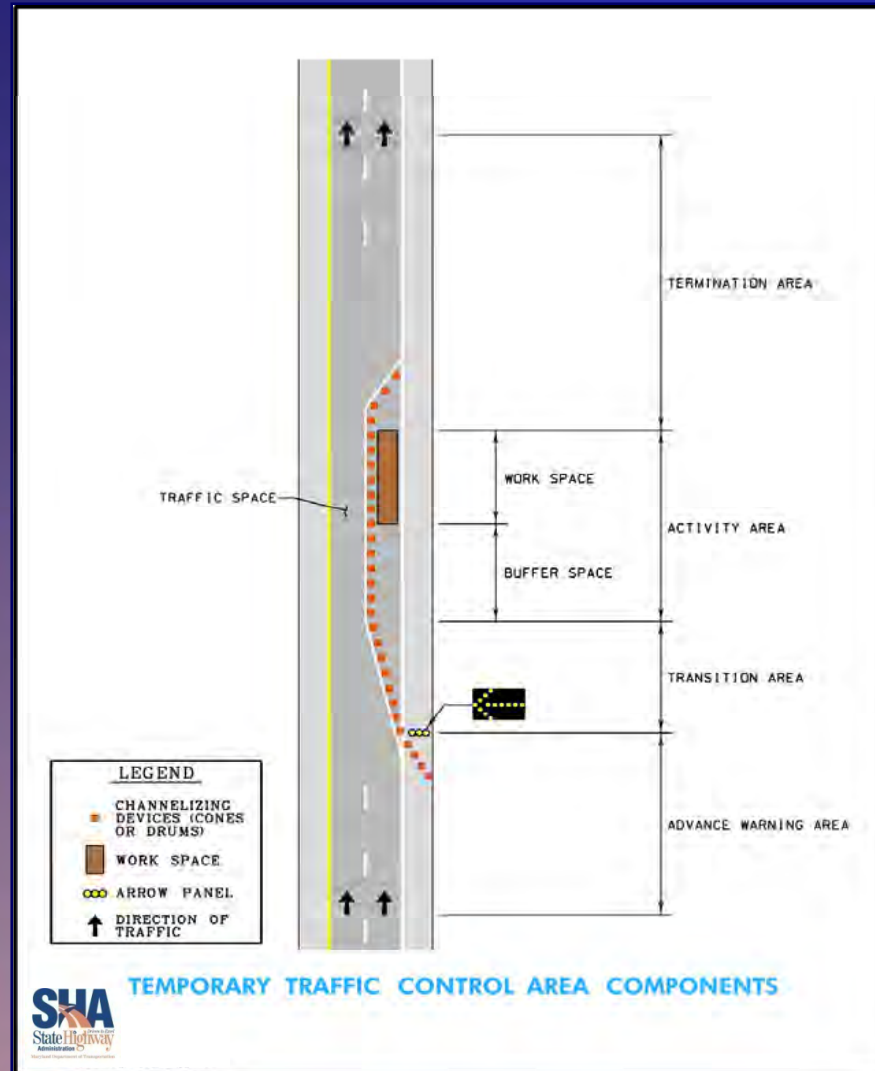
The goal of work zone traffic control is to guide traffic safely and smoothly through work zone

- Causes of work zone crashes:

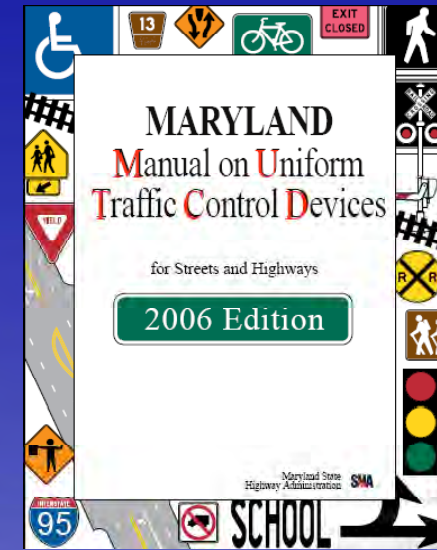
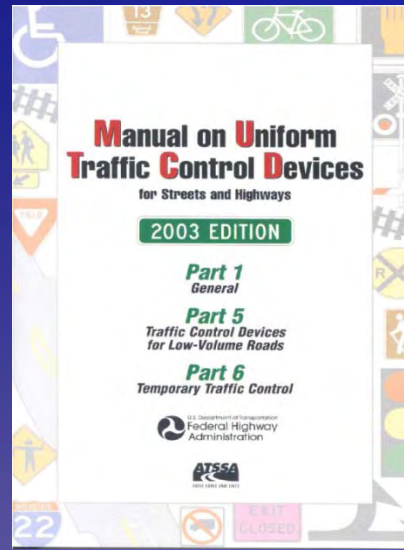
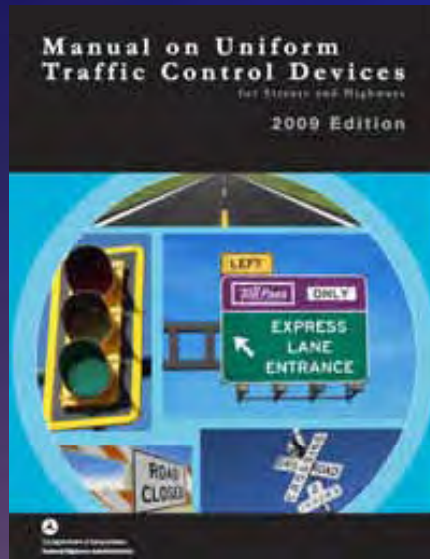
- Unexpected or confusing work zone sites
- Obstructions
- Diverted attention
- Workers exposed to traffic
- Improper Temporary Traffic Control Setup (especially short lane closure taper)



Parts of Work Zone Traffic Control Zone



Applicable Publications



SPECIAL PROVISIONS



SPECIFICATIONS



SHA Approved Available Training

- **Temporary Traffic Control Traffic Manager's Course**
 - ◆ Contact Information: Ms. Laurie Baquol (Registration)
 - Maryland Transportation Builders and Materials Association
 - <http://www.mtbma.org>
 - 410 760-9505
- **ATSSA's Flagger Training Course**
 - ◆ Conducted by SHA for State and Local Municipalities Only
 - ◆ Conducted by Approved ATSSA Flagger Instructors
 - <http://www.atssa.com/cs/flagger>

SECTION 2: Traffic Control Devices



Traffic Control Device (TCD) Requirements

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Command respect of road users
- Give adequate time for proper response



Work Zone Traffic Control Devices

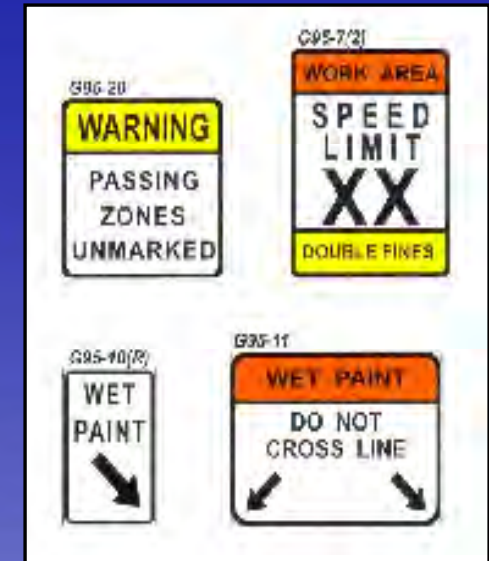
- Signs
- Channelizing Devices
- Concrete Barriers
- Crash Cushion/ Other End Treatment
- Pavement Markings
- Arrow Panels
- Portable Changeable Message Sign (PCMS)
- Warning Lights
- Traffic Signals
- Truck Mounted Attenuator (TMA)
 - ◆ Protection Vehicle

Types of Signs

Regulatory Signs



Special Signs



Warning Signs



- Warning Signs are Diamond shape orange signs
- Standard size of Warning Signs is 48" x 48"

Sign Placement

Signs shall not be hidden by trees, poles, construction equipment, other signs, etc.



Acceptable Sign Mounting

Wood Support Sign Mounting



Portable Sign Mounting



Tubular Steel post are acceptable for mounting signs.

Wooden Skid Mounted supports are acceptable for mounting signs.

Channelizing Devices

Tall Weighted Cones

Drums



- 36" high
- 18" wide minimum reflective surface on all sides
- 6" reflective stripes
- Manufactured of low density polyethylene (LDPE)



- 42" minimum height
- 6" reflective stripes

Cones

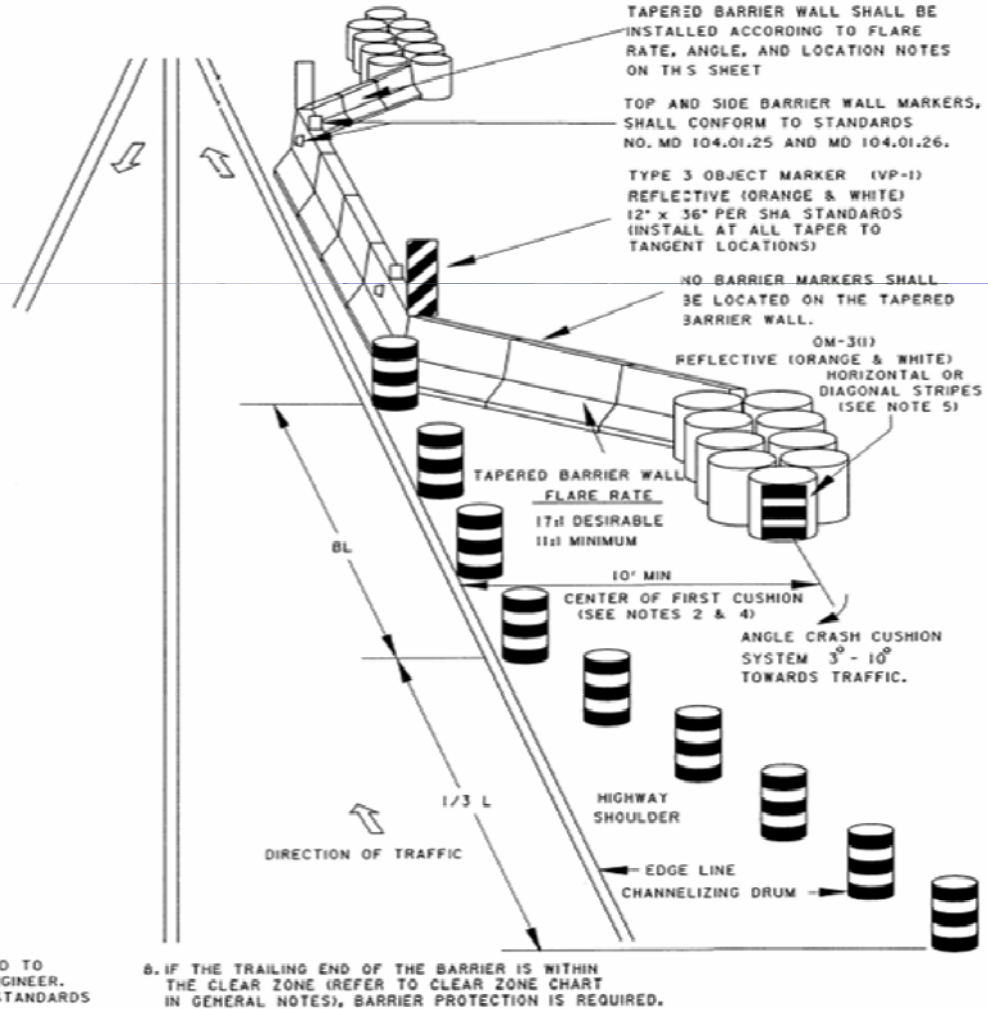


- 28" minimum height
- **10" minimum inside diameter** at the base
- 6" & 4" reflective stripes

Concrete Barrier - Advance Channelization and Protection

NOTES:

1. TEMPORARY EDGE LINE STRIPING-
 - TEMPORARY EDGE LINE STRIPING IS OPTIONAL ALONG THE ENTIRE LENGTH OF TANGENT BARRIER WALL UNLESS OTHERWISE SPECIFIED.
 - THE EDGE LINE SHALL BE REQUIRED WHERE BARRIER WOULD NOT BE TANGENT TO, OR WOULD BE TANGENT TO, BUT NOT WITHIN 2' OF PROJECTED EDGE LINE.
 - TEMPORARY EDGE LINE STRIPING SHALL BE REQUIRED ALONG THE TANGENT BARRIER WALL FOR A DISTANCE OF 100' PAST THE BEGINNING OF THE TANGENT SECTIONS.
 - THE EDGE LINE SHOULD BE PLACED 8" - 12" FROM AND ALONG THE BARRIER, WHEN POSSIBLE.
2. WHERE SPACE IS LIMITED A TELESCOPING ATTENUATOR MAY BE INSTALLED AS APPROVED BY THE ENGINEER.
3. THE SLOPED END BARRIER TRANSITION IS NOT PERMITTED ON ANY ROADWAY WHERE THE TRAVEL SPEED IS GREATER THAN 25 MPH.
4. UNLESS CONDITIONS DETERMINE OTHERWISE, AS DETERMINED BY THE ENGINEER
5. REFLECTORIZAION IS REQUIRED ON INITIAL CRASH CUSHION. USE OM-3(I) WITH HORIZONTAL STRIPES IF CUSHION IS GREATER THAN OR EQUAL TO 10 FEET FROM THE EDGE LINE AND OM-3(II) WITH DIAGONAL STRIPES IF LESS THAN 10 FEET.
6. ON TWO-LANE, TWO-WAY ROADWAYS, THE TWO-WAY TRAFFIC TAPER SHALL BE A MINIMUM OF 100'.
7. TAPERED BARRIER WALL MAY BE CONNECTED TO EXISTING W BEAM AS DIRECTED BY THE ENGINEER. REFER TO CATEGORY 6 OF THE BOOK OF STANDARDS FOR RELEVANT STANDARD DETAIL(S).



TEMPORARY TRAFFIC CONTROL TYPICAL APPLICATION

8. IF THE TRAILING END OF THE BARRIER IS WITHIN THE CLEAR ZONE (REFER TO CLEAR ZONE CHART IN GENERAL NOTES), BARRIER PROTECTION IS REQUIRED.

Temporary Pavement Markings

- Temporary Pavement Markings are placed to serve an area of work activity for a period of work duration, after which they are to be removed
- As a minimum at the close of each day, the roadway shall have all center and lane lines in place
- During the work day while work activity is underway, center and lane lines shall be in place or the lines shall be represented by channelizing devices, signs, or other traffic control devices to clearly define and mark all vehicle paths



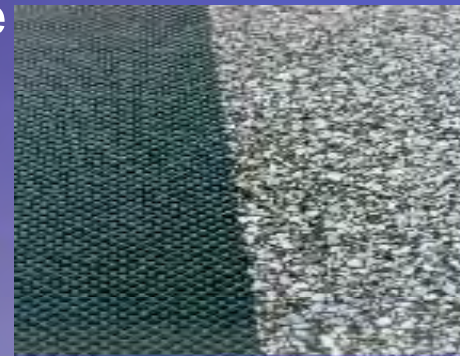
When Not in Use ...

All non-applicable devices shall be removed or completely covered or turned from traffic



Signs shall be completely covered

Markings shall only be removed by grinding, hydroblasting or covered with black out tape



Portable Changeable Message Sign shall be blanked and turned away from traffic



Arrow Panel

- Do not close lanes without the use of an Arrow panel in the Arrow Mode for shoulder work.
- On two-lane, two-way roadways, the arrow panel is ONLY allowed in the CAUTION MODE (four corner lights display)
- Do not use Arrow Panel during flagging operations



Portable Changeable Message Signs

- All sign messages shall be visible for ½ mile and legible for a distance of 900 ft from any point along the approach traveled roadway during 24 hour operations
- The PCMS shall be capable of displaying three lines of text
- A message can have a maximum of two Displays
- PCMS can only be used to supplement temporary traffic control warning signs



DISPLAY - 1



DISPLAY - 2

Warning Lights

Work vehicles shall use warning lights in mobile operations. Some stationary work zones may also require use of warning lights.



Warning Lights

Vehicles shall, also display flashing hazard/parking lights in front and rear.

These vehicles conspicuity requirements shall be met when vehicle stops are 15 minutes maximum or less and at locations where the line of sight to vehicle work activity is adequate. Also no advance signing is typically needed for 15 minutes operations, when these vehicles conspicuity requirements are met.



Rotating/flashing Yellow Warning Lights



Vehicle Hazard Lights

Traffic Signals



- In general, all persons (contractors, maintenance, and utility) should contract the Assistant District Engineer – Traffic (ADE-T) to determine the best method for temporary traffic at a signalized intersection from the following two (2) cases:

- Case 1: The signal is turned to flashing mode during flagging operation.
- Case 2: The signal is turned off (dark mode) during flagging operation

Note : Except for police, flagging shall not occur at a signalized intersection operation in a full-color stop-and –go mode (Normal Operation).

Truck-Mounted Attenuator

- A protection vehicle with rear truck-mounted attenuator is required for all work operations on freeways, where no formal lane closure exists
- A protection vehicle is also required for highway marking operations and may be required under other traffic and work conditions in conformance with SHA policy or as directed by the Engineer.

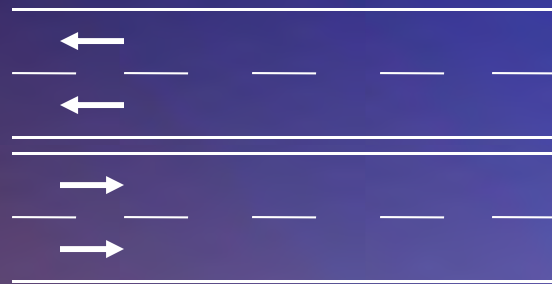


SECTION 3: Temporary Traffic Control Design and Layouts



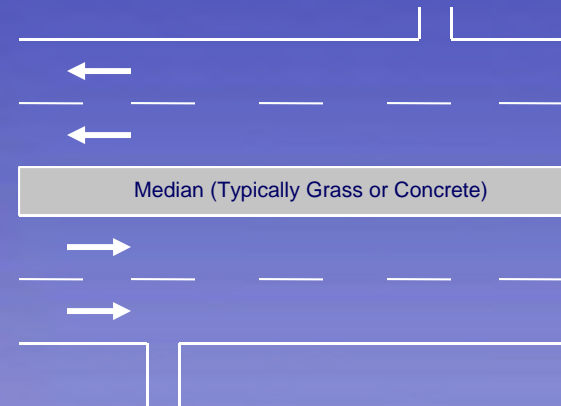
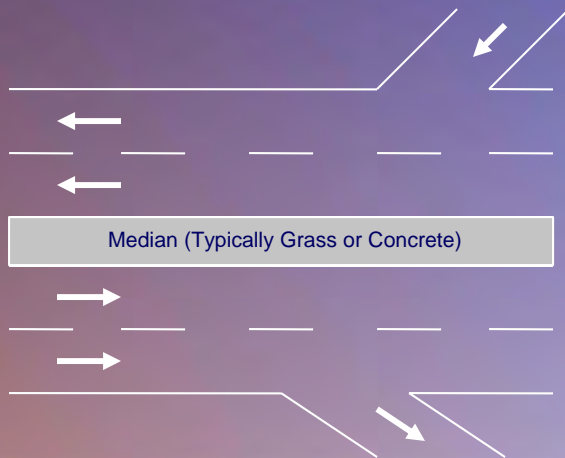
Types of Roadways

Two-Lane, Two-way



Multilane Undivided

Divided Uncontrolled



Expressway/Freeway



Location of Work

- Work location is generally on the road within a travel lane or adjacent to the road (within 15 feet of edge line)
- Work vehicles/equipment should never be hidden over hills or around curves
- Place channelizing devices in advance of hills or curves, so that motorists know what to expect

Category of Work

- Stationary – Roadway
- Stationary – Intersection
- Mobile: Less than 15 Minutes at a Location

Moving Slow: Mobile operation, traveling more than 15 mph (or more) below the Posted Speed Limit

Moving Normal: Mobile operation, traveling within 15 mph of the Posted Speed Limit

Sign Spacings

Sign spacings are typically shorter on lower speed urban roadways

- Don't install the temporary advance warning sign directly behind the work vehicle.
- Motorists need time to read and react to a sign message, therefore they need adequate advance warning
- Install signs using the correct advance warning distance

Transition Area

The transition area is provided to move traffic out of its normal travel path when a lane is closed or shifted.

Taper Length:

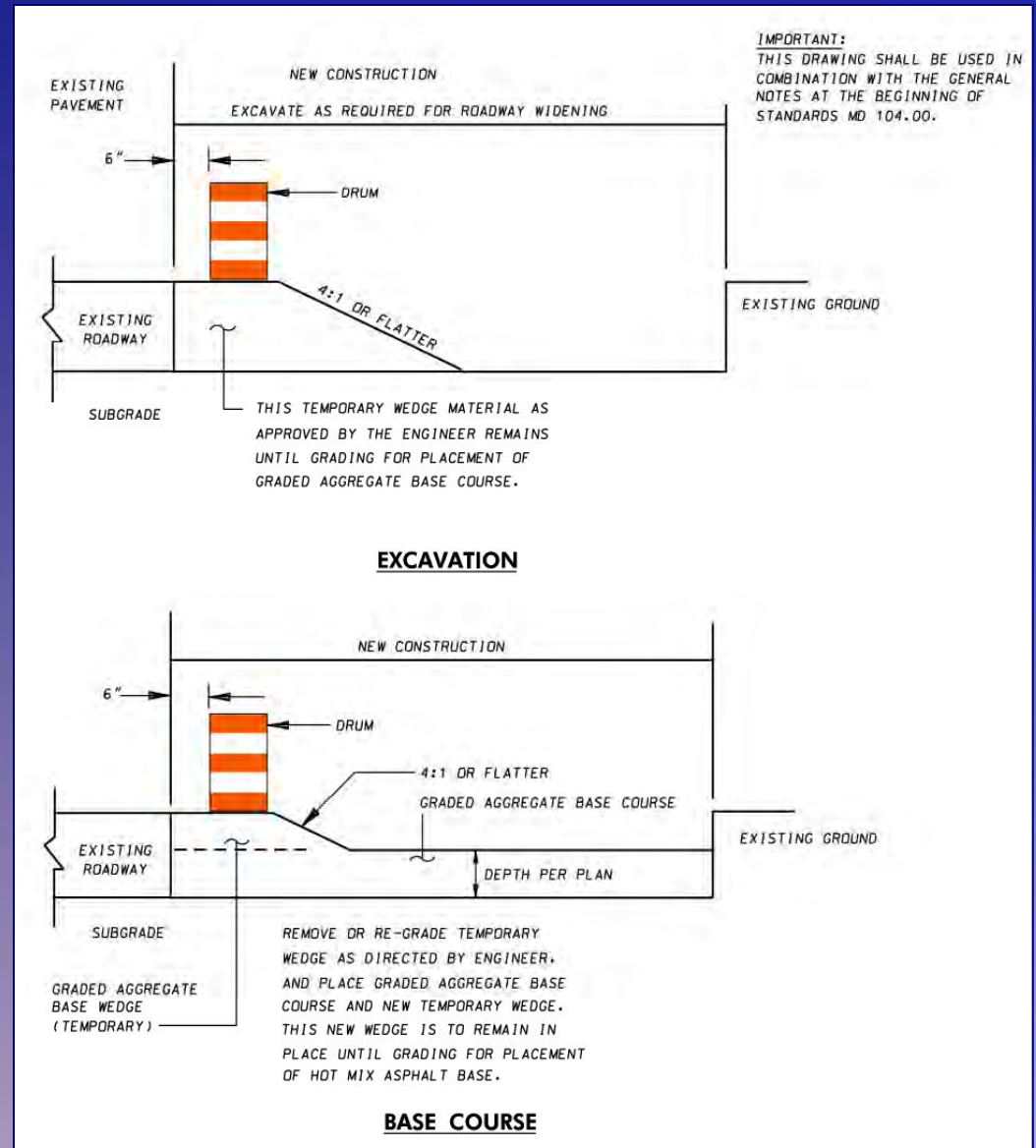
$$L = \frac{W \times S^2}{60} \text{ (For speeds equal to or less than 40 mph)}$$

$$L = W \times S \text{ (For speeds greater than 40 mph)}$$

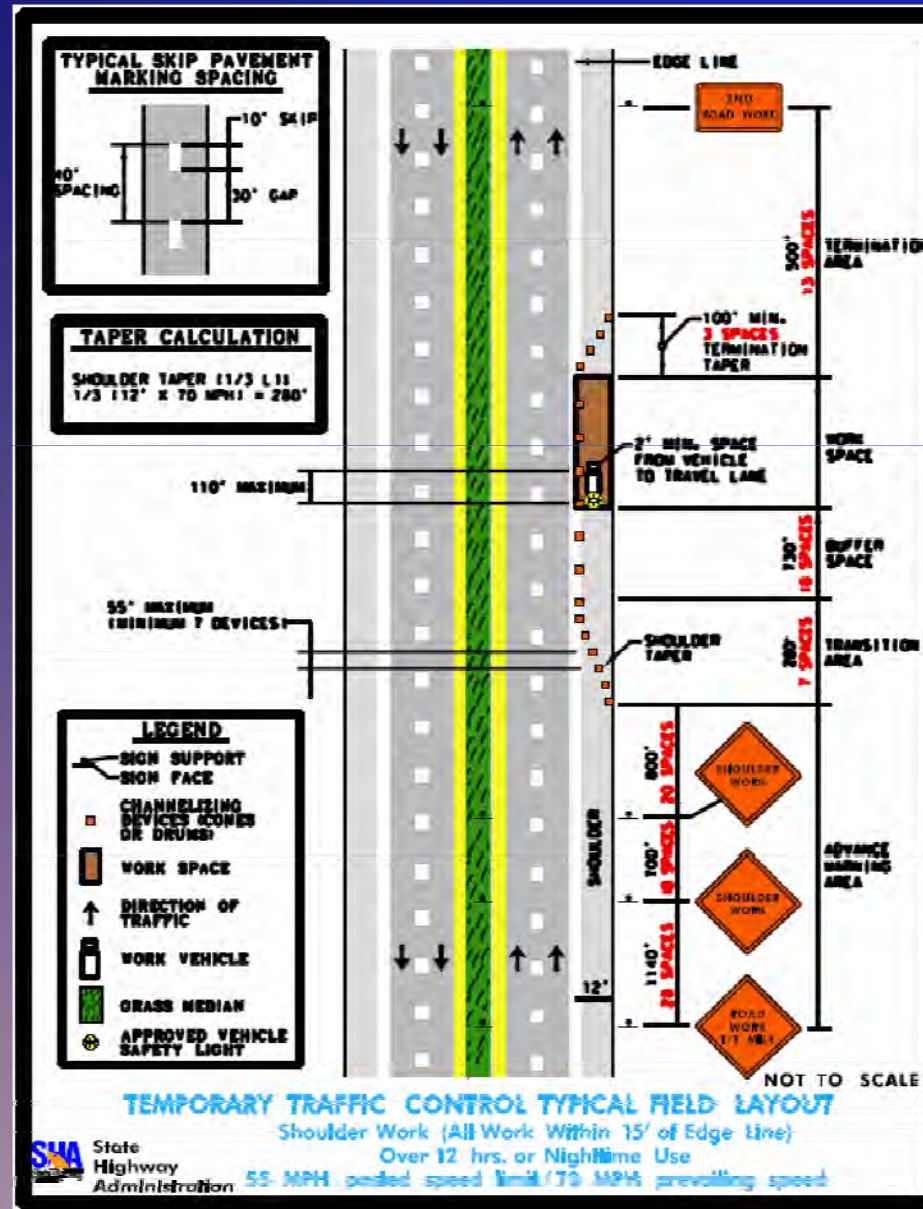
where: W = Width of the shift or lane being closed
 S = Speed of traffic
 L = Lane taper length

Staged Roadway Construction

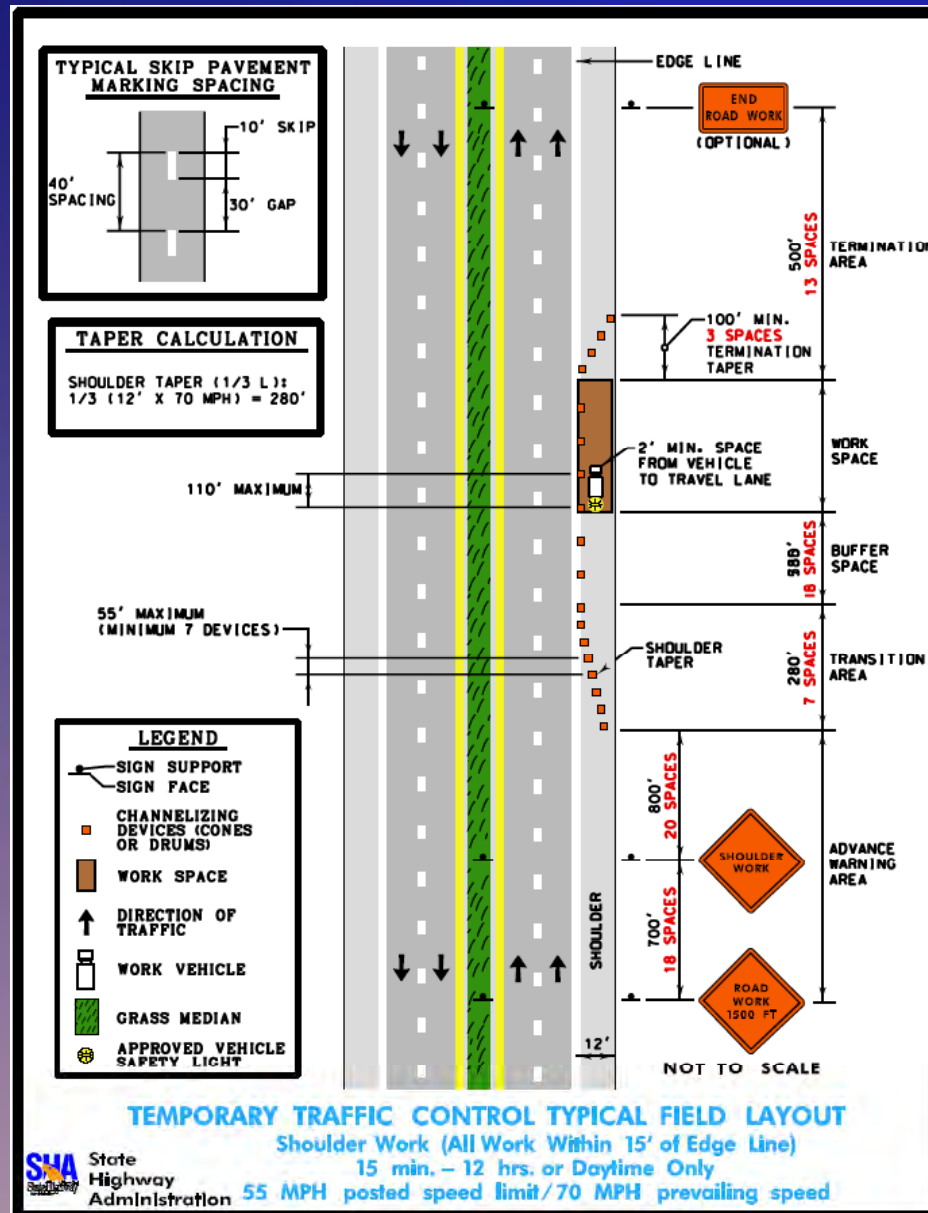
- Pavement edge drop-offs can be dangerous
- All temporary pavement edge drop-offs shall be wedged with temporary material at a grade 4:1 or flatter
- This temporary wedge material as approved by the Engineer remains until grading for placement of graded aggregate base course.



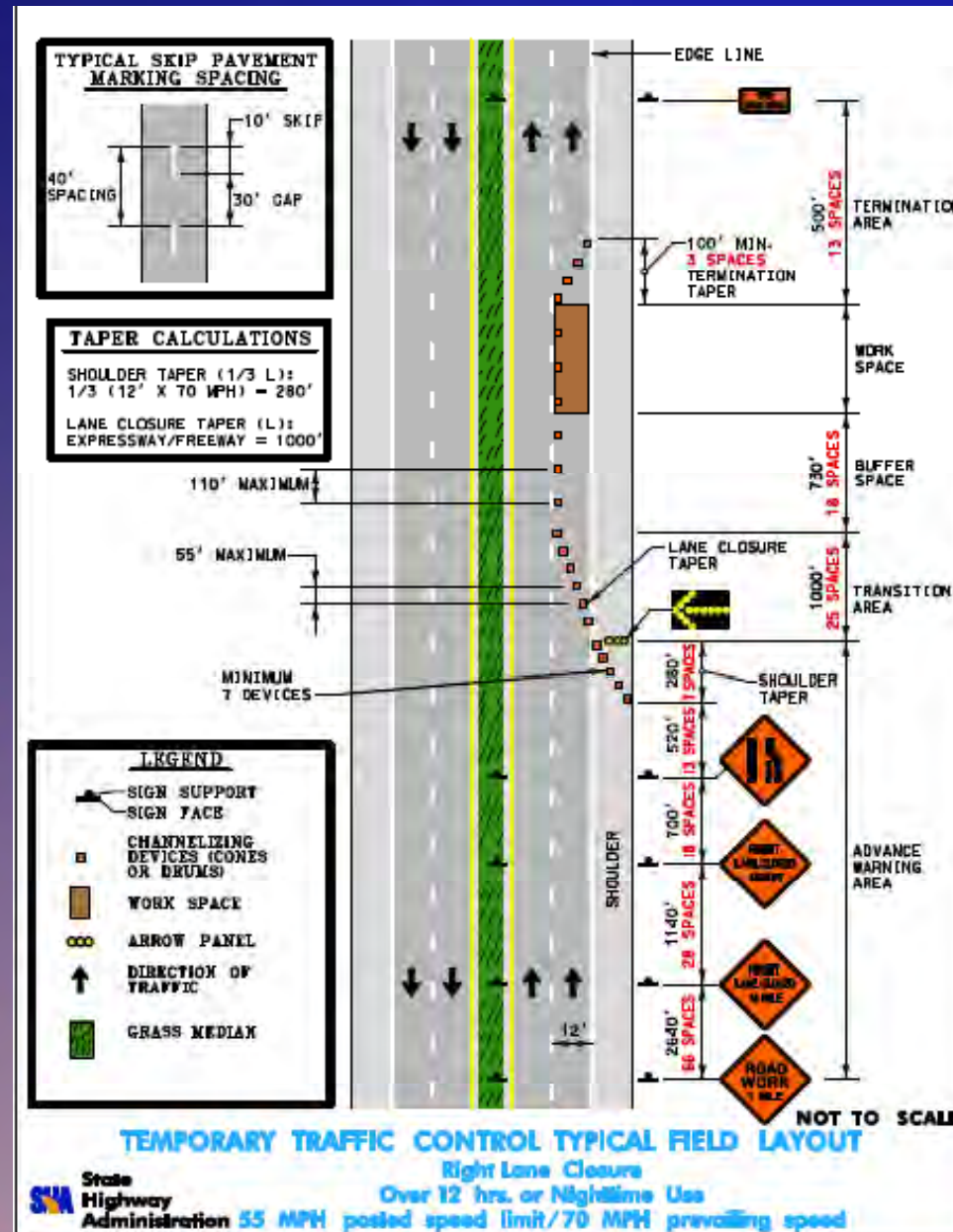
Temporary Traffic Control Typical Layout



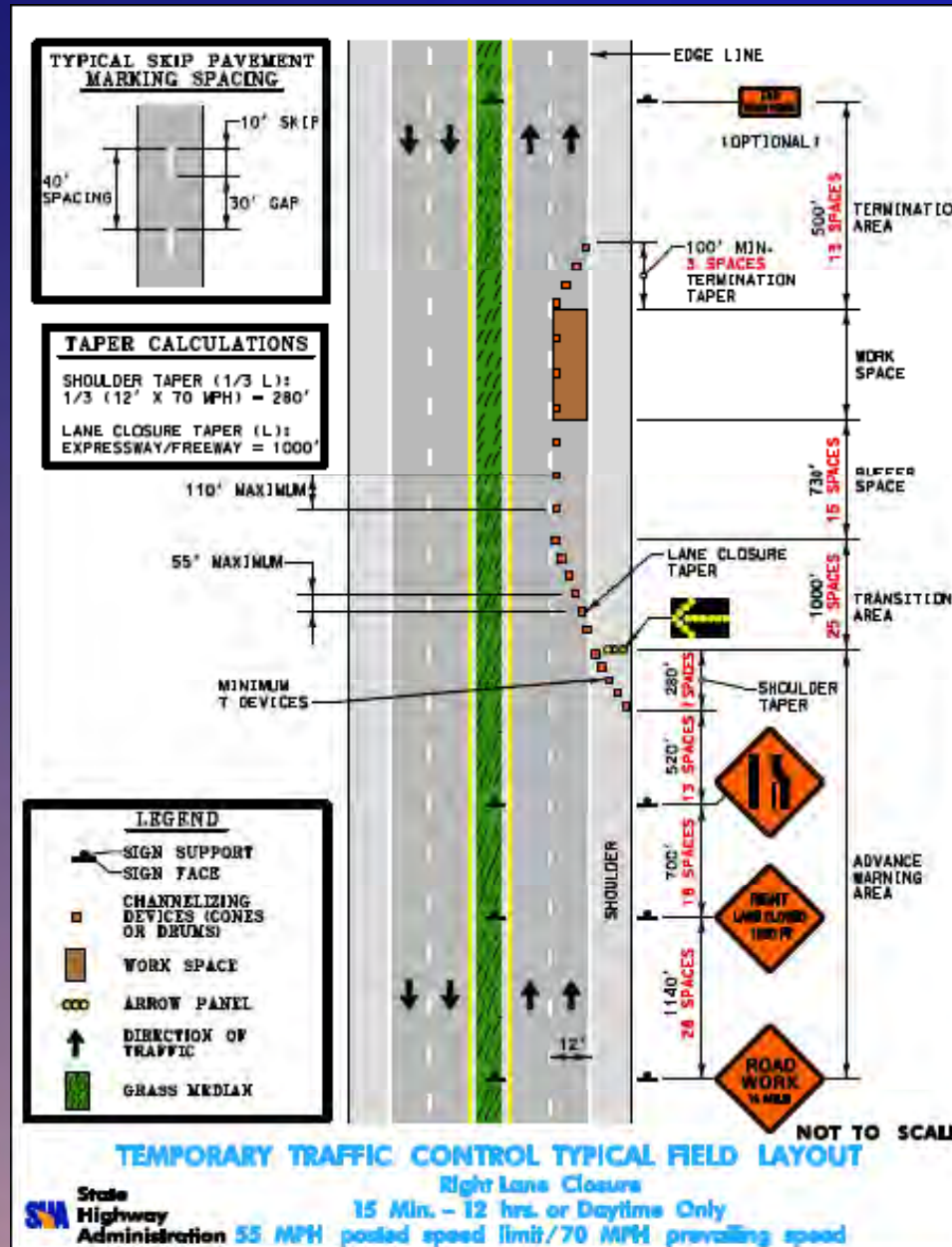
Temporary Traffic Control Typical Layout



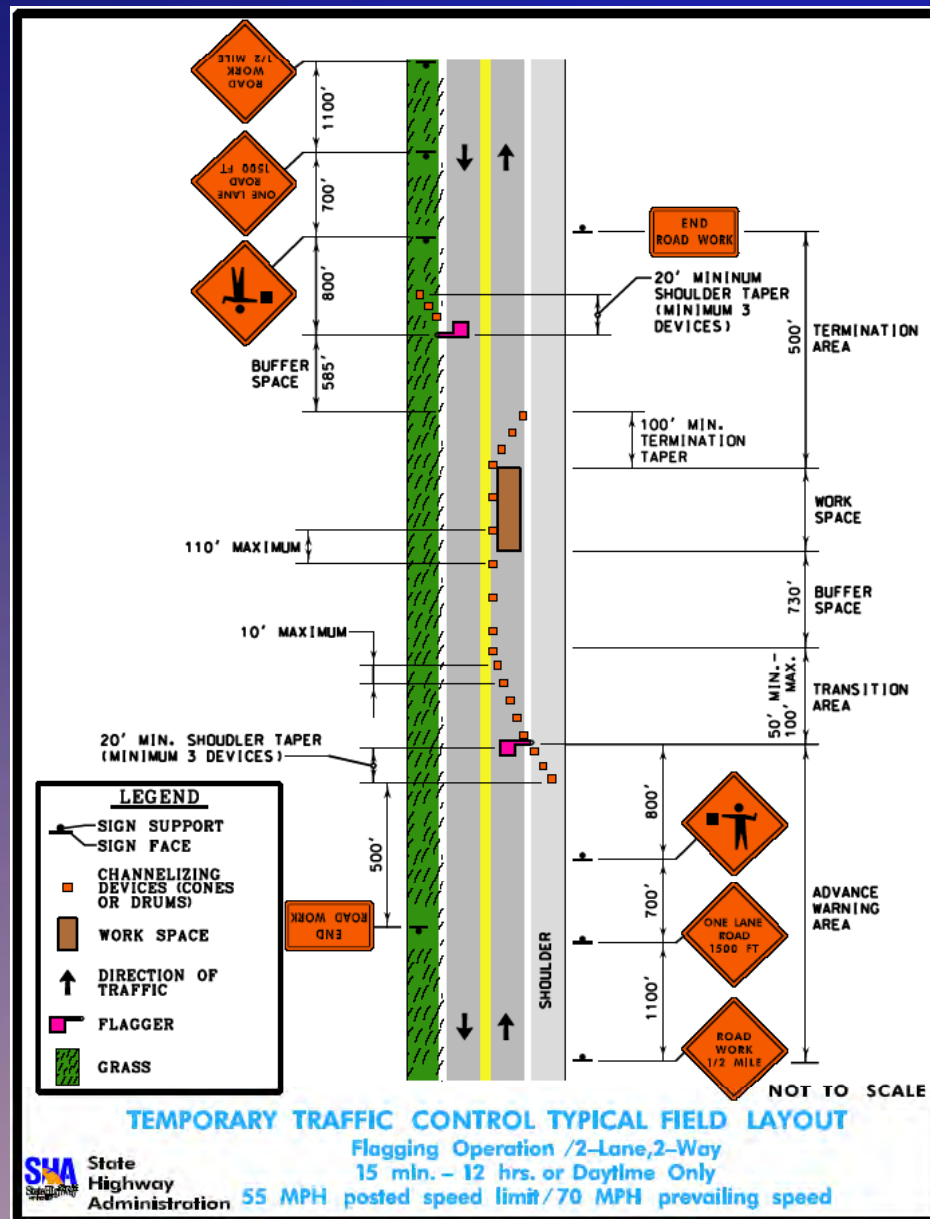
Temporary Traffic Control Typical Layout



Temporary Traffic Control Typical Layout



Temporary Traffic Control Typical Layout



Pavement Marking Operation

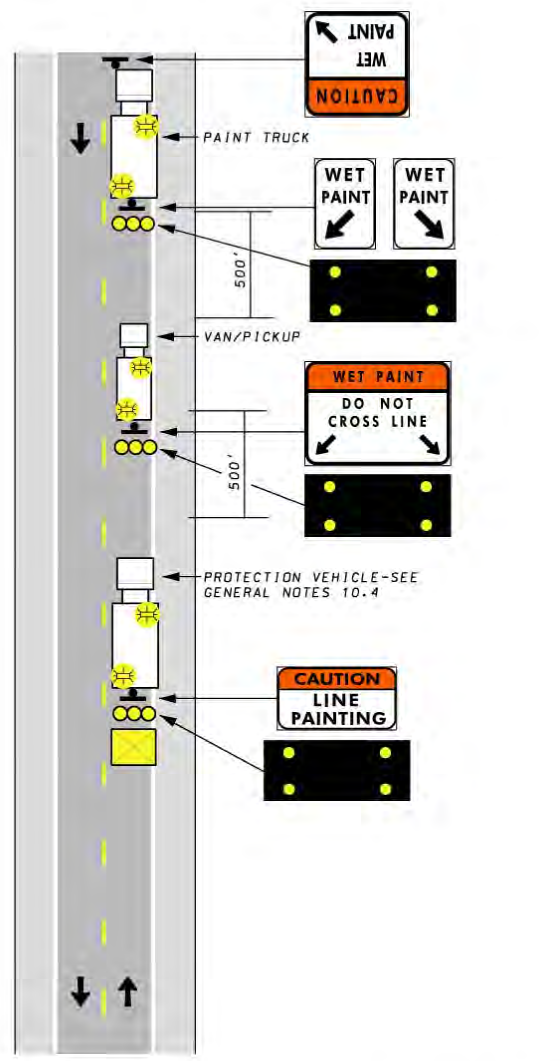
IMPORTANT:
THIS DRAWING SHALL BE USED IN COMBINATION WITH THE GENERAL NOTES AT THE BEGINNING OF STANDARDS NO. MD 104.00.

NOTES:
DISTANCES BETWEEN VEHICLES MAY BE INCREASED OR DECREASED DEPENDING ON PAINT DRYING TIME, TERRAIN, LOCAL AREA AND OTHER FACTORS.

CONES MAY BE REQUIRED TO PROTECT WET LINES AT GRADE CROSSINGS, ETC.

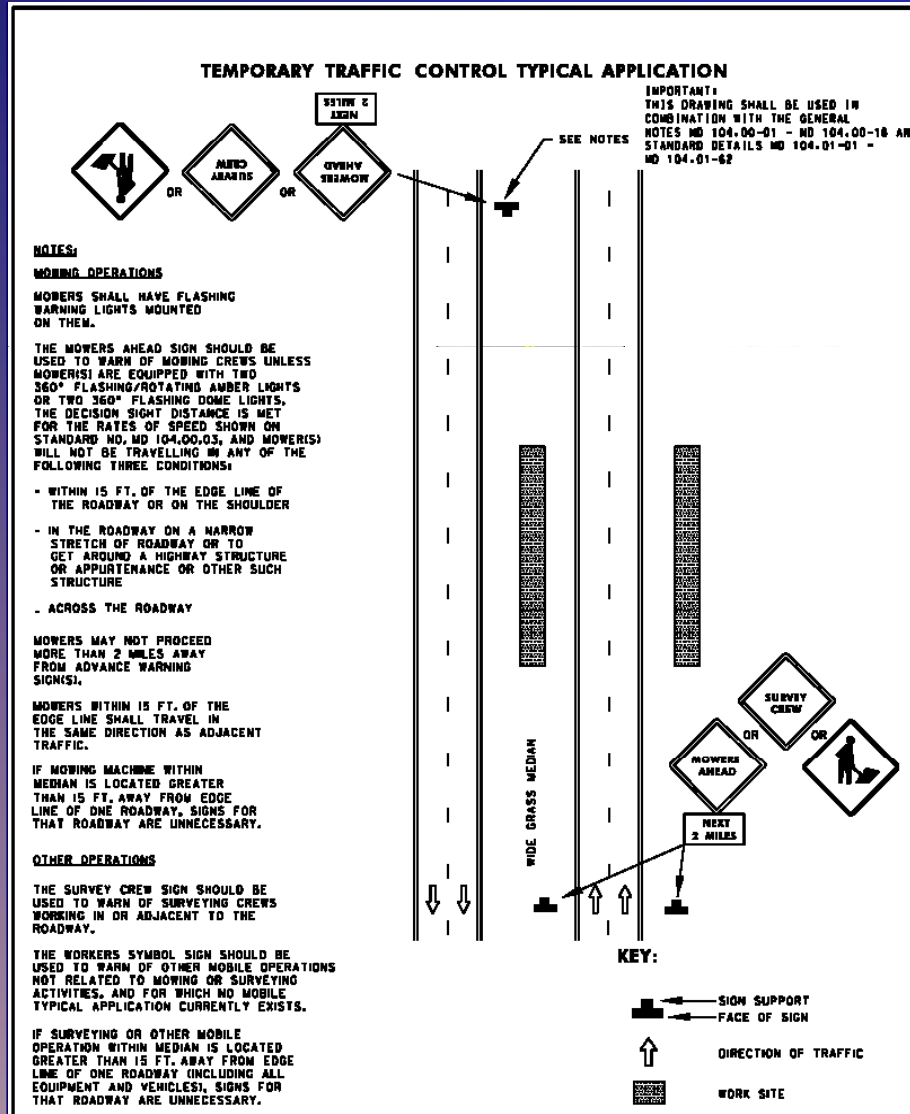
THE PAINT AND PROTECTION VEHICLES SHOULD PULL OVER PERIODICALLY TO ALLOW TRAFFIC TO PASS.

LEGEND	
	SIGN SUPPORT SIGN FACE
	ARROW PANEL (CAUTION MODE ONLY)
	DIRECTION OF TRAFFIC
	WORK VEHICLE
	APPROVED VEHICLE SAFETY LIGHT
	TRUCK MOUNTED ATTENUATOR



NOT TO SCALE

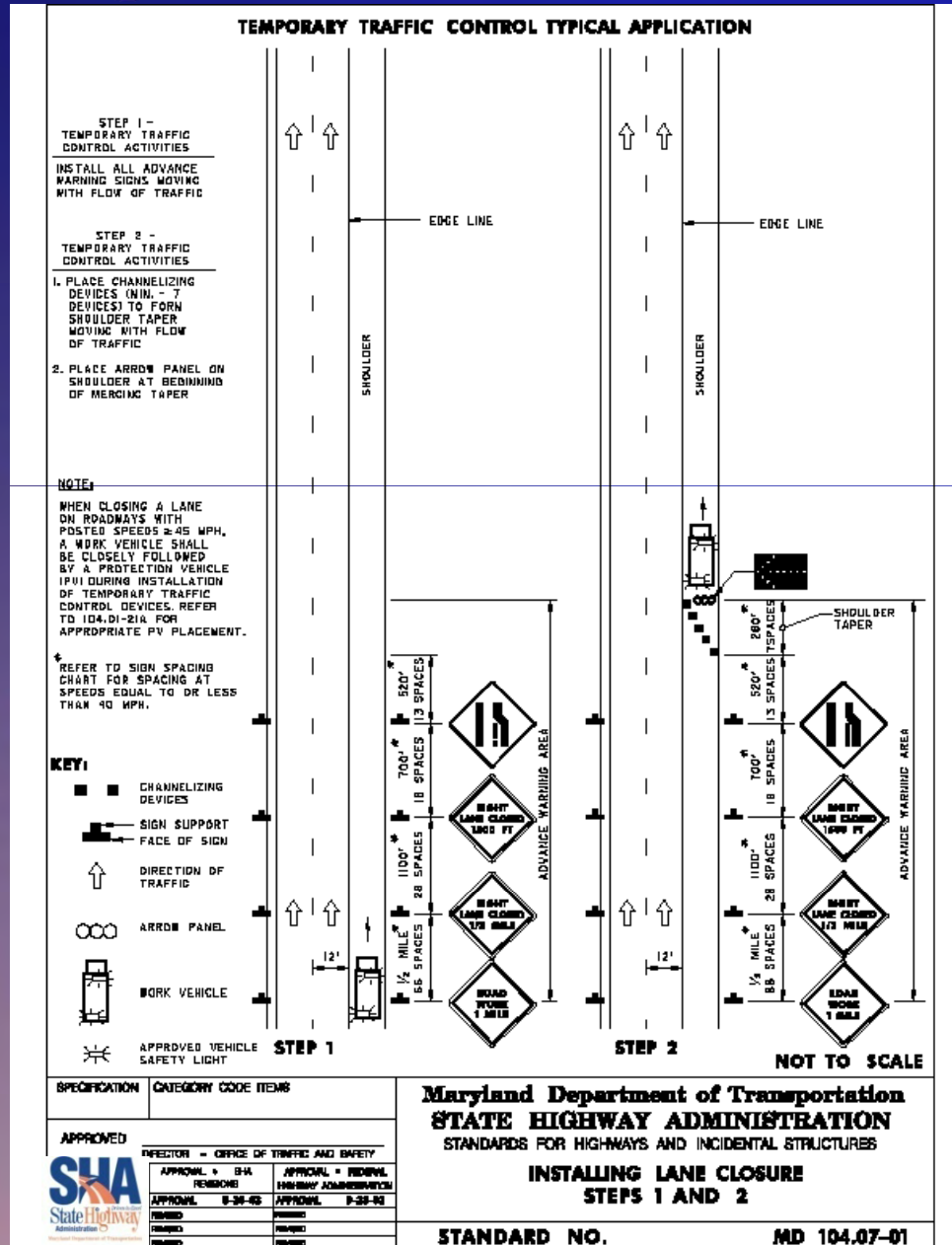
Mobile Work Operation



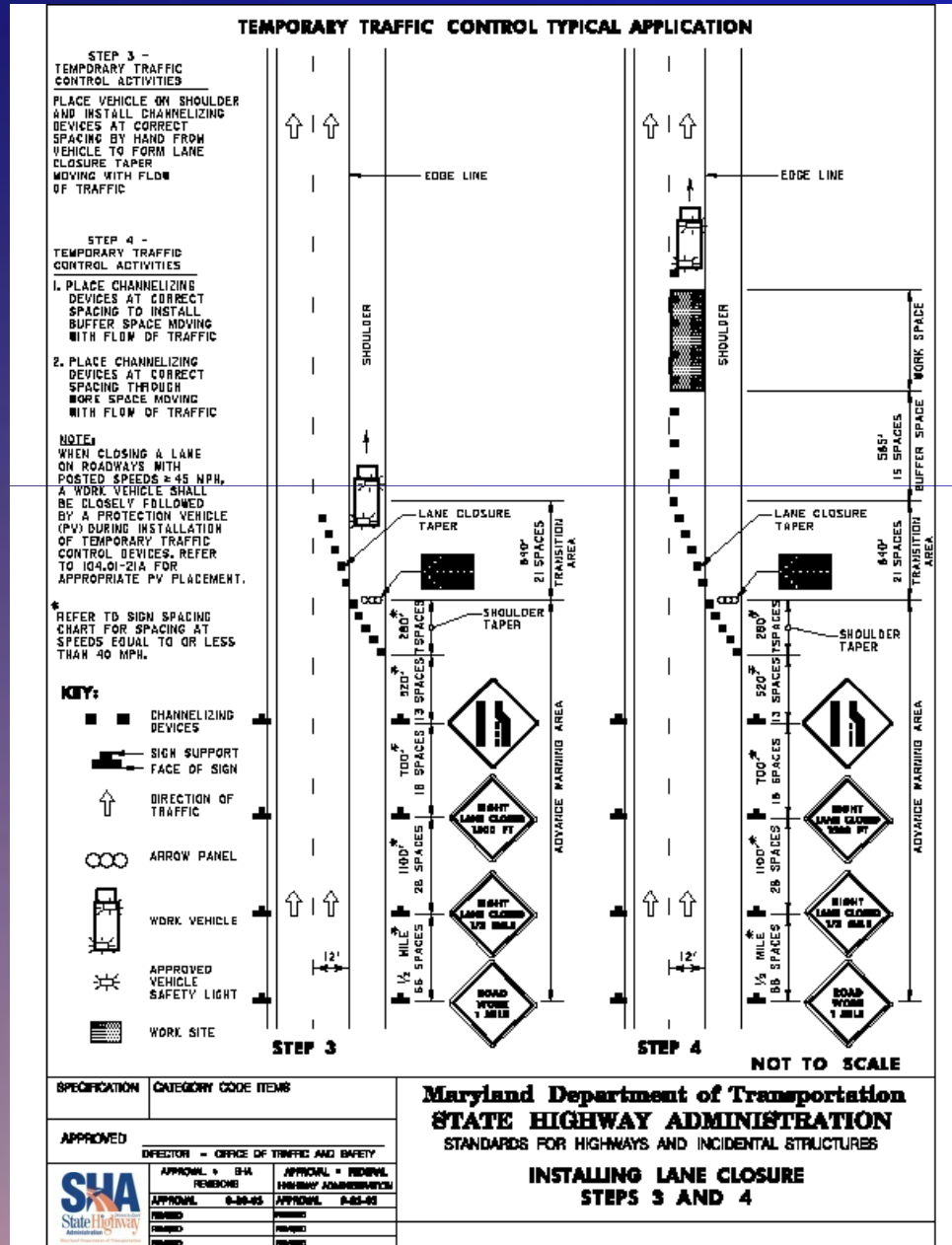
Section 4: Typical Field Layout Installation and Removal



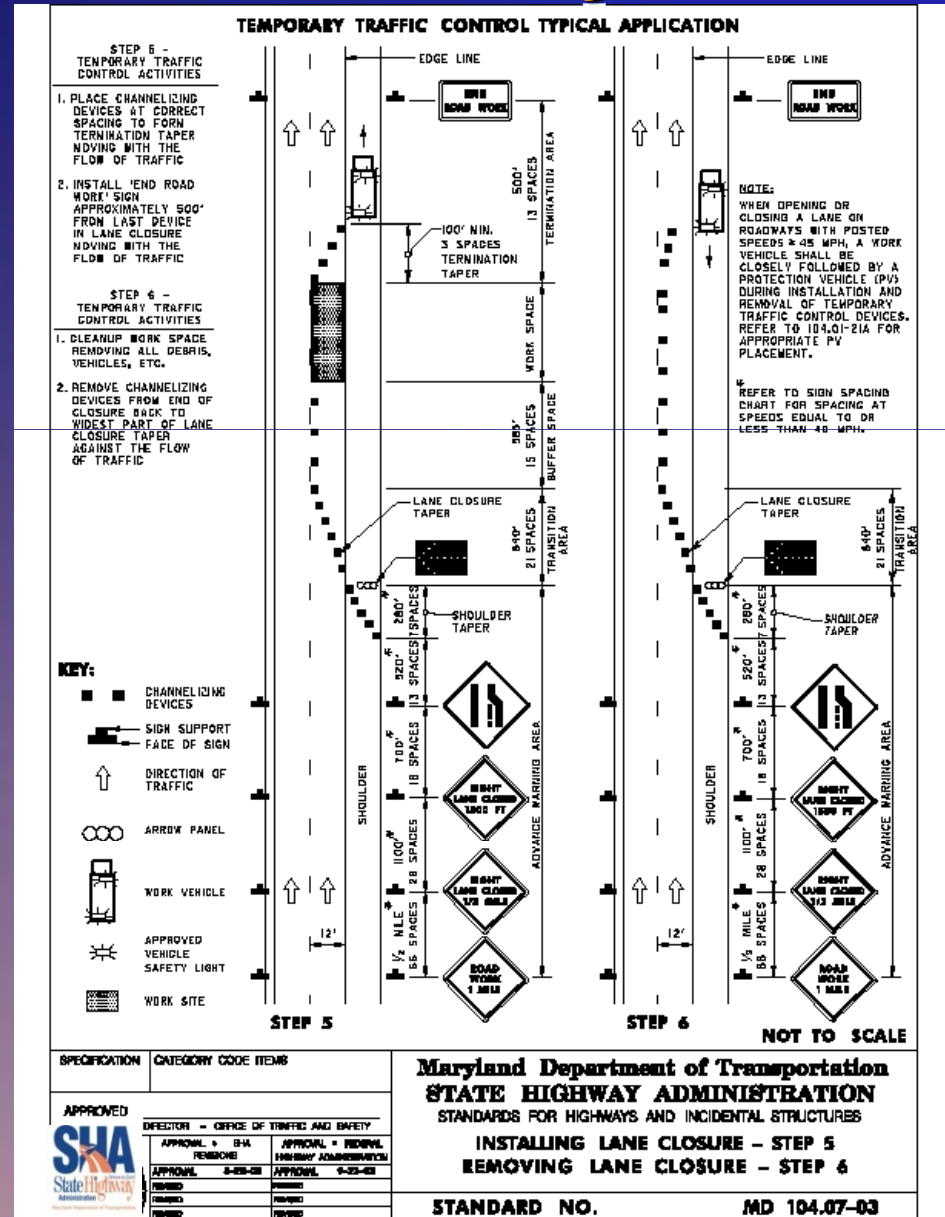
Installing Lane Closure - Field Layout



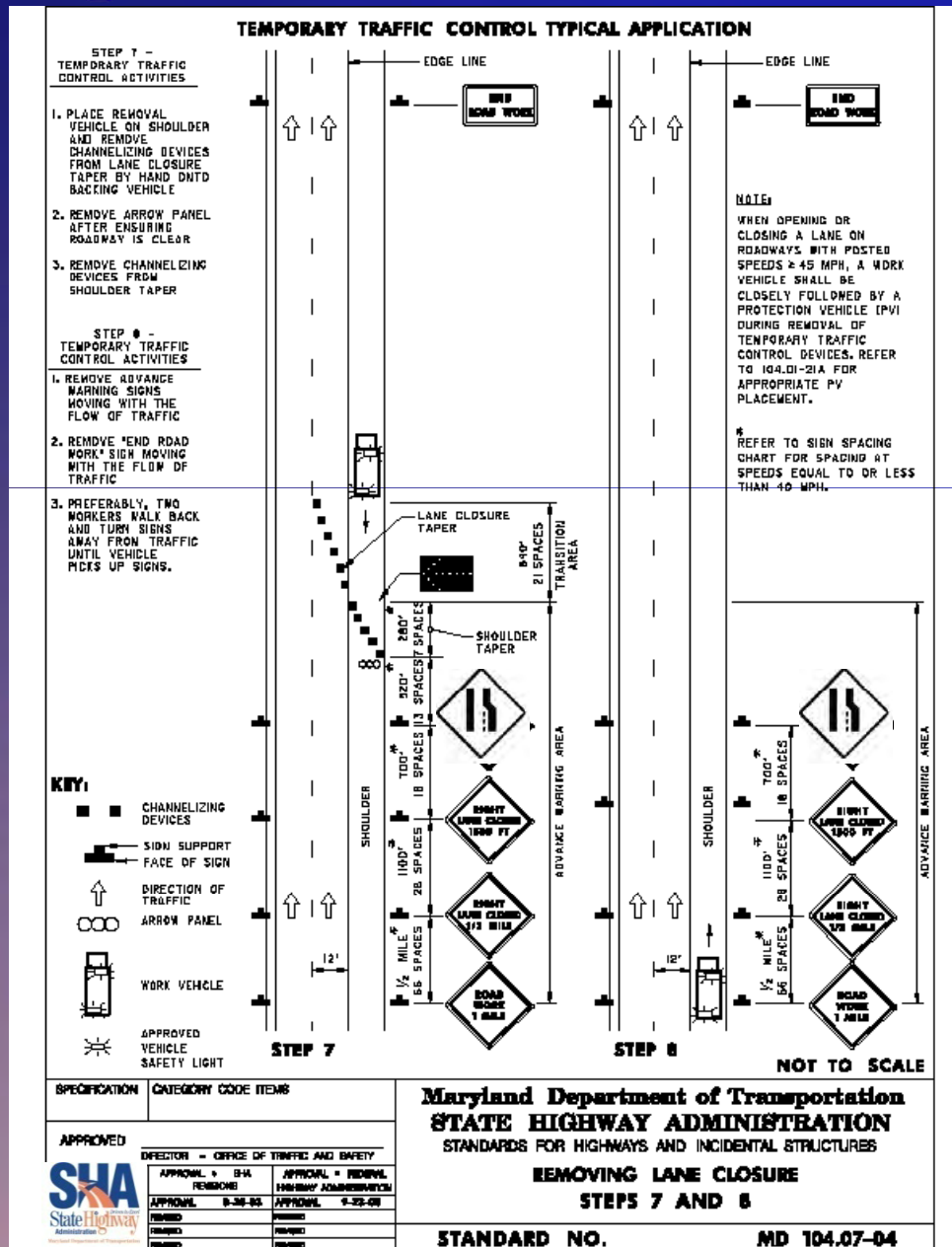
Installing Lane Closure - Field Layout



Installing/Removing Lane Closure - Field Layout



Removing Lane Closure - Field Layout



Section 5: Conclusion



Conclusion

The Basic Course provides the minimum training required to safely work on roadways.

The Work Zone Safety & Mobility Program

web site:

<http://www.marylandroads.com/Index.aspx?PageId=403>

For more information contact

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- ◆ chaskett@sha.state.md.us