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

Maryland Department of Transportation

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

   - Part 1: General
   - Part 5: Traffic Control Devices for Low-Volume Roads
   - Part 6: Temporary Traffic Control
3. Maryland Department of Transportation (MDOT)
   - Standard Specifications for Construction and Materials
4. Book of Standards
   - Tracking & Record Keeping
5. Standard Sign Book

(Special Provisions)
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
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**

- Yield
- Do Not Pass

**Special Signs**

- Warning Signs
- Speed Limit

**Warning Signs**

- 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

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

Tall Weighted Cones
- 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 6'-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. REFLECTORIZATION IS REQUIRED ON INITIAL CRASH CUSHION USE OM-310 WITH HORIZONTAL STRIPES IF CUSHION IS GREATER THAN OR EQUAL TO 10 FEET FROM THE EDGE LINE AND OM-311 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.
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
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.
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

Median (Typically Grass or Concrete)
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:**

\[ L = \frac{W \times S^2}{60} \]  
\[ L = W \times S \]  

For speeds equal to or less than 40 mph  
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 Field Layout

Stake
Highway
Administration

55 MPH posted speed limit/75 MPH prevailing speed

Shoulder Work (All Work Within 15' of Edge-line)
Over 12 hrs. or Nighttime Use

LEGEND

- Sign Support
- High Pace
- Channelizing Devices
- Work Zone
- Direction of Traffic
- Work Vehicle
- Grass Median
- Approved Vehicle Safety Light

TYPICAL SKIP PAVEMENT MARKING SPACING
10' SKIP
10' SKIP

10' SKIP

EDGE LINE

30' GAP

100' MIN. SPACE TO TERMINATION TAPER

110' MAXIMUM SPACE FROM VEHICLE TO TRAVEL LANE

55' MAXIMUM

TEMPORARY TRAFFIC CONTROL TYPICAL FIELD LAYOUT

NOT TO SCALE

SMA
Temporary Traffic Control Typical Layout

Temporary Traffic Control Typical Field Layout

Shoulder Work (All Work Within 15' of Edge Line)
15 min. - 12 hrs. or Daytime Only
55 MPH posted speed limit/70 MPH prevailing speed
Temporary Traffic Control Typical Layout

Typical Skip Pavement
Marking Spacing:
- 10' Skip
- 40' Spacing
- 30' Gap

Taper Calculations:
- Shoulder Taper (1/3 L):
  1/3 (12' X 70 MPH) = 280'
- Lane Closure Taper (L):
  Expressway/Freeway = 1000'

Minimum T Devices:

Legend:
- Sign Support
- Sign Face
- Channelizing Devices (Cones or Drums)
- Work Space
- Arrow Panel
- Direction of Traffic
- Grass Median

Temporary Traffic Control Typical Field Layout
Right Lane Closure
Over 12 hrs. or Nighttime Use
State Highway Administration 55 MPH posted speed limit/70 MPH prevailing speed

Not to Scale
Temporary Traffic Control Typical Layout
Temporary Traffic Control Typical Layout

Legend:
- Sign Support
- Sign Face
- Channelizing Devices (Cones or Drums)
- Work Space
- Direction of Traffic
- Flagger
- Grass

Temporary Traffic Control Typical Field Layout
Flagging Operation / 2-Lane, 2-Way
15 min. - 12 hrs. or Daytime Only
55 MPH posted speed limit / 70 MPH prevailing speed
Pavement Marking Operation

IMPORTANT:
THIS DRAWING SHALL BE USED IN
COMBINATION WITH THE GENERAL
NOTES AT THE BACK OF
STANDARDS NO. WD 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

TEMPORARY TRAFFIC CONTROL TYPICAL APPLICATION

NOTES:

WORKER OPERATIONS

WORKERS SHALL HAVE FLASHING WARNING LIGHTS MOUNTED ON THEIR.

THE WORKER’S WARNING SIGN SHOULD BE USED TO WARN OF WORKING CREWS UNLESS WORKERS ARE EQUIPPED WITH TWO 360° FLASHING/STROBING BEACON LIGHTS OR TWO 360° FLASHING DOME LIGHTS.

THE DEVIATION OR DIVERSION DISTANCE IS ETY FOR THE RATES OF SPEED SHOWN ON THE SIGNS.

WORKERS MAY NOT ENTER MORE THAN 2 MILES AWAY FROM ADVANCE WARNING SIGN.

WORKERS MUST BE IN unserer OF THE EDGE LINE, TRAVEL IN THE SAME DIRECTION AS ADJACENT TRAFFIC.

THE WEAPON MACHINE MUST BE LOCATED GREATER THAN 15 FT. AWAY FROM THE EDGE OF THE ROADWAY, SIGNS FOR THAT ROADWAY ARE UNNECESSARY.

OTHER OPERATIONS

THE SURVEY CREW SIGN SHOULD BE USED TO WARN OF SURVEYING CREW WORKING IN OR ADJACENT TO THE ROADWAY.

THE WORKER’S WARNING SIGN SHOULD BE USED TO WARN OF OTHER MOBILE OPERATIONS NOT RELATED TO SURVEYING ACTIVITIES. FOR SUCH MOBILE TYPICAL APPLICATION CURRENTLY EXISTS.

IF SURVEYING OR OTHER MOBILE OPERATION WITHIN MEDIAN IS LOCATED GREATER THAN 15 FT. AWAY FROM THE EDGE LINE OF ONE ROADWAY INCLUDING ALL EQUIPMENT AND VEHICLES, SIGNS FOR THAT ROADWAY ARE UNNECESSARY.
Section 4:
Typical Field Layout
Installation and Removal
Installing Lane Closure - Field Layout

Temporary Traffic Control Typical Application

Step 1 - Temporary Traffic Control Activities

1. Clear Traffic Cones
   
Step 2 - Temporary Traffic Control Activities

1. Place Cones in Snow
   
Step 3 - Temporary Traffic Control Activities

1. Place Cones in Snow
   
Step 4 - Temporary Traffic Control Activities

1. Place Cones in Snow

NOTE:
Over closing and lane
pattern to

NOT TO SCALE

Specifications:

Maryland Department of Transportation
State Highway Administration
Standards for Highways and Incidental Structures
Installing Lane Closure Steps 3 and 4
Installing/Removing Lane Closure - Field Layout
### Removing Lane Closure - Field Layout

**Temporary Traffic Control Typical Application**

**Step 1:**
- Place Rollout Channeled Devices Across Traffic Stream.
- Use Edge Line Marking to Mark Out End of Work Zone.

**Step 2:**
- Remove Rollout Channeled Devices brick by brick, and close a lane or remove work zone.
- Use non-reflecting striping to mark out end of work zone.

**Step 3:**
- Use non-reflecting striping to mark out end of work zone.

**Step 4:**
- Remove Rollout Channeled Devices brick by brick, and close a lane or remove work zone.
- Use non-reflecting striping to mark out end of work zone.

**Step 5:**
- Remove Rollout Channeled Devices brick by brick, and close a lane or remove work zone.
- Use non-reflecting striping to mark out end of work zone.

### Key:

- **Channeling Devices:** Used for guiding traffic flow.
- **Sign Support:** Used to hold signs.
- **Direction of Traffic:** Indicators for traffic direction.
- **Arrow Panel:** Used to guide traffic flow.
- **Approved Vehicular Safety Light:** Used for safety during work zones.

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**Maryland Department of Transportation**

**State Highway Administration**

**Standards for Highways and Incidental Structures**

**Removing Lane Closure**

**Steps 7 and 8**

**Specification:**
- **SHA:** Maryland Department of Transportation
- **Department:** State Highway Administration

**Standard No.:** MD 104.07-04
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?PagId=403

For more information contact

- Clarence Haskett 410 787-5876
- chaskett@sha.state.md.us