Work Zone Safety
A Look At Best Practices

AASHTO – SCOTE
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Work Zone Safety Innovations

- Positive Protection Measures
- Pedestrian Accommodations
- Temporary Bicycle Facilities
- Work Area Lighting
- Sequential Drum Lights
- Temporary Portable Rumble Strips
- Smart Work Zone Applications
- Work Zone Intrusion System
- Automated Enforcement
Why Change Work Area Protection

July 6, 2016

[Images of damaged concrete barriers, vehicles, and construction equipment]
Positive Protection/Worker Safety

- Develop provisions to protect motorists from drop-off conditions and workers from vehicle intrusion
- Provide design engineers and contractors with guidance on how & when to protect the work area
- Give clear direction on when restrained barrier is required for drop-off conditions
- Define proper clear-zone and barrier flare rate requirements
- Establish standard safe work area entry/exit details
Positive Protection Examples
Temporary Barrier Details

Transition Flare Rates updated based on the posted speed limit

In-line Transition Details

Safe Entry/Exit Details

<table>
<thead>
<tr>
<th>BARRIER TRANSITION FLARE RATE</th>
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<tbody>
<tr>
<td>70 MPH = 23:1</td>
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<tr>
<td>65 MPH = 20:1</td>
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<tr>
<td>60 MPH = 18:1</td>
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<tr>
<td>55 MPH = 17:1</td>
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<tr>
<td>50 MPH = 16:1</td>
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<tr>
<td>45 MPH = 14:1</td>
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<tr>
<td>40 MPH = 13:1</td>
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<tr>
<td>35 MPH = 11:1</td>
</tr>
<tr>
<td>30 MPH &amp; BELOW = 10:1</td>
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NOTE: BARRIERS SHOULD BE PLACED ON HMA OR CEMENT CONCRETE SURFACES ONLY.

ATTENUATOR IS NOT REQUIRED IF THE END BARRIER IS PROTECTED BY ROADWAY BARRIER OR IF THE BARRIER IS PLANTED OUTSIDE OF THE CLEAR ZONE.
Pedestrian Accommodations

- It is undesirable to close sidewalks or pathways during construction, however if unavoidable, use channelizing devices to delineate a temporary route.

- Clearly define detour routes and place advance signs at intersections rather than midblock locations.

- Maintain a minimum width and smooth surface for wheelchair access, including providing ADA compliant ramps if pedestrians are channeled from the sidewalk into the street.

- Protect pedestrians from hazards, such as holes, cracks or construction debris.
To accommodate visually impaired pedestrians effectively, the traffic control devices should **NOT**:

- Present a tripping hazard at entry or along a travel route
- Present an injury hazard when trailed by hand
- Present an entrapment hazard in continuous cane use
- Present a hazard to pedestrians with a cane or guide dog

**Detectable Edge**
- Using a Longitudinal Channelizer
  - 32 in. minimum
  - 2 in. maximum

**Detectable Edge**
- Shown on a railing system
  - 36-38 in.

Source: Minnesota DOT
Temporary Curb Ramps

Manufacturers are starting to develop ADA compliant WCR devices

Recommend use contrast color on edge of walkway ramp/path

Follow standard ADA requirements

Source: Virginia DOT
Temporary Pedestrian Modular Ramp

Replaces curb transitions and temporary ramps that are non-compliant.

*Manufactured by Plastic Safety Systems
Bicycle Hazards
Bicycle Accommodation

- Guidance for how bicycles should be accommodated based upon “stress level”
- Temporary facilities should not be a lower facility type unless no reasonable alternative is available
- Define recommendations based upon facility type (multi-use paths, bike lanes, shared lanes, etc.)
- Rules for surface conditions, maintenance recommendations, drainage, and detours
Bicycle Typical Applications

Source: Virginia DOT

Source: MassDOT
Glare-free light increases the personal safety of night-time road work crews and drivers.

New technology is visually as bright and effective as conventional diesel towers.
Sequential Drum Lights

MassDOT will be testing out lighting the taper for lane closures using the sequential drum lights.

These lights automatically synch with each other and when lit they will provide additional guidance similar to an arrow board.
Temporary Portable Rumble Strips

MassDOT will be testing out using temporary portable rumble strips for lane closures to alert motorists and encourage speed reduction.

A typical application has been developed for use of the TPRS based on the speed of the roadway.
SWZs are portable combinations of ITS equipment designed for flexible deployment in work zone environments and used to monitor and report out on traffic operations.

FHWA’s Every Day Counts program is targeting more SWZ utilization for mobility.
Queue Warning System

- Used to alert motorists of stopped traffic before they reach the back of queue

- Helps to prevent rear-end crashes before they happen
**Dynamic Merge System**

- **Early merge**: In low-volume conditions reduces the occurrence of high-speed merging at the point of lane closure.

- **Late merge**: In high-volume conditions reduces the length of the queue.

*Source: FHWA Operations, Work Zone Safety, Massachusetts Department of Transportation*
Lane Closure System

SwiftGate/SwiftSign
- Permanent or short-term
- Sign Module
- Remote Operation
Driveway Assistance Device

- Developed by Horizon Traffic Signal & TTI
- Used to control driveway access for a one-lane bidirectional work zone
- FHWA Experimentation
- Michigan DOT
- Others expressed interest as well
- Developed with TTI
Speed Feedback Signs

Flashers: Use Only if Workers Present
Speeding and driver distraction are major issues for work zone safety and MassDOT is looking towards technology to help address the issue.

MA is considering a pilot test of automated speed enforcement in work zones for improved worker and motorist safety (in-use IL & MD).

Note: Use of photo/video enforcement is not currently legal in Massachusetts.*
WZ Operational Analysis

NCDOT Planning-Level Work Zone Corridor-Level Analysis Tool: FREEVAL-WZ

Work zone capacity (NCHRP 03-107), analysis that can readily predict the impacts of a freeway work zone.
and finally…Red Light Running Camera Enforcement – Who is having success?

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