OSC | 11
Ohio Safety Congress & Expo

#441 Temporary work zone traffic control for public/private utility companies

Ken Linger, PE

Thursday, March 31, 2011
8:15 to 9:15 a.m.

Ohio | Bureau of Workers' Compensation

WORK ZONE TRAFFIC CONTROL

Presented by:
Kenneth Linger, P.E.
Ohio Department of Transportation
Office of Traffic Engineering

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Todays Objectives

- **Leave with a new appreciation for work zone safety.**
- **Understand why we have standards.**
- **Why you should refer to the OMUTCD.**
- **Have a little fun……**

3

Traffic Control Equipment

- For most cases:
  - 3 Advance Warning Signs (each direction)
  - 5 to 13 cones for a taper, to close the lane
  - Another 8 or so cones along the work area
  - 360 degrees, High Intensity, Rotating Flashing Lights
  - ANSI Class II Vests
  - Flaggers

4

Traffic Control Equipment

- For **your** traffic control setups:
  - 2 Advance Warning Sign (Road Work Ahead)
  - 3 or 4 cones to delineate your vehicle
  - 360 degrees, High Intensity, Rotating/Flashing Lights
  - ANSI Class II Vests
- But it really depends on:
  - Where you will be working…type of highway
  - How long you will be there……
- **And now the WHY……**

5

Is Working Along the Roadway Dangerous? – – Yes!

- People die
- People are injured
- Money is lost
- You and your company/organization can be sued

6

Actual News Stories

July, 1998

RAVENNA

Road worker struck, killed

A flagger for a highway construction crew was struck and killed by a station wagon.

Caren G , of Green, was on state Route 5 signaling to stop traffic when she was struck by the car Thursday morning.

State Highway Patrol Trooper Paul Gerke said traffic was light when the accident occurred.

Gerke said the county prosecutor is determining whether charges will be filed against the driver of the station wagon.

Gerke said no signs, including those indicating a flagger ahead, were posted for drivers approaching the construction area.

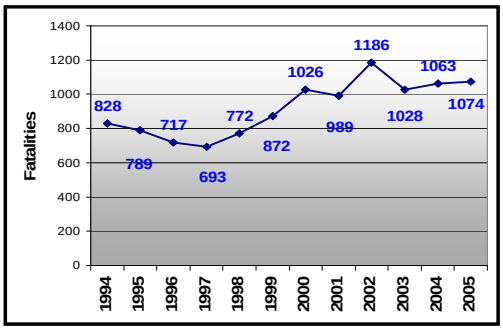
From news services

Motorcyclist's dad sues city for fatal crash

Ravenna Post 3-18-99

7

Fatalities in US Work Zones 1997-2005



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Work Zones Can Be Dangerous!!

- People die
  - Each year approximately 42,000 people die on America's highways.
    - ✓ About 2-3% (1000+) of those in work zones
    - ✓ 10-15% of work zone fatalities are workers!

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Why Crashes?

- **Worksites create potential hazards because they:**
  - **Confront motorists with unknown conditions**
  - **Disrupt normal traffic flow**
  - **Divert attention from driving**
  - **Expose workers**

10

Even with all the right traffic control devices installed, it doesn't guarantee the motorists will do the right thing……..

11

In fact, some drivers do some really stupid things……..

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And now some statistics……

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Ohio - 2008 – A very safe WZ Year

WORK ZONE CRASHES	TOTAL CRASHES
15 fatalities	1,191 Fatalities
5200 WZ crashes	320,000 total crashes
100 WZ crashes / week	6350 crashes per week
1 WZ crash / week	72 crashes /county/ week
4 WZ crashes a month	288 crashes a month
1700 serious injury	10,113 serious injury
1 out of 3 serious	3 out of 100 serious

Seatbelts

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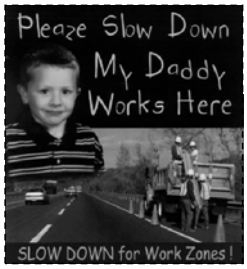
What is the Primary Purpose of Temporary Traffic Control?

- Safety!!
  - Motorists
  - Pedestrians
  - Workers



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However, safety should not be compromised!!

- By using fewer devices
- Because the operation will frequently change its location
- Because of its short duration
- Starting work before the work zone is setup

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Why do we need standards?

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Standardization Promotes:

- Recognition and understanding
- Consistent interpretation
- More rapid driver response
- Motorists' respect
- Reduce traffic control cost

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Who Establishes Standards?

- National Standards
- State of Ohio's Standards

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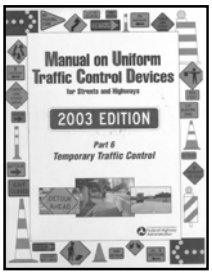
National Standards

- Found in the *Manual on Uniform Traffic Control Devices* (MUTCD) Minimum Federal standards applicable to all roads open to public travel



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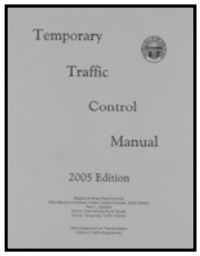
Ohio Standards

- The Ohio Manual (OMUTCD) establishes the standards for design and use of traffic control devices on all public roads in Ohio.
- Per Sections 4511.09 – 4511.11 of the ORC.
- To purchase a copy, contact the ODOT Office of Contracts
  - The cost is $8.00



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Ohio Revised Code Section 4511.11

- "(A) Local authorities in their respective jurisdictions shall place and maintain traffic control devices in accordance with the department of transportation manual and specifications for a uniform system of traffic control devices ..."

(See Appendix B2 of the 2005 OMUTCD)

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OMUTCD 2005

- Standard = "Shall" condition
- Guidance = "Should" condition
- Option = "May" condition
- Support = Additional information

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Organization/Format – Relation To The OMUTCD

- **Standards (shall) information is shown in large bold text.**
- Guidance (should) information is shown in large text, but not bold.
- Option (may) and Support information are shown in a smaller size text.

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Fundamentals of Traffic Control

- The ABCs:
  - Provide advance warning
  - Be visible and alert
  - Be in control

Apply them before the work begins!!!

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Advance Warning Area

- Every TTCZ should have an advance warning area
- Use advance warning signs
  - Can be a series of signs
  - Can be a single sign
- Can be rotating lights on work vehicle
- Refer to OMUTCD for standards

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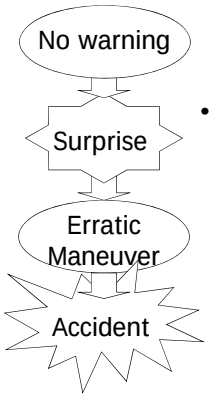

Warning

- **EVERY** temporary traffic control zone has an advance warning area
  - Even low-speed closures

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Signs

- Signs communicate the same message redundantly, through:
  - Shape
  - Color

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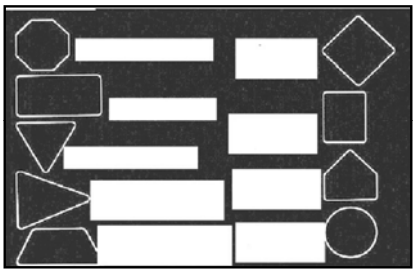
Sign Shapes??



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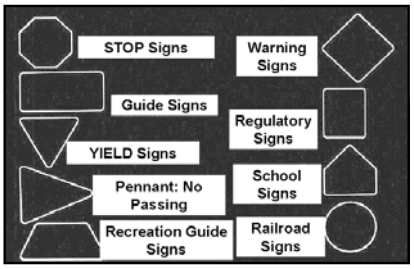
Sign Shapes



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Sign Colors

Yellow - General Warning
Red - Prohibition (regulatory)
Blue - Motorist Services Guidance
Green - Direction
Brown - Recreational/Cultural Interest
Orange - Construction/Maintenance
White - Regulatory
FYG – Pedestrian/bike/school Warning

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Warning Signs

- Warn drivers of situations or conditions ahead
- In work zones
  - Usually diamond shape
  - Orange background
  - Black letters

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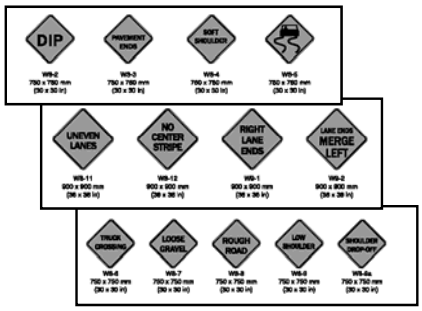
Warning Signs



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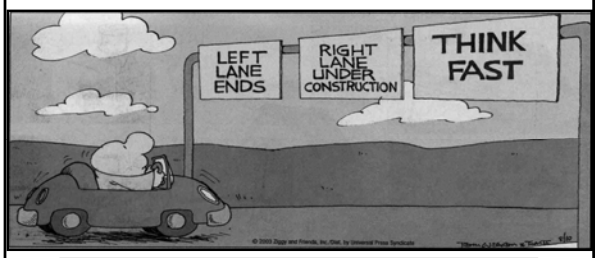
Sign Spacing is Critical



Motorists must be given time to make the proper decision

I-75 got lucky – not so in '99 (western Ohio)

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Suggested Sign Spacing

Road Type	A	B	C
Urban (low speed)	100'	100'	100'
Urban (high speed)	350'	350'	350'
Rural	500'	500'	500'
Freeways and Expressways	1,000'	1,500'	2,640

40

Size of Advance Warning Signs is also Critical

- OMUTCD states:
  - Due to importance of higher-speed locations, signs shall be 48″ x 48″
  - Where speeds and volumes are low, signs shall be 36″ x 36″
  - On secondary roads or street where speeds are low, signs shall be 24″ x 24″

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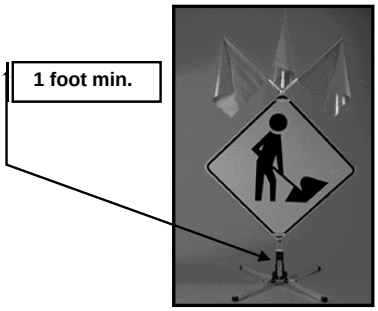
Portable Sign Supports



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Is this sign easy to see?

43

Sign Maintenance?

- "Signs shall be properly maintained for cleanliness, visibility, and correct positioning."
- "Signs that have lost significant legibility shall be promptly replaced."

44

Signs Used at Night

- **All signs used at night *shall* either be:**
  - **Illuminated**
    - **Own light source**
    - **Roadway lighting doesn't meet these requirements**
  - **Retroreflective**

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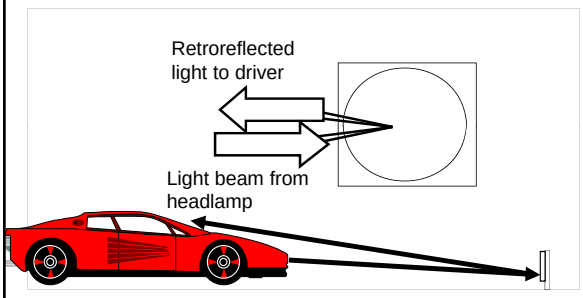
Principle Of Retroreflection



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Principle of Retroreflectivity in Action

Non retroreflective

Retroreflective

- Non retroreflective signs literally disappear at night
- BEWARE: Signs may look good during the day

47

Communication

- Using 'High Intensity' sign sheeting improves our communication with the public because they can see the signs at night much easier.
- The following slides show attempts at communication that fall a little short……

48

Creative Sign Design??

49

The many uses of duct tape..

50

Creative Sign Design??

51

remember, good communication is the goal

52

Creative Sign Design??

53

Is this helpful?

54

Notice the arrow board ?

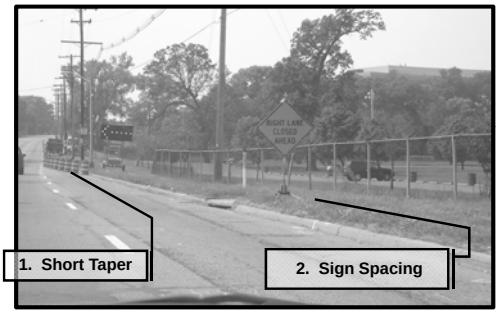
55

56

Accident Waiting to Happen ?

57

Yes, because….



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Channelizing Devices

- Help guide traffic
- Separate workers from traffic
- Usually form lines
  - "delineation"

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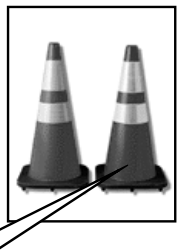
Cone Height

- Min. 18″ for daytime low speed operations
- Min. 28″ for higher speeds
- Retroreflectorized for night use
- 42″ can be used at all locations



Two white bands

60

Cones Delineating a Truck

61

Cones Delineating Equipment

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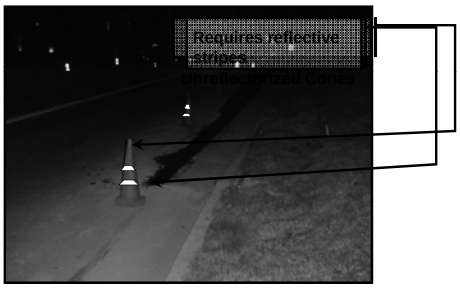
Any comments?

1997- District T2



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Barricades - Stripes slope downward in the direction traffic is to pass

THIS SIDE!

64

Follow Standard and Uniform Flagging Procedures

- Increases motorists' respect
- Promotes uniform response
- Minimizes drivers' confusion

Flagger ahead??

65

Clothing (Safety Apparel)

- ANSI 107-1999 Class 2 garment
- Class 3 recommended for nighttime flagging
- Hard hat
  - When required

66

Close up view…

67

The Shoulder is Part of the Road

- Used by drivers during emergencies
- Do not use without advance warning
  - A "ROAD WORK AHEAD" sign may be sufficient
  - The "SHOULDER WORK" sign may be used for work adjacent to the shoulder

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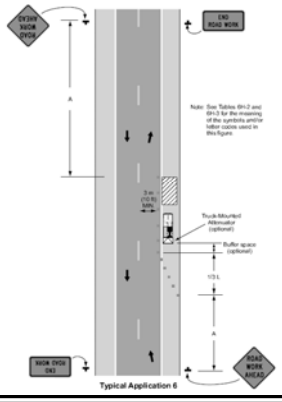
Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)



Typical Application 6

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Notes for Figure 6H-6—Typical Application 6
Shoulder Work with Minor Encroachment

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.
2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

Option:

3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

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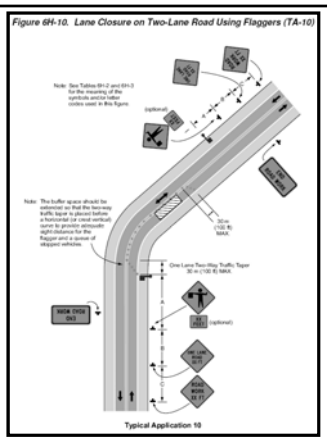
Figure 6H-10. Lane Closure on Two-Lane Road Using Flaggers (TA-10)



Typical Application 10

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Notes for Figure 6H-10—Typical Application 10
Lane Closure on Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

4. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Standard:

5. At night, flagger stations shall be illuminated, except in emergencies.

Guidance:

6. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.
7. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
8. When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.
9. When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.
10. Early coordination with the railroad company should occur before work starts.

Option:

11. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.

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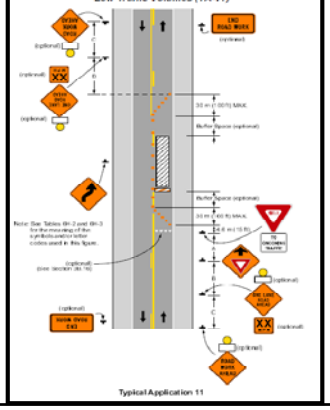
Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes (TA-11)



Typical Application 11

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Notes for Figure 6H-11—Typical Application 11
Lane Closure on Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6H-10 (using flaggers) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.
2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary. For additional information on proper use of warning lights, see Section 6F-78.

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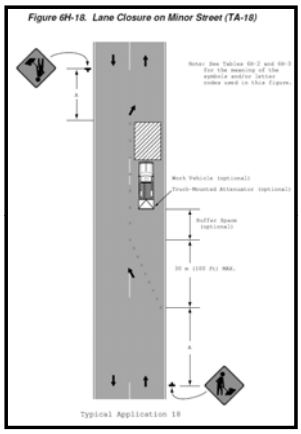
Figure 6H-18. Lane Closure on Minor Street (TA-18)



Typical Application 18

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Notes for Figure 6H-18—Typical Application 18
Lane Closure on Minor Street

Standard:

1. **This TTC shall be used only for low-speed facilities having low traffic volumes.**

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

Standard:

3. **Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6H-10.**

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.

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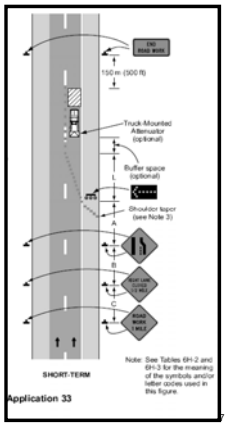
Notes for Figure 6H-33—Typical Application 33
Stationary Lane Closure on Divided Highway



SHORT-TERM

Application 33

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Notes for Figure 6H-33—Typical Application 33
Stationary Lane Closure on Divided Highway

Standard:

1. **This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**
2. **When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.**

Guidance:

3. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.

Option:

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.

Support:

5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

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Work Vehicles Parked in Roadways

- The OMUTCD provides guidance
- Some minor adjustments may be necessary
- Treat as a lane closure

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Work Vehicles Parked in Roadways

- Cones are normally acceptable to delineate a path around the vehicle
- Use at least one warning sign; more if in a travel lane

WZ crash in upstate New York

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Anatomy of a Work Zone Crash

- 30 mph road; slight curve to the left;
- Utility Co.; Excavating Co.; Lawn Care Co.;
- Only 2 cones… no signs;
- 30 seconds to set up the sign;
- 5 minutes to set up the WZ properly;
- Employee properly trained (36 years)
- Equipment was on the truck;

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Anatomy of a Work Zone Crash

- What were the safety practices of the companies?
- Were the safety practices being followed?
- Was safety training in place at the companies?
- Was safety training used?
- What safety equipment was available?
- Was safety equipment used or not?

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Anatomy of a Work Zone Crash

- Liability Issues
  - Who was responsible for the injuries?
  - Who was negligent?
  - What should the settlement be?
  - Who will pay?
    - Lawn Care Co. – settled for $250,000
    - Utility and Excavating Companies split the **judgment.**
      - **$1,040,000**

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Traffic Control Equipment

- For your traffic control setups:
  - 1 Advance Warning Sign (Road Work Ahead)
  - 3 or 4 cones to delineate your vehicle
  - 360 degrees, High Intensity, Rotating/Flashing Lights
  - ANSI Class II Vests
- **But it really does depend on:**
  - **Where you will be working…the type of highway**
  - **How long you will be there……**

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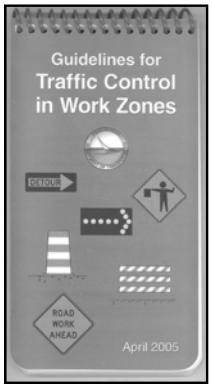
Field Manual

NOTE:
This booklet is intended to provide the principles of proper work zone traffic control, but is not a standard. Part 6 of the OMUTCD contains the standards.



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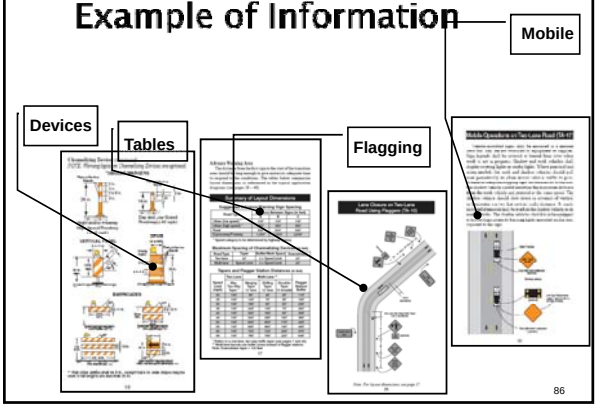
Example of Information



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Field Manual

- To purchase a copy, contact the ODOT Office of Contracts
  - The cost is $3.00
- 1980 West Broad St.,
  P.O. Box 899
  Columbus, Ohio 43216-0899
- By phone at 1-800-459-3778

87

Contact Information

Ken Linger
Ohio Department of Transportation
Office of Traffic Engineering
Phone: 614-466-0139
Email: ken.linger@dot.state.oh.us

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