OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES

PROGRAM DIRECTIVE

Program Directive A-290
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SUBJECT: Inspection and Citation Guidance for Roadway and Highway Work Zones

AFFECTED STANDARDS/DIRECTIVES:

Division 2/I, 437-002-0134(7), High Visibility Garments

Division 2/N, 437-002-2224(12), Traffic Control

Division 2/R, 437-002-0305, Traffic Control

Division 2/R, 437-002-0307(1), Personal Protective Equipment

Division 3/C, 437-003-0128, High Visibility Garments

Division 3/G, 1926.200(g)(1), Traffic Signs

Division 3/G, 437-003-0420(1),(2) and (3), Traffic Control

Division 3/P, 1926.651(d), Exposure to Vehicular Traffic

Oregon OSHA Field Inspection Reference Manual (FIRM)

Millennium Edition of the Federal Highway Administration Manual of Uniform Traffic Control Devices, December 2000

Oregon Temporary Traffic Control Handbook (OTTCH) for Operations of 3 Days or Less, December 2011

American National Standards Institute (ANSI) D6.1e-1989

U.S. Department of Labor, Occupational Safety and Health Administration, CPL 02-01-054, EFFECTIVE DATE: October 16, 2012
SUBJECT: Inspection and Citation Guidance for Roadway and Highway Construction Work Zones

Oregon Department of Transportation (ODOT), Work Zone Fact Sheet 2015

PURPOSE: To provide guidance to compliance safety and health officers (CSHOs) on how to conduct safety and health inspections of workplaces involved in construction, maintenance, or utility work activities on or near roadways and highways (hereinafter "work zones") where public or site operation vehicular traffic exposes workers to struck-by hazards. This instruction supplements guidance on inspection procedures provided in Oregon OSHA's Field Inspection Reference Manual (FIRM).

BACKGROUND: Working near fast-moving public traffic presents obvious hazards for CSHOs when performing work zone inspections. According to the Oregon Department of Transportation (ODOT) Work Zone Safety Fact Sheet 2015, over the past 10 years, Oregon averaged 510 work zone related crashes per year – including an average of 18 serious injury and 9 fatal crashes per year. In 2013, Oregon work zone fatalities represented 2% of all roadway fatalities for the year.

ACTION: This directive applies to all statewide construction, maintenance, or utility work zone activities subject to Oregon OSHA jurisdiction.

INSPECTION GUIDANCE: Work zone operations are normally transient and of limited duration. As a result, inspections are normally initiated by a CSHO observance that results in a referral inspection or a scheduled inspection conducted under a National or Local Emphasis Program (NEP or LEP), complaint, or internal and external referral.

(NOTE: See Appendix A for definitions of traffic control terms.)

A. Arrival at a work zone. Before beginning the inspection, the CSHO should take the following precautions for personal and public safety:

1. When a CSHO drives by a work zone, any hazards and potential violations should be identified only when the opportunity exists for the CSHO to look around while driving safely at a safe following distance. The CSHO should determine whether:

   - Advanced warning signs are in place.
   - Transition area tapers are at a safe distance.
   - Buffer spaces exist (an optional work zone component).
   - Cones are spaced correctly.
   - The control devices indicate a clear path of travel.

   For personal safety, the CSHO should pay particular attention to:

   - Dangerous conditions that would require abrupt driving maneuvers.
   - The posted speed limit and the actual speed of passing traffic.
   - The presence of skid marks, as potential evidence of inadequate traffic controls.

2. CSHOs must not operate cameras or video recorders while driving. The use of such equipment by the driver should only be done when the vehicle is parked in a safe location that does not obstruct the normal flow of traffic.
3. When two or more CSHOs are in the same vehicle, one CSHO must focus on driving while the other observes the work zone and documents potential hazardous conditions.
4. If intending to conduct an inspection, the CSHO should initially drive-by the entire work zone to determine where to safely pull off and park. During this time, the CSHO must focus on driving safely and locating a safe place to park. When deciding where to park, CSHOs should consider the following before parking in the work zone:
    - Is there an employee parking area or a material staging or storage area?
    - Is there a general contractor trailer that is located outside the work zone in a protected area of the worksite?
    - Is there a parking area that is beyond the work zone and away from public traffic lanes and work zone traffic?
5. If no other safe parking is available, then the CSHO may park within the work zone. When locating a parking spot within the work zone, the CSHO should take the following precautions:
    - Do not park in the advance warning area, the transition or taper area, or in an area that requires crossing lanes open to public traffic.
    - Stay clear of buffer spaces, if any. The buffer space is for the separation of traffic flow from the activity area and provides space for an errant vehicle. Work activity should not occur in this space and vehicles should not be parked there. A buffer space is optional since some work zones do not have adequate space to allow it.
    - Do not park in front of shadow vehicles or other impact attenuator vehicles (i.e., between the attenuator or shadow vehicle and approaching traffic, or in front of the front bumper of the attenuator or shadow vehicle).
    - Do not park in an area that interferes with work activities or the internal traffic controls in the work zone.
    - Park the vehicle behind barriers whenever possible. If no barrier exists, park at a safe distance from the public traffic lane and work zone traffic.
    - Plan an exit strategy for leaving the work zone and for emergencies.

- At the opening conference, the CSHO should verify with the employer whether the vehicle is parked in a safe place.

6. When performing inspections of work zones, the CSHO must wear all necessary personal protective equipment:

   - High-visibility safety garment. A Class 3 high-visibility safety vest in accordance with ANSI/ISEA 107-2004. Class 3 safety vests have sleeves.
   - Head Protection. A Type I hard hat, in accordance with ANSI Z89.1.
   - Eye Protection. Appropriate eye protection, such as safety glasses.
   - Foot Protection. Safety-toe footwear.
   - Hearing Protection. Have ready access to hearing protection while in the work zone.
   - Respiratory Protection. CSHOs should determine the presence of any airborne contaminants and, when possible, stay upwind. If a safety compliance officer (SCO) observes employee exposure to airborne contaminants, they should make a health referral. CSHOs who are approved to wear respiratory protection, must do so where appropriate.

7. While walking to a work zone activity area, the CSHO should:

   - Expect the unexpected and do not assume that drivers see them.
   - Face traffic and stay as far away as safely possible from the live lane of traffic.
   - Identify areas where vehicle and mechanical equipment are in operation throughout the work zone and stay outside those areas until it is safe to enter. Watch out for "blind spots" and the swing radius of equipment. CSHOs may only approach equipment after the operator acknowledges their presence (eye contact), stops the equipment, and indicates it is safe to approach. If the CSHO cannot see the operator, the operator cannot see the CSHO.
   - Not stand or walk directly to the rear of any vehicles or mechanical equipment. Vehicles may be propelled by electric motors, and backup alarms may be inoperable or may not provide sufficient warning. (e.g., high ambient noise levels.)
   - Follow internal traffic controls, including instructions from spotters, signalers, flaggers, and observers.

8. Once at the work zone activity area, CSHOs should:

   - Continue being alert to public and work zone traffic, and facing traffic as much as possible.
   - Have an escape plan in case errant vehicles enter the work zone.

- Never step outside of the work zone into the traveled way.
- Perform interviews in a safe or protected area (e.g., in a car well off the roadway).
- The CSHO should not approach workers performing flagger operations. Prior to interviewing a flagger, ensure that a replacement flagger is available and arrange with site personnel for a time and safe place to interview the flagger in an area away from the flagger station.

B. Inspection Activities. CSHOs should follow the inspection guidelines provided in the FIRM, and when applicable, the guidelines under any related National Emphasis Program (NEP) or Local Emphasis Program (LEP). During the opening conference, determine the nature of the work activities to properly evaluate applicable traffic control requirements.

CSHOs should consider work location, work type, and work duration when assessing the number and types of devices used in temporary traffic control zones.

When the work location is off the roadway (beyond the shoulders, but within the right-of-way), little or no temporary traffic control may be needed. Temporary traffic control generally is not needed where work is confined to an area 15 feet or more from the edge of the traveled way. However, temporary traffic control is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the work site via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing).

If the work type is related to an unexpected incident of an emergency nature (i.e., a road user incident, natural disaster, or special event), the MUTCD 2000 only requires the use of temporary traffic control devices on hand to be used for the initial response as long as they do not themselves create unnecessary additional hazards. Examples of incidents include a stalled vehicle blocking a lane, a road user crash blocking the traveled way, a chemical spill along a highway, floods and severe storm damage, a planned visit by a dignitary, or a major sporting event. If the incident is anticipated to last more than 3 days, applicable procedures and traffic control devices required under the Section 6 of the MUTCD 2000 should be used.

Work duration is also a major factor in determining the number and types of devices used in temporary traffic control zones. The duration of a temporary traffic control zone is defined relative to the length of time a work operation occupies a spot location. The five categories of work duration and their time at a location shall be:

1) Long-term stationary is work that occupies a location more than 3 days.

2) Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

3) Short-term stationary is daytime work that occupies a location for more than 1 hour, but less than 12 hours.

4) Short duration is work that occupies a location up to 1 hour.

5) Mobile is work that moves intermittently or continuously.

Comprehensive inspections of work zones have two main aspects:

1) Inspection of the activity area (or "work space") containing the work activities that include workers, materials and equipment.

AND

2) Inspection of the temporary traffic controls for the work zone.

1. The activity area is the section of the highway where the work activities take place. Typical hazards normally found in the activity area may be related to:
   - Noise
   - Airborne hazards (silica or lead)
   - Illumination
   - Personal protective equipment
   - Scaffolds, particularly during bridge construction
   - Fall protection
   - Equipment
   - Excavations
   - Precast/poured concrete
   - Steel erection
   - Overhead lines
   - Machine guarding
   - Cranes
2. The primary function of temporary traffic control is to provide safe and efficient movement of vehicles through or around work zones. Employers must require employees to set up appropriate traffic controls (e.g., signs, channelizing devices, barriers, pavement markings, or work vehicles) when they work on or adjacent to a highway, street, or road in a way that creates a hazard and when

traffic cannot adjust safely on its own. Depending on the work activity, the controls must conform to:

- The Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000
- The most current edition of the Oregon Temporary Traffic Control Handbook (OTTCH) for Operations of 3 Days or Less
- The American National Standards Institute (ANSI) D6.1e-1989.

After CSHOs determine the type of work activity being performed, they should ask the employer which traffic control manual or handbook, and the edition, they are following.

While a temporary traffic control plan (TCP) is not required for every work zone, TCPs provide for continuity of the movement of motor vehicles, bicycles, and pedestrian traffic; transit operations; and access to property and utilities when the normal function of the roadway is suspended. A temporary TCP describes the measures to be used for safely facilitating road users through a work zone, and can range in scope from very detailed to simply referencing a diagram in the MUTCD. The degree of detail in a temporary TCP depends entirely on the complexity of the situation.

When conducting an inspection following a work zone accident or when there is an independent basis for believing that a hazard exists, CSHOs should determine if the employer has a TCP for the work zone and request a copy during the opening conference, in addition to other normally requested documents.

In addition to documenting the specific conditions that expose employees to struck-by vehicle hazards, CSHOs should document the following key points for the case file to support traffic control violations.

- Advanced warning sign locations (document number and type).
- Number of devices and spacing.
- Barricades.
- Flagger locations and setup.
- Truck mounted attenuators (TMA).
- The duration of work activities.
- Whether activities are fixed or mobile operations.
- Time of day and environmental conditions.

A field diagram can help recreate the work zone for the case file. Locations of fixed objects such as telephone poles, fire hydrants, etc. can greatly increase accuracy. CSHOs should ask the employer for:

- Start of taper to activity area.
- Width of offset (the amount of lateral space taken by the taper)
- Width of normal lane.
- Width of shoulder.
- Proximity of items within work zone to live traffic.

C. Departure from a Work Zone. When leaving a work zone, CSHOs should take the following precautions for personal and public safety:

1. CSHOs should ask if the contractor has an escort plan in place that covers moving vehicles in and out of the work zone.
2. If a plan exists, CSHOs should request an escort (ride) back to the CSHO's vehicle and traffic assistance when pulling out of the parking area.
3. If there is no escort plan and if local law enforcement is on site, CSHOs should request an escort from the officer back to the CSHO's vehicle and assistance when pulling out.
4. Before pulling out of the parking spot, CSHOs should assess the vehicle's acceleration ability, environmental factors, traffic flow and posted speed limit.
5. When pulling out, CSHOs should signal that they are entering traffic and should proceed in the closed lanes, if any, or the shoulders for as long as safely possible in order to accelerate to an appropriate merging speed.

CITATION GUIDANCE:

It is Oregon OSHA's policy to allow employers to follow standards of the most current additions of the MUTCD, OTTCH, and ANSI D6.1e. However, citations should include the source, edition and the provision violated to support the identified employee exposures to struck-by vehicle hazards.

(NOTE: See Appendix B for examples of traffic control standards.)

For violations under 437-003-3224(12), 437-003-0420(1), 437-003-0420(2) 437-003-0420(3), 437-002-0316(2)(a), and 437-002-2224(12), if the scope of the operation is three days or less, then the rule allows employers to follow the most current edition of the Oregon Temporary Traffic Control Handbook for Operations of 3 Days or Less. CSHOs should cross-reference the provision used to support a citation to avoid discrepancies.

For citations involving utility work, CSHOs should determine if the work activity is construction or maintenance.

A. Oregon OSHA Traffic Control Rules for Construction Activities:

1. Traffic Signs – 1926.200(g)(1). Construction areas must be posted with legible traffic signs at points of hazard.
2. Traffic Control – 437-003-0420(1). Adequate and appropriate traffic controls must be provided for all operations on or adjacent to a highway, street, or roadway. The traffic controls must conform to the Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000.
3. Traffic Control – 437-003-0420(2). Signaling by flaggers and the use of flaggers, including warning garments worn by flaggers must conform to the Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000.
4. Traffic Control – 437-003-0420(3). Barricades for protection of employees must conform to the Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000.
5. High Visibility Garments – 437-003-0128. Employees exposed to hazards caused by on highway type moving vehicles in construction zones and street/highway traffic must wear highly visible upper body garments. The colors must contrast with other colors in the area sufficiently to make the worker stand out. Colors equivalent to strong red, strong orange, strong yellow, strong yellow-green or fluorescent versions of these colors are acceptable. During hours of darkness, the garments must also have reflective material visible from all sides for 1000 feet.
6. Traffic Control – 437-003-3224(12). You must require employees to set up appropriate traffic controls when they stop on or adjacent to a highway, street, or road in a way that creates a hazard and when traffic cannot adjust safely on its own. The controls must conform to the Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000.

B. Oregon OSHA Traffic Control Rule for Excavation Activities:

Exposure to Vehicular Traffic (During Excavation) – 1926.651(d). Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

C. Oregon OSHA Traffic Control Rules for Maintenance Activities:

1. Traffic Control – 437-002-2224(12). You must require employees to set up appropriate traffic controls when they stop on or adjacent to a highway, street, or road in a way that creates a hazard and when traffic cannot adjust safely on its own. The controls must conform to the Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000.

2. High Visibility Garments – 437-002-0134(7). Employees exposed to hazards caused by on highway type moving vehicles in construction zones and street/highway traffic must wear highly visible upper body garments. The colors must contrast with other colors in the area sufficiently to make the worker stand out. Colors equivalent to strong red, strong orange, strong yellow, strong yellow-green or fluorescent versions of these colors are acceptable. During hours of darkness, the garments must also have reflective material visible from all sides for 1000 feet.

D. Oregon OSHA Traffic Control Rules for Tree and Shrub Services Activities:

1. Traffic Control – 437-002-0305. Effective means for control of pedestrian and vehicular traffic shall be instituted on every job site on or adjacent to a highway, street or railway. Traffic controls shall conform to the American National Standards Institute (ANSI) D6.1e-1989, Manual on Uniform Traffic Control Devices for Streets and Highways.

2. Personal Protective Equipment – 437-002-0307(1). Personal protective equipment shall be provided and used as required by OAR 437, Division 2/I, Personal Protective Equipment. [See High Visibility Garments – 437-002-0134(7)].

E. Oregon OSHA Rule for Telecommunications Activities:

Employee Protection in Public Work Areas – 437-002-0316(2)(a). Before work is begun in the vicinity of vehicular or pedestrian traffic which may endanger employees, pedestrian and traffic control devices shall be provided for all operations on or adjacent to streets, alleys and walkways. The traffic control shall conform to the American National Standards Institute (ANSI) D6.1e-1989 Manual on Uniform Traffic Control Devices for Streets and Highways and the Oregon Department of Transportation's Short Term Work Zones Manual. Where further protection is needed, barriers shall be utilized. At night, warning lights shall be prominently displayed, and excavated areas shall be enclosed with protective barricades.

TRAINING: CSHOs should be adequately trained to safely inspect work zones. Training should enable the CSHO to observe and identify the four typical components of a work zone:

(NOTE: See Appendix C for a temporary traffic control diagram.)

A. Advance Warning Area. The advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area. The advance warning area may vary from a single sign or rotating/strobe lights on a vehicle to a series of signs in advance of the temporary traffic control zone activity area. Advance warning may be eliminated when the activity area is sufficiently removed from the road

users' path so that it does not interfere with the normal flow. The following are examples of when the advance warning is required:

- Closed shoulder
- Work on the traveled way
- Closed lanes

B. Transition Area. The transition area is that section of highway where road users are redirected out of their normal path. When redirection of the road users' normal path is required, they must be channelized from the normal path to a new path. In mobile operations, the transition area moves with the work space. Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.

C. Activity Area (including buffer spaces). The activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space:

1. Work space. The portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.
2. Traffic space. The portion of the highway in which road users are routed through the activity area.
3. Buffer space. The lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle.

D. Termination Area. The termination area returns road users to their normal path. The termination area must extend from the downstream end of the work area to the END ROAD WORK signs, if posted. An END ROAD WORK sign, a speed limit sign, or other signs may be used to inform road users that they can resume normal operations.

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APPENDIX A

Common terms used in the Millennium Edition of the Federal Highway Administration Manual of Uniform Traffic Control Devices (FHWA MUTCD 2000):

Activity Area: The section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

Advance Warning Area: The section of highway where road users are informed about the upcoming work zone or incident area.

Channelizing Devices: The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.

Flagger: A person who actively controls the flow of vehicular into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).

Freeway: A divided highway with full control of access.

Highway: A general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Incident Area: The area of a highway where temporary traffic controls are imposed by authorized officials in response to a road user incident, natural disaster, or special event.

Pedestrian: A person afoot, in a wheelchair, on skates, or on a skateboard.

Retroreflectivity: A property of a surface that allows a large portion of the light coming from a point of source to be returned directly back to a point near its origin.

Roadway: The portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used herein shall refer to any such roadway separately, but not to all such roadways collectively.

Roadway Work Zone (includes "**Highway Work Zone**" and "**Temporary Traffic Control Zone**"): An area of a highway where road user conditions have changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, police, or other authorized personnel.

Rural Highway: A type of roadway normally characterized by lower volumes, higher speeds, few turning conflicts, and less conflict with pedestrians.

Sidewalk: That portion of a street between the curb line or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved intended for use by pedestrians.

Sign: Any traffic control device that is intended to communicate specific information to road users through a word or symbol legend. Signs do not include traffic control signals, pavement markings, delineators, or channelization devices.

Temporary Traffic Control Zone: See "Roadway Work Zone," above.

Termination Area: The section of the highway where road users are returned to their normal path.

Traffic: Pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using any highway for the purposes of travel.

Traffic Control Device: All signs, signals, markings, or other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, or bicycle path by authority of a public agency having jurisdiction.

Transition Area: That section of highway where road users are redirected out of their normal path.

Traveled Way: The portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.

Urban Street: A type of street normally characterized by relatively low speeds, wide ranges of traffic volumes, narrower lanes, frequent intersections and driveways, significant pedestrian traffic, and more businesses and houses.

Vehicle: Every device in, upon, or by which any person or property can be transported or drawn upon a highway, except trains and light rail transit operating in exclusive or semi-exclusive alignments. Light rail transit operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle.

Warning Sign: A sign that gives notice to road users of a situation that might not be readily apparent.

APPENDIX B

The following lists are traffic control standards CHSOs may reference when citing employee exposure to struck-by vehicle hazards in work zones; however, they do not include all the provisions of each source listed. For additional standards to address other hazardous conditions, CSHOs should consult the applicable source or use the most current edition of the OTTCH.

Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000

Section 6A.01 General:

- Temporary traffic control plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and incident management. Such statutes shall provide sufficient flexibility in the application of temporary traffic control to meet the needs of changing conditions in the temporary traffic control zone.

Section 6B.01 Fundamental Principles of Temporary Traffic Control:

- The control of road users through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and incident management.

- All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.

Section 6C.05 Transition Area:

- When redirection of the road users' normal path is required, they shall be channelized from the normal path to a new path.

Section 6C.10 One-Lane, Two-Way Traffic Control:

- When traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated.

Section 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control:

- The PILOT CAR FOLLOW ME (G20-4) sign shall be mounted at a conspicuous location on the rear of the vehicle.

Section 6E.02 High-Visibility Clothing:

- For daytime work, the flagger's vest, shirt, or jacket shall be orange, yellow, yellow-green, or a fluorescent version of these colors. For nighttime work, similar outside garments shall be retroreflective. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 300 m (1,000 ft). The retroreflective clothing shall be designed to clearly identify the wearer as a person.

Section 6E.03 Hand-Signaling Devices:

- The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 450 mm (18 in) wide with letters at least 150 mm (6 in) high and should be fabricated from light semi-rigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

- Flags, when used, shall be a minimum of 600 mm (24 in) square, made of a good grade of red material, and securely fastened to a staff that is approximately 900 mm (36 in) in length.

- When used at nighttime, flags shall be retroreflectorized red.

Section 6E.04 Flagger Procedures:

- The following methods of signaling with paddles shall be used:

    A. To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.

    B. To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.

    C. To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.

- The following methods of signaling with a flag shall be used:

    A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held

with the palm of the hand above the shoulder level toward approaching traffic.

B. To direct stopped road users to proceed, the flagger shall stand parallel to the road user movement and with flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

C. To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Section 6E.05 Flagger Stations:

- Flagger stations shall be located far enough in advance of the work space so that approaching road users will have sufficient distance to stop before entering the work space.

Section 6F.01 Types of Devices:

- Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.

- All traffic control devices used on street and highway construction, maintenance, utility, or incident management operations shall conform to the applicable provisions of this Manual.

Section 6F.02 General Characteristics of Signs:

- All signs used at night shall be either retroreflective with a material that has a smooth, sealed outer surface or illuminated to show the same shape and similar color both day and night.

Section 6F.03 Sign Placement:

- Post-mounted signs installed at the side of the road in rural areas shall be mounted at a height at least 1.5 m (5 ft), measured from the bottom of the sign to the near edge of the pavement. In business, commercial, and residential districts where parking and/or pedestrian movement is likely to occur, or where there are other obstructions to view, the distance between the bottom of the sign and the top of the near edge of the traveled way shall be at least 2.1 m (7 ft).

Section 6F.04 Sign Maintenance:

- Signs shall be properly maintained for cleanliness, visibility, and correct positioning.

- Signs that have lost significant legibility shall be promptly replaced.

Section 6F.07 Regulatory Sign Applications:

- If a temporary traffic control zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by the appropriate temporary regulatory signs. This change shall be made in conformance with applicable ordinances or statutes of the jurisdiction.

Section 6F.08 ROAD (STREET) CLOSED Sign (R11-2):

- The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained or where the actual closure is some distance beyond the sign.

Section 6F.15 Warning Sign Function, Design, and Application:

- Because of their importance, advance warning signs for higher-speed locations shall have a size of 1200 x 1200 mm (48 x 48 in) (see Part 2).

Section 6F.21 LANE(S) CLOSED Signs (W20-5, W20-5a):

- The LANE(S) CLOSED sign shall be used in advance of that point where one or more through lanes of a multiple-lane roadway are closed.

Section 6F.29 Flagger Sign (W20-7, W20-7a):

- The Flagger sign shall be removed, covered, or turned away from road users when the flagging operations are not occurring.

Section 6F.37 Signs for Blasting Areas:

- Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.

Section 6F.38 BLASTING ZONE AHEAD Sign (W22-1):

- The BLASTING ZONE AHEAD (W22-1) sign shall be used in advance of any temporary traffic control zone where explosives are being used. The TURN OFF 2-WAY RADIO AND PHONE and END BLASTING ZONE signs shall be used in sequence with this sign.

Section 6F.40 END BLASTING ZONE Sign (W22-3):

- The END BLASTING ZONE (W22-3) sign shall be placed a minimum of 300 m (1,000 ft) past the blasting zone.

Section 6F.41 SHOULDER DROP-OFF Sign (W8-9a):

- The SHOULDER DROP-OFF (W8-9a) sign shall be used when a shoulder dropoff, adjacent to the travel lane, exceeds 75 mm (3 in) in depth and is not protected by portable barriers.

Section 6F.53 Arrow Panels:

- Arrow panels shall meet the minimum size, legibility distance, number of elements, and other specifications shown on Figure 6F-3.

- An arrow panel shall be used only in the caution mode for shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway.
- When arrow panels are used to close multiple lanes, a separate arrow panel shall be used for each closed lane.

Section 6F.55 Channelizing Devices:

- Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

- Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced.

Section 6F.56 Cones:

- Cones (see Figure 6F-4) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 450 mm (18 in) in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 700 mm (28 in) in height.

- For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of 700 mm (28 in) or larger cones shall be provided by a white band 150 mm (6 in) wide located 75 to 100 mm (3 to 4 in) from the top of the cone and an additional 100 mm (4 in) wide white band approximately 50 mm (2 in) below the 150 mm (6 in) band.

Section 6F.57 Tubular Markers:

- Tubular markers (see Figure 6F-4) shall be predominantly orange, and shall be not less than 450 mm (18 in) high and 50 mm (2 in) wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

- Tubular markers shall be a minimum of 700 mm (28 in) in height when they are used on freeways and other high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.

- For nighttime use, tubular markers shall be retroreflectorized. Retroreflectorization of 700 mm (28 in) or larger tubular markers shall be provided by two 75 mm (3 in) wide white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands.

- When a non-cylindrical tubular marker is used, it shall be attached to the pavement to ensure that the width facing road users meets the minimum requirements.

Section 6F.58 Vertical Panels:

- Vertical panels (see Figure 6F-4) shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height. They shall have orange and white diagonal stripes and be retroreflectorized.

- Vertical panels shall be mounted with the top a minimum of 900 mm (36 in) above the roadway.

- Where the height of the vertical panel itself is 900 mm (36 in) or greater, a panel stripe width of 150 (6 in) shall be used.

- Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward at an angle of 45 degrees in the direction motor vehicle traffic is to pass. Vertical panels used on expressways, freeways, and other high-speed roadways shall have a minimum of 174,000 mm2 (270 in2) retroreflective area facing motor vehicle traffic.

Section 6F.59 Drums:

- Drums (see Figure 6F-4) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 900 mm (36 in) in height and have at least a 450 mm (18 in) minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 100 to 150 mm (4 to 6 in) wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflectorized spaces between the horizontal orange and white stripes shall not exceed 75 mm (3 in) wide.

Drums shall have closed tops that will not allow collection of construction debris or other debris.

- Ballast shall not be placed on the top of a drum.

Section 6F.60 Type I, II, or III Barricades:

- Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Except as noted in the Option, the stripes shall be 150 mm (6 in) wide.

- The minimum length for Type I and Type II Barricades shall be 600 mm (24 in), and the minimum length for Type III Barricades shall be 1,200 mm (48 in). Each barricade rail shall be 200 to 300 mm (8 to 12 in) wide. Barricades used on expressways, freeways and other high-speed roadways shall have a minimum of 174,000 mm2 (270 in2) of retroreflective area facing road users.

- Ballast shall not be placed on top of any striped rail. Barricades shall not be ballasted by non-deformable objects such as rocks or chunks of concrete.

Section 6F.62 Temporary Traffic Barriers as Channelizing Devices:

- Temporary traffic barriers shall not be used solely to channelize road users, but also to protect the work space. For nighttime use, the temporary traffic barrier shall be supplemented with delineation.

Section 6F.69 Lighting Devices:

- Although vehicle hazard warning lights are permitted to be used to supplement rotating or strobe lights, they shall not be used instead of rotating or strobe lights.

Section 6F.70 Floodlights:

- Floodlighting shall not produce a disabling glare condition for approaching road users.

Section 6F.74 Temporary Traffic Control Signals:

- One-lane, two-way motor vehicle traffic flow (see Chapter 4G) requires an allred interval of sufficient duration for road users to clear the portion of the temporary traffic control zone controlled by the traffic control signals. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the temporary traffic control zone.

Section 6F.75 Temporary Traffic Barriers:

- Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if

they are used to channelize motor vehicle traffic. The delineation or pavement marking color shall match the applicable pavement marking color.

Section 6F.76 Crash Cushions:

- Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced.

- Stationary crash cushions shall be designed for the specific application intended.

- The shadow truck shall be positioned a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.

Section 6F.80 Future and Experimental Devices:

- New traffic control devices shall conform to the provisions for design, use, and application set forth in this Manual. New traffic control devices that do not conform with the provisions in this Manual shall be subject to experimentation, documentation, and adoption following the provisions of Section 1A.10.

Section 6G.02 Work Duration:

- Mobile operations that move at speeds greater than 30 km/h (20 mph), such as pavement marking operations, shall have appropriate devices on the equipment (that is, rotating lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.

Section 6G.06 Work on the Shoulder with No Encroachment:

- When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct motor vehicle traffic to remain within the traveled way.

- When used for shoulder work, arrow panels shall operate only in the caution mode.

Section 6G.11 Work within the Traveled Way of Multi-Lane, Non-Access Controlled Highways:

- When a lane is closed on a multi-lane road, a transition area containing a merging taper shall be used.

- When temporary traffic barriers are placed immediately adjacent to the traveled way, they shall be equipped with appropriate channelizing devices, delineation, and/or

other temporary traffic control devices. For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area.

- When only the left lane is closed on undivided roads, channelizing devices shall be placed along the centerline as well as along the adjacent lane.

- When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

Section 6G.12 Work Within the Traveled Way at an Intersection:

- When work will occur near signalized intersections where operational and capacity problems are anticipated, the highway agency having jurisdiction shall be contacted.

Section 6G.14 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway:

- When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing motor vehicle traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate) or with channelizing devices throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

Section 6G.18 Work in the Vicinity of Highway-Rail Grade Crossings:

- When highway-rail grade crossings exist either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be stopped on the railroad tracks with no means of escape. If the queuing of vehicles across the tracks cannot be avoided, a law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

Oregon Temporary Traffic Control Handbook for Operations of Three Days or Less (OTTCH), December 2011

Section 4.1 Signs:

- Unless otherwise noted, all warning signs used for temporary traffic control shall have standard black legends and borders on an orange background except signs for emergency response which may be black legends and borders on florescent pink. A fluorescent yellow boarder may be added to truck-mounted signs to enhance their visibility.

- All warning and regulatory signs used for temporary traffic control shall be retro reflective.

Section 3.6.5 Flagger Apparel:

- (a) While on duty, flaggers shall be fully clothed. Do not wear abbreviated clothing such as swimsuits, shorts, tank tops or halter tops.

- (b) Flaggers shall wear safety apparel meeting ANSI 107-2004 Class II risk exposure. Consider using Class III apparel for night work to enhance flagger visibility.

Section 3.5.1 Flagger Station Practices:

- Flagger stations shall be located such that approaching road users will have sufficient sight distance to be able to stop at the intended stopping point.

Section 3.8 Night Flagging:

- When flaggers and/or pilot cars are necessary during night operations, flagger stations shall be illuminated, and shall be illuminated separately from the work space.

Section 3.4.2 Flagging Principles:

- DO NOT CONTROL TRAFFIC BY FLAGGING IN CONFLICT WITH NORMAL INTERSECTION TRAFFIC CONTROL.

Section 3.6 Flagging Signs & Equipment:

- The Flagger Ahead (W20-07) sign (symbol or text) shall always precede flaggers.

- (1) Flaggers shall use a minimum 18" X 18" octagon-shaped retroreflective STOP/SLOW paddle. The paddle shall be made of a rigid material and the full face of the STOP and the SLOW sides shall be visible and legible at all times when the paddle is in use.

Manual on Uniform Traffic Control Devices, 1988 Edition, American National Standards Institute (ANSI) D6.1e – 1989

Section 6A-5 Fundamental Principles:

- All traffic control devices used on street and highway construction, maintenance, utility or incident management operations shall conform to the applicable specifications of this Manual.

- Adequate warning, delineation, and channelization by means of proper pavement markings, signing, and use of other devices which are effective under varying

conditions of light and weather should be provided to assure the motorist a positive guidance in advance of and through the work area.

Section 6B-3 Position of Sign:

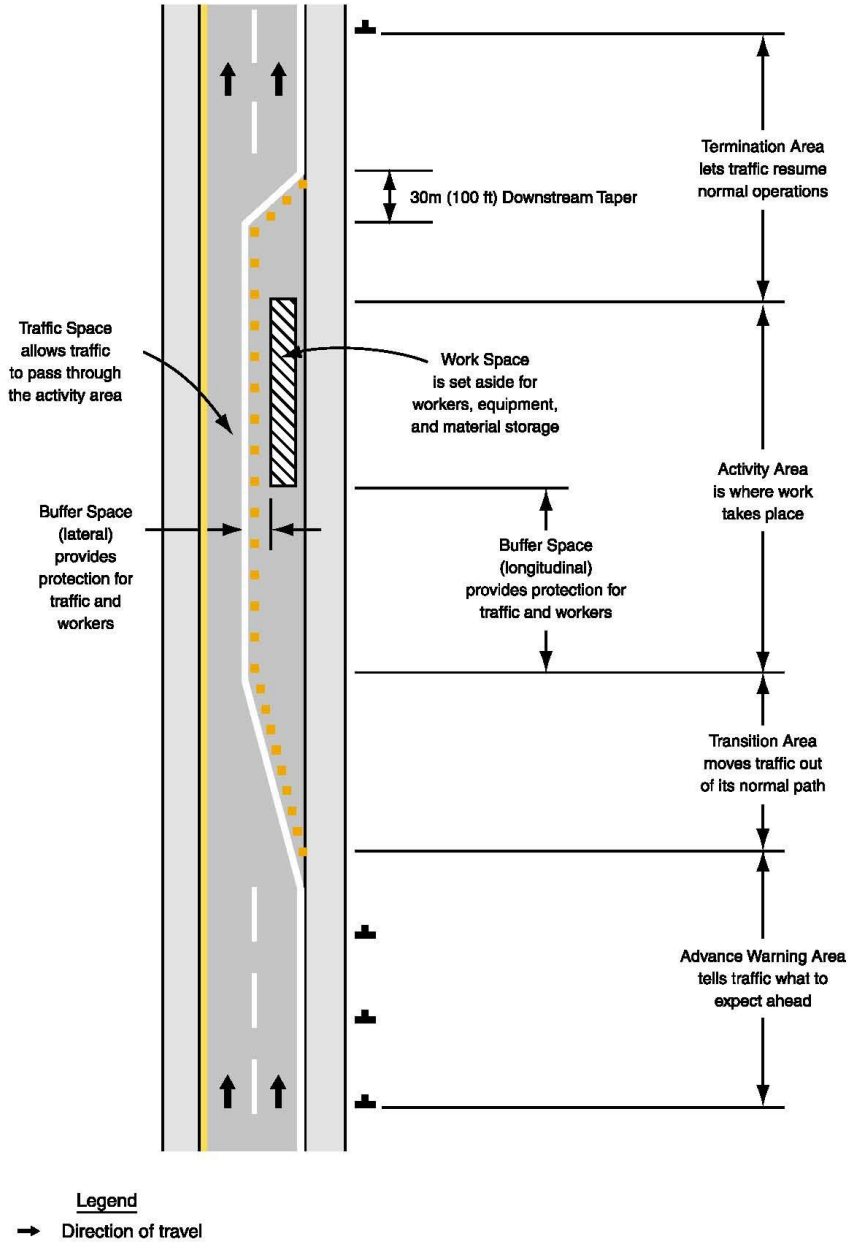
- Signs shall be placed in positions where they will convey their messages most effectively and placement must therefore be accommodated to highway design and alignment. Signs shall be placed so that the driver will have adequate time for response.

Section 6F-5 Flagger Stations:

- Flagger stations shall be located far enough in advance of the worksite so that approaching traffic will have sufficient distance to reduce speed before entering the project.

APPENDIX C

Component Parts of a Temporary Traffic Control Zone



Source: Millennium Edition of the (FHWA) Manual of Uniform Traffic Control Devices (MUTCD), December 2000, page 6C-4, Figure 6C-1.