Chapter 2
Temporary Traffic Control Devices (TCD)
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CHAPTER 2 TEMPORARY TRAFFIC CONTROL DEVICES (TCD)

2.0 – KEY TOPICS COVERED IN THIS CHAPTER
- Purpose & Principles of Traffic Control Devices (TCD)
- Crashworthy Devices
- TCD Categories
- Detailed Descriptions of TCD

2.1 – PURPOSE & PRINCIPLES OF TCD

The primary purpose of Traffic Control Devices (TCD) is to provide for the safe movement of traffic through or around the work zone. Safety for roadway users and workers within the work zone is enhanced through uniform usage of TCD. Temporary traffic control devices are used to:

- Regulate
- Warn
- Guide

When temporary traffic control devices are installed consistently within the work zone, driver expectancy and compliance can be optimized. The consistent and proper application of TCD in the work zone performs two vital functions in a successful work zone:

- Reduce the frequency of crashes
- Reduce the severity of crashes

Individuals assigned the responsibility of assuring safe and effective work zones are knowledgeable in the general principles behind temporary traffic control devices.

TCD used in work zones should exhibit the following characteristics. These characteristics are considered key principles for temporary traffic control devices:

1) Fulfill a need
2) Command attention
3) Convey a clear & simple meaning
4) Command respect from road user
5) Give adequate response time

It is imperative TCD are consistent and correctly applied within work zones to provide the road user necessary information to negotiate the work zone safely.

Inappropriate TCD are devices not needed for the current conditions within the work zone, and should be turned away from traffic, covered, or removed from the roadway. Legibility and visibility of the devices should be maintained through the life of the project. Damaged, dirty or improperly functioning devices must be repaired or replaced in a timely manner to maintain their effectiveness.
2.2 – CRASHWORTHY DEVICES
The Federal Highway Administration (FHWA) policy requires all TCD used in a work zone on the National Highway System (NHS) be crashworthy. FHWA adopted the testing guidelines established by the AASHTO Manual for Assessing Safety Hardware (MASH).

MASH is an update to and supersedes NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features, for the purposes of evaluating new highway safety hardware. An implementation plan for MASH, adopted jointly by AASHTO and FWHA, states that all highway safety hardware accepted prior to the adoption of MASH (January 1, 2010), using criteria contained in NCHRP Report 350, may remain in place and may continue to be manufactured and installed on the NHS.

Highway safety hardware accepted using NCHRP Report 350 criteria is not required to be retested using MASH criteria. If a Report 350 approved device is updated or modified, affecting its structural characteristics or its performance (e.g. changes in materials, physical shape, size, weight, etc.), the device may require retesting under the MASH criteria.

New highway safety hardware not previously evaluated must utilize MASH for testing and evaluation. New MASH testing procedures include changes to design vehicles, variety in barrier design, safety performance, levels of roadway utilization, and criteria for impact severity. It provides a broad range of testing to establish a uniform basis for the application of roadside TCD to the level of use of the particular roadway.

All TCD used on Oregon State Highway construction projects must be listed on the ODOT Qualified Products List (QPL). ODOT ensures each device meets the established crashworthy guidelines before a device is used on the NHS. Signal poles are exempt. Each device is reviewed according to the ODOT Product Review Guidelines before the device is deemed Qualified and placed on the QPL. Occasionally, a device is categorized as “Conditional” and placed on the Conditional Use List. The Conditional Use List is used for products that meet established crashworthy guidelines, but when ODOT wants to evaluate the product controlled conditions before moving them onto the Qualified list. A designer or contractor may use devices on the Conditional Use List, but the Project Manager or Contractor may have to conduct a field evaluation.

“Crashworthy” means a device has met the established testing and evaluation criteria of MASH (or Report 350 for older or existing devices) and has received a “Letter of Acceptance” from the FHWA.

Work zone traffic control devices have been classified into four categories by the FHWA, each having its own testing requirements.

**Category 1** – Low-mass devices with a known performance history. Vendors may self-certify the crashworthiness of these devices. Category 1 devices include tubular markers, conical markers, and plastic drums.

**Category 2** – Devices with a higher mass and can pose a greater risk to the public if struck. Because of their higher mass, Category 2 devices typically require crash testing (e.g. Barricades, sign supports, and most temporary signing).
Category 3 – Category 3 devices pose a more significant risk to the public if not adequately protected or installed correctly. Category 3 devices require more complex crash testing. Examples include impact attenuators, concrete barrier, and guard rail systems, etc.

Category 4 – These devices pose the greatest risk to motorists as temporary TCD. Category 4 devices are usually trailer-mounted and should be shielded from traffic, when practical. At a minimum, if used on the roadside and not placed behind a barrier system, these devices should be heavily delineated using other Category 1 and 2 retro-reflective devices. Currently, Category 4 devices do not require crash testing, as FHWA is in the process of developing specific crash testing standards for them. Examples of Category 4 devices include sequential arrow boards, PCMS, portable traffic signals, and automated flagger assistance devices (AFAD).

Crashworthy Test Level: In general, devices used on State Highways should be tested to the appropriate speeds used on the Highway. It is recommended to use Test Level 3 (TL-3) or higher devices for all highways, regardless of the posted speeds. Test Levels are defined in the AASHTO Roadside Design Guide, NCHRP Report 350, and MASH.

- Test Level 1 (TL-1) devices can be used on highways with speeds of 35 mph or less.
- Test Level 2 (TL-2) devices can be used on highways with speeds of 45 mph or less.
- Use Test Level 3 (TL-3) devices on highways with speeds greater than 45 mph.

NOTE: Lights are NOT to be added to any channelization device (drums, barricades, etc.) in Oregon. To eliminate the need for large, potentially hazardous batteries, ODOT does not include supplemental warning light devices on its portable channelization devices.

2.2.1 - AMERICAN TRAFFIC SAFETY SERVICES ASSOCIATION (ATSSA)
The ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features” is a set of guidelines users should refer to in evaluating the condition of TCDs in the field. The guidelines are written into the Standard Specifications and the Contractor is contractually obligated to use devices that meet the guidelines. Use new or “Acceptable” TCD for all installations. Replace TCD not meeting the “Acceptable” criteria.
2.3 – CATEGORY 1 DEVICES

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<th>Examples of Devices Included</th>
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<td>Self-Certified Crashworthy</td>
<td>Tubular and Conical Markers</td>
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<tr>
<td>• Light Weight devices &lt; 100 lbs.</td>
<td>• Plastic Drums</td>
</tr>
<tr>
<td>• No potential for device to penetrate vehicle windshield or cabin</td>
<td>• Temporary Delineators</td>
</tr>
<tr>
<td>• No significant effect on control or trajectory of an impacted vehicle</td>
<td>• Pavement Markers</td>
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2.3.1 - TUBULAR AND CONICAL MARKERS

The most commonly used temporary traffic control devices for delineating the roadway and channelizing traffic through the work zone are tubular markers and cones. Tubular markers are typically a two-part device with a separate rubber base weighing between 12 and 18 pounds. Cones are often one or two-piece devices. Two-piece cones have a rubber base similar to tubular markers.

Tubular markers are effectively used to override existing pavement markings for shorter-duration applications (daily shift work or stationary work in place less than three days). For longer operations, the existing pavement markings are removed and temporary pavement markings are applied. While Section 6F.77 of the 2009 MUTCD calls for the maintenance of pavement markings for all “long-term stationary work zones”, ODOT recognizes that this is not always practical or cost-effective. Section 6F of the MUTCD also states:

警告标志、渠化装置和标线应被用于指示TTC区域中所需道路使用者路径，当不可能提供清晰路径时。

Warning signs, channelizing devices and delineation shall be used to indicate required road user paths in TTC zones where it is not possible to provide a clear path by pavement markings.

For most pavement preservation projects, or other projects constructed in short time segments, removing exiting markings and applying temporary markings is not practical. Therefore, under the allowances suggested in Chapter 6F of the MUTCD, exercise judgment in selecting either temporary pavement markings or channelization devices to provide guidance for drivers in the work zone.

Tubular Marker types:

- **Standard Tubular Markers** - Orange plastic with silver-white reflective bands. Rubber base used as ballast.
- **Surface Mounted Tubular Markers** – Similar to a standard tubular marker, but installed with an adhesive base to restrict movement of the device.
- **‘Blue’ Tubular Markers** - Blue plastic with blue reflective bands. Used to delineate selective business accesses within a work zone.
When applied on an ODOT construction project, standard spacing for tubular markers and cones is speed-dependent and are spaced at either 20 or 40 feet apart. At speeds of 45 mph or greater, the 40 ft. spacing is used. For low-speed conditions (< 25 mph) or around intersection and access radii, a spacing of 10 feet is recommended.

### 2.3.2 - TEMPORARY PLASTIC DRUMS

Temporary Plastic Drums are the largest, most visible of the “soft,” (deformable) channelization devices. Like tubular markers and cones, plastic drums are used to delineate travel lanes, identify work areas, construct lane closure tapers, and delineate PCMS and temporary traffic signal installations. Due to their larger size and higher target value, plastic drums are effective in creating a visual separation between the work area and live travel lanes. Because of this advantage, plastic drums are used extensively on Oregon high-speed divided highways and are required on Oregon freeways for some functions.

Alternating bands of orange and silver-white retro-reflective sheeting are used on plastic drums. This “encapsulated lens, wide-angle, retro-reflective“ sheeting provides excellent visibility for the drums in the daytime or nighttime and in a variety of inclement weather conditions.

Due to their proximity to traffic, drums can have the tendency to shift slightly out of place at the passing of larger vehicles or during high wind conditions. To compensate, drums include a rubber ring (weighing at least 10 lbs.) installed around the base to add ballast to the drum without impeding its crashworthiness. However, a second ring can be added to the drum base to resist further movement. No other means of ballast are allowed to anchor drums.

### 2.3.3 - TEMPORARY DELINEATORS

Temporary delineators are used to supplement normal pavement edge delineation (tubular markers, striping, etc.) to indicate the roadway alignment. The mounting height of the reflector should be approximately four feet above the edge of the roadway surface. Temporary Delineators should be used on temporary roadway alignments as required by the MUTCD (Ch. 3F) and as shown on the Standard Drawings (TM 570, etc).

“Type W-1” (white) delineators are installed along both sides of a two-way roadway, and along the right side of a one-way roadway. The left side of a one-way roadway will be delineated with “Type Y-1” (yellow) delineators.

Traffic delineator spacing and installation details are shown on Standard Drawings TM570, TM571, TM575, and TM576.
2.3.4 - TEMPORARY PAVEMENT MARKINGS & MARKERS

Temporary pavement markings are used to provide guidance for traffic passing through a work zone where the normal traffic path has been disrupted by construction staging.

Temporary markings are used for long term stationary work zones greater than three days. Use channelization devices for short term stationary work zones and mobile work zones. Temporary markings are also used to enhance and delineate runs of temporary concrete barrier and temporary on-site diversions. The decision to use a certain temporary pavement marking or marker should follow the guidance in the MUTCD, ODOT Traffic Line Manual, and ODOT Pavement Marking Design Guidelines and be supported by the Region Traffic Engineer.

TEMPORARY STRIPING

The most common type of temporary pavement markings is temporary striping (paint). Temporary striping is a fast, economical, and effective means of providing required markings, and can be easily paved over.

Temporary and permanent striping must be accounted for during all aspects of construction staging. Determine the best placement for temporary striping while also considering the placement of permanent striping at the completion of the project. Staging may incorporate a combination of permanent and temporary striping.

Temporary striping must meet the same layout requirements for permanent striping. Refer to the ODOT Traffic Line Manual for striping details.

Consider the duration of the project when calculating quantities for Temporary Striping. If the project is expected to last through multiple seasons – particularly over the winter, a second, or even third application of striping may be needed. Inclement weather, sanding treatments, snowplows, and studded tire wear can have a significant impact on the durability and visibility of Temporary Striping.

It is essential to consider roadway delineation as part of a temporary Traffic Control Plan. Pavement markings are critical in providing clear and positive guidance for drivers as they pass through a work zone.

STRIPE REMOVAL

Stripe removal is an important aspect to consider during plans development. According to the Standard Specifications, stripe removal may be accomplished by sandblasting, hydro-blasting, steel shot blasting, or grinding. Grinding of striping is not permitted on final permanent wearing surfaces.

If temporary striping is used, removal of conflicting existing pavement markings and reflectors is required. Include adequate quantities of “Stripe Removal” in the TCP to account for existing marking removal.

If durable materials (e.g. thermoplastics) are to be used for permanent striping, ensure that the placement of temporary striping will not adversely affect placement of the durable materials. It may be necessary to identify in the Special Provisions (or on plan sheets) to off-set temporary markings so as to avoid the application of the durable markings in their permanent location.
**TEMPORARY STRIPING ON STAGE SURFACES**

Often, the total depth of the new pavement is too thick to complete the entire section in one lift. Lifts of pavement are placed one at a time. Drivers may be required to drive on an intermediate lift until the final lift (finish lift, or wearing surface) can be placed. Traffic may be shifted onto a temporary diversion (a temporary surface adjacent to the existing roadway) to allow for construction of the new pavement without having traffic in the active work area.

The interim driving surface will require temporary pavement markings until the next lift can be placed and markings can be applied.

Occasionally, temporary striping is needed on the final lift to allow completion of other road work before permanent striping is applied and traffic is shifted to its final position. When temporary striping is needed on the final lift, to minimize damage to the pavement surface, Standard Specifications – Section 00225.43(g) – instruct the contractor to do the following:

- Place temporary tape or simulate lines using pavement markers.
- When durable striping will be used for permanent markings, apply a reduced application of temporary striping (paint) immediately adjacent to the location for the permanent striping. The paint will be allowed to wear off without having to grind off the paint.

As a Designer, be aware of the planned material for the permanent markings and make any necessary adjustments to the TCP.

**TEMPORARY PAVEMENT LEGENDS, CROSSWALKS, & STOP BARS**

Pavement Legends (e.g. Right Turn or Left Turn Arrows, “ONLY”, “RR XING”) are applied to the pavement prior to an intersection or decision point and are used to inform the driver of the direction that they are allowed to take in a particular lane or to warn them of an approaching condition. Existing and temporary pavement legends, crosswalks, and stop bars should be maintained during construction. Pavement legend examples include Right-Turn or Left-Turn arrows in dedicated turn lanes, “SCHOOL XING”, “ONLY” or “RR XING” legend, where applicable. Bicycle legends may be included in designated bicycle lanes or along shoulders.

Quantities and payment for pavement legends are made by “each”.

Temporary pavement markings (striping and tape) are also used for crosswalks and stop bars in areas where work obscures existing markings or markings are relocated due to staged construction. Do not use temporary pavement markers to represent crosswalks or stop bars.

To calculate the quantity of striping needed for a crosswalk, use the following process:

1) Measure the length of the crosswalk
2) Multiply the distance by two (to account for the two parallel bars)
3) Multiply this quantity by three (each 12-inch bar is made of three 4-inch temporary stripes)

Use the same process for each stop bar, excluding Step 2) above.

Quantities and payment for temporary crosswalks and stop bars is made by the “square foot”. 
STRIPING QUANTITIES FOR MULTIPLE SEASON PROJECTS

Some construction projects extend through the winter months and must “winter over.” Winters in Oregon can be very harsh on pavement markings, especially in work zones. Consider additional striping quantities when the project is expected to extend into or beyond the winter months, to account for additional applications.

If the project runs for multiple seasons, adjust temporary striping quantities to account for multiple application(s) of temporary striping. The ADT and geographical location of the highway segment can affect the quantities for temporary striping.

DURABLE STRIPING

Durable striping (e.g. methyl methacrylate, thermoplastics or other polymer-based products) is used exclusively for permanent striping. When staging traffic from their original lanes to a temporary alignment this striping may conflict with the temporary alignment.

In this case, decide which of the following techniques is the safer, more practical and cost-effective method for protecting and guiding traffic:

- Removing the existing durable markings and replacing them later
- Covering durable markings with temporary, non-reflective, removable tape (“blackout” tape)
- Place channelization devices (cones, tubular markers, drums) to create new lanes for the shifted traffic

A strategy for dealing with durable markings should be based on factors such as duration needed for the temporary markings, quantity of durables in conflict, location of the project, age of the existing durable markings, traffic volumes, and complexity of the temporary traffic shift.

Discuss the decision with the Region Construction office and other stakeholders to avoid unnecessary removal of the durable striping.

TEMPORARY TAPE

Temporary Tape may be used in lieu of temporary striping. When consideration is needed for damage to the roadway surface, temporary tape can be an excellent alternative material. Temporary tape is commonly applied to concrete roadways, bridge decks or other finished-grade surfaces that are not being overlaid as part of the project.

Three classifications of temporary tape exist:

- Removable
- Non-Removable
- Removable, Non-Reflective (“Blackout”)
**Temporary Removable Tape** – Provides an effective, short-term (3-6 months) alternative to striping with the added benefit of leaving behind minimal traces or damage to the pavement surface.

Temporary Removable Tape is typically used in lieu of temporary striping or pavement markers on concrete pavements, including bridge decks.

Similar to temporary striping, temporary removable tape is useful in a number of applications:

- Skip and solid lines during staging
- Used on existing or new bridge decks to avoid damage
- Temporary crosswalks or pavement arrows
- Used as an option for finish lift AC paving

**Temporary Non-Removable Tape** – Provides an equally effective alternative to striping; however, due to its adhesive nature, is better suited to a pavement surface that is to be removed or overlaid later in the contract.

Temporary Non-Removable Tape is used for several unique applications:

- To secure pavement markers for Emulsified Asphalt Concrete (EAC) or Cold In-place Recycled (CIR) preservation projects
- Used as temporary markings prior to an AC overlay

**Temporary Removable, Non-Reflective Tape** – Commonly referred to as “Blackout” tape, it is typically used to temporarily cover durable markings. When a facility has existing durable markings, consider using removable, non-reflective tape as an alternative to grinding off the existing markings. This is desirable when the existing pavement surface is not being affected and a final wearing course is not being applied as part of the scope of work.

Chapter 6F of the MUTCD does not allow existing striping to be painted over with black paint or bituminous material. The standard accepted practices for long-term projects are to remove all inappropriate striping, or to cover existing striping with temporary removable, non-reflective tape. The intent is to mask the existing durable striping. When staging is completed, the “blackout” tape is removed and the existing durable striping is retained.

While non-reflective tape is more expensive than temporary striping, the removal and replacement of durable markings is significantly more expensive. In addition, coordinating the reinstallation of durable markings is difficult due to limited availability of durable marking contractors.

**PAVEMENT MARKERS**

Pavement Markers are used to simulate or supplement temporary striping. The raised reflective surfaces of the markers make them effective devices especially at nighttime or during wet weather.

Pavement markers are available in three different forms:

- Reflective Pavement Markers (commonly known as, “buttons”)
- Flexible Overlay Pavement Markers (commonly known as, “tabs” or “stick-n-stomps”)
- Flexible Oiling Pavement Markers (with a disposable plastic cover protecting the reflector)
Temporary Reflective Pavement Markers

The markers are either mono-directional or bi-directional, meaning they have reflectors on one side or on both sides.

Mono-directional markers are typically used to simulate skip lines in multi-lane sections or to supplement a painted line. See the ODOT Temporary Traffic Control Standard Drawings for examples of pavement marker use.

Bi-directional markers are used to delineate the centerline of a two-lane roadway, or the double-yellow markings in the median or turn-lane of a multi-lane, non-freeway section.

Reflective markers can be installed on either AC or concrete surfaces; however, if installed on AC surfaces, a bituminous adhesive should be used. If installed on a PCC surface, an epoxy adhesive should be used.

When specifying temporary pavement markers to be used on new or existing open graded AC pavements, the adhesive has a tendency to penetrate into the pavement. Remove marker without damaging the pavement surface.

NOTE: Field personnel should use caution in the quantity of adhesive used to install pavement markers. Too much adhesive can make removal of the marker difficult, as well as leave large quantities of unsightly adhesive on the roadway surface.

Flexible Overlay Pavement Markers

These are used primarily during pavement preservation projects (HMAC overlays, EAC, CIR, etc.) to simulate the existing striping. These types of preservation projects obliterate centerline striping, thus requiring temporary pavement markings until permanent striping can be replaced.

The quantity of flexible markers and the method by which they are installed will depend on both the type of work being done and the ADT of highway section. There is no difference in the pay item, whether an oiling cover is provided or not. The markers are measured and paid for as “each”.

Flexible Oiling Pavement Markers:

These are used primarily during preservation projects such as Emulsified Asphalt Surface Treatments (EAST), commonly referred to as, “chip seals”. Flexible markers are used to simulate the existing striping that is covered by the paving process. The markers are identical to the Overlay marker, except it has a plastic cover to protect the reflective face. The cover is removed after the oil is spread onto the roadway.

The quantity of flexible markers and the method by which they are installed will depend on both the type of work being done, the duration the devices will be needed, and the ADT of the highway section.
2.4 – CATEGORY 2 DEVICES

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<td><strong>Barricades – Type I, Type II, and Type III</strong></td>
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<td><strong>Sign Stands – Portable, TSS, and Posts</strong></td>
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<td></td>
<td><strong>Tripod mounted devices</strong></td>
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</table>

Device is not expected to produce significant vehicular velocity change, but may otherwise be hazardous.

2.4.1 - TYPE I, II AND III BARRICADES

Barricades are used for several purposes including:

- Type I and II barricades are typically used on pedestrian facilities and multi-use paths for delineating closures and as pedestrian signing supports.

- Type III barricades are regularly used for the following:
  - Delineating signs mounted on Temporary Sign Supports (TSS)
  - Delineating portable changeable message signs (PCMS), sequential arrow boards, or a temporary portable traffic signal trailers
  - Placed at regular intervals in a closed lane to remind drivers the lane is closed to traffic
  - Placed in the roadway in advance of and at the point of road closures

Type III barricades (most common) can be specified in 4, 6 and 8 ft. widths, depending on the application the barricade is used for and the space available for the placement of the barricade. See ODOT Temporary Traffic Control Standard Drawings for additional details in using or placing barricades. Type “R” barricades are placed on the right side of traffic, traffic is supposed to pass on the left of the barricade when facing the barricade. Type “L” barricades are placed on the left side of traffic, traffic is supposed to pass on the right side of the barricade when facing the barricade. Type “LR” barricades are placed in between two streams of traffic going in the same direction, traffic is supposed to go on either side of the barricade, currently Type “LR” barricades may also be used for roadway closures. Type “C” barricades are placed in a roadway to close the roadway to traffic.

When included on TCP plan sheets, add the proper designation for each barricade:

- For placing an 8 ft. Type III Barricade on the right side of the road, use the following designation on plan sheet(s):
  - **8’ III(B)R**

“R” refers to side of the road that the barricade is to be placed – in this case, the Right side. The stripes on the panels will point down and to the left. If calling for a narrower barricade, replace the 8’ with the appropriate width – 4’ or 6’.
• For placing two 8’ Type III Barricades for a road closure, the designation on the plan sheets would be: \(2 – 8’ \text{ III(B)C}\). The “C” indicates the stripes on the panels will slope toward the center of the barricade.

**Signs and Lights on Barricades**

The MUTCD Section 6F.03 allows the installation of temporary signs on Type III barricades, if barricade/sign combination is crashworthy. Installing temporary signs on barricades is not an ODOT standard practice.

Temporary signs that must be installed in the roadway for durations exceeding three consecutive days should be installed on a Temporary Sign Support (TSS). The use of the TSS allows the temporary sign to be installed 7 feet above the pavement surface for added visibility. The barricade is added in front of the TSS, as per ODOT *Temporary Traffic Control Standard Drawings*, to provide higher target value, additional delineation and visibility of the sign – particularly at night.

All barricades used on State Highways must be selected from the QPL and conform to ODOT Temporary Traffic Control Standard Drawings. See the Standard Drawings for examples of the Barricades placed in various work zones.

ODOT requires barricades to have retro-reflective sheeting on one side of the barricade panels only. Sheeteting on both sides of the barricade is not allowed for barricades used on State Highways.

Adding flashing warning lights on barricades is not an ODOT standard practice. Other agencies may choose to include them on barricades. However, the combination of the light and barricade must be deemed crashworthy and comply with all applicable DEQ requirements for the power supplies.

### 2.4.2 - TEMPORARY SIGNS

Exhaust the following resources when determining the text, configuration, sizing, color, usage and placement for Temporary Signs:

- ODOT “*Sign Policy & Guidelines for State Highway Signs*”
- “*Standard Highway Signs*” (SHS) manual published and maintained by the FHWA
- *Manual on Uniform Traffic Control Devices (MUTCD)*

Temporary signage is used to convey regulatory, guidance, and warning messages. Appropriate signing must be visible and legible during construction activities, and updated, covered or removed, as activities change. Temporary signs can be moved about within the work zone, as needed; or, installed in fixed locations for the duration of the project. When the design of a sign is not provided in the documents listed above, a separate design will be needed and must be included in the contract plans.
2.4.3 - SIGN SHEETING

“O3” – There are a few specific type “O3” signs. Type “O3” signs use an orange, ASTM Type III or Type IV sheeting background with black non-reflective permanent legend and red retro-reflective symbols (e.g. STOP or Yield Ahead Symbol sign).

“O4” – Most work zone signs are designated as Type “O4”. Type “O4” signs use fluorescent orange, ASTM Type VIII or Type IX sheeting background with black, non-reflective permanent legend.

“O5” – A few signs require removable legends. Type “O5” signs use fluorescent orange Type VIII or Type IX sheeting background with black, non-reflective removable legend.

“O6” – The Signal Ahead symbol sign is a Type “O6” sign. Type “O6” signs use fluorescent orange Type VIII or Type IX sheeting background with black, non-reflective permanent legend and red, yellow, and green Type VIII and Type IX circles.

“O8” – The Speed Reduction symbol sign is a Type “O8” sign. Type “O8” signs use fluorescent orange Type VIII or Type IX sheeting background with black, non-reflective screened or cut-out permanent legend and silver-white Type VIII or Type IX symbol.

Other standard highway signs are available for use during temporary traffic control. Examples include Regulatory, Guide, and Service signs, these signs design and sheeting will match the permanent sign. One exception to this is that any Type “Y1” (yellow) sign can be fabricated using Type “O4” (orange) sheeting for work zone applications.

Roll-up signs are allowed to be used for signs in work zones. Roll-up sign sheeting complies with current retroreflectivity standards.

2.4.4 - SIGN FLAGS AND SIGN FLAG BOARDS

Sign Flags (flexible fabric) and Sign Flag Boards (rigid plywood) can be used to draw a driver’s attention to a temporary sign. Sign flags are required on all portable roll-up signs, per the MUTCD.

Sign flag boards (with Type “O4” sheeting) can be used to enhance the visibility of a temporary sign that may otherwise go unnoticed. For example, a temporary Speed Zone sign (see photo) looks like a permanent sign, but would be displaying a lower speed. It is important for drivers to notice this reduction, and using the flag boards can help achieve this. Critical detour signing or other regulatory signs (Temporary STOP signs, etc.) can also benefit from the added target value.

Sign flag boards are specified for Freeway Projects, Detour warning signs, and Road Closed warning signs in the ODOT Specifications. Use sign flag boards sparingly, particularly for temporary signs that are already made using fluorescent orange sheeting.
2.4.5 – ROAD WORK XX MPH AND LOOSE GRAVEL XX MPH SIGNS

**Definition**

The “ROAD WORK XX MPH” sign provides an advisory travel speed through the work zone based on the work activity and the roadway conditions. The “XX” number on the sign should be a safe, reasonable speed for drivers given the current work zone conditions or configuration.

The “LOOSE GRAVEL XX MPH” sign is used specifically for Emulsified Asphalt Surface Treatment (“Chip Seal”) pavement preservation projects or other projects where the roadway surface is temporarily covered by or made up of an unpaved surface.

**Application**

Typical values for “XX” are 10 – 20 mph below the pre-construction posted speed. However, the reduced speed on these signs does NOT allow a Designer to use a reduced Design Speed, nor is the displayed speed on this sign a regulatory speed. The displayed speed is only advisory.

The “XX” portion of the sign may be placed directly on the sign or added as a Velcro placard. The “XX” portion of the sign shall have a fluorescent orange background with black, non-reflective legend.

**Do not** use white sheeting and black legend for the “XX MPH” placard on these signs.

Avoid the overuse of these signs, as it can accelerate the loss of their effectiveness. Use sound engineering judgment when including these signs in the TCP.

**Responsibility**

In determining the appropriate speed for the “XX” placard on the signs, seek assistance from ODOT Region Traffic staff or the ODOT Traffic-Roadway Section.

A 10 mph reduction below the pre-construction posted speed is most commonly used for the value of “XX”. Larger reductions are heavily dependent upon the type of work being conducted and other traffic control measures in place on the project. If conditions or configurations within the work zone change, the speed on the “XX” placard can be adjusted to suit those changed conditions.

If values greater than 20 mph below the posted speed are needed, the traffic control plan should be revisited and additional measures implemented to enhance safe traffic speeds through the work zone.

As examples, a 40 mph “XX” placard may be used in a 55 mph work zone due to a temporary curvilinear alignment or a narrowed roadway. Or, a LOOSE GRAVEL XX MPH sign may display a 35 mph placard on a 55 mph roadway during a chip seal operation to minimize the likelihood of flying gravel.
2.4.6 - SPECIALTY SIGNS

There are a number of ODOT specific “Specialty Signs” that are frequently included in a TCP. These signs are used to provide additional information to the traveling public as a courtesy.

PROJECT IDENTIFICATION SIGN (CG20-8)

The “YOUR TAX DOLLARS AT WORK” Project Identification sign is used to identify an ODOT and OTIA highway construction project. From the current ODOT Special Provisions in Section 00225, if all of the following criteria are met, the Project ID sign is to be included in the TCP:

- Project duration exceeds one month
- Highway segment ADT > 500
- Project budget exceeds $1 million

For Urban projects where space is limited, a smaller sign may be used (left sign):

Project ID signs should be installed in advance of all other work zone signing, including the initial “ROAD WORK AHEAD” sign. For ODOT construction projects, the Engineer (ODOT Construction Project Manager) typically determines the sign legend once the contract is awarded. The “KEEPING OREGON ON THE MOVE” rider is included with the Project ID sign. For more information on Project Identification signs, refer to Chapter 6 of the ODOT Sign Policy ODOT & Guidelines Manual available on the ODOT Traffic Section website.

BUSINESS ACCESS SIGN (CG20-11)

The “BUSINESS ACCESS” sign is used to identify a private business access which may be obscured or otherwise impacted by construction. In combination with the “Business Access” sign, blue tubular markers are used to improve the visibility and delineation for the business access while under construction.

2.4.7 - SIGN SUPPORTS

WOOD SIGN POSTS

Wood posts are the most common type of support for temporary signs. Details for the installation of Temporary Signs on wood posts can be found in the ODOT Standard Drawings for Temporary Traffic Control (Series 800) and for Signs, Illumination and Signal Support Structures (Series 600).

SQUARE TUBE SIGN SUPPORTS

Square Tube sign supports are an alternative to wood posts for the installation of Temporary Signs. Square tube sign supports are listed on the QPL. Sizing and gauge of the posts based on the sign size table provided by the post manufacturer. Metal square tube sign post installation details may be found in the ODOT Standard Drawings for Temporary Traffic Control (Series 800) and for Signs, Illumination and Signal Support Structures (Series 600).
Metal posts are a popular alternative to wood due to cost, ease of installation and the ability to reuse the posts at the conclusion of the project.

**TEMPORARY SIGN SUPPORT (TSS)**

A Temporary Sign Support (TSS) is a crash-worthy wooden support that can be used in lieu of in-ground wood or metal post installations. TSS can be repeatedly positioned to maximize the effectiveness of a temporary sign. A temporary sign support is useful when:

- A sign must be placed in the roadway, on a shoulder, paved island or other rigid surface
- Roadside ground is too hard or soft for an in-ground installation
- A sign is expected to move several times over the life of the project
- A sign is in place for a short duration (i.e. less than one week)
- The location of in-ground signs would conflict with underground utilities

See the ODOT Temporary Traffic Control Standard Drawings for TSS details. Contractors must build a TSS as shown in the Drawings for it to be crashworthy. A TSS is crashworthy from all four directions. However, a TSS should never be tipped over. A TSS has not been crash-tested in this orientation. Single-post and Double-post designs are shown on the **Standard Drawings**.

When not in use, the sign on the TSS should be covered; or, the TSS can be turned away from traffic or removed from the roadway completely.

When a TSS is exposed to live traffic; and, not behind guardrail or concrete barrier or removed a substantial distance from the roadway, the TSS must be delineated by placing a Type III barricade (4 or 8 ft. wide) in front of it. See additional details on the ODOT Standard Drawings.

The maximum total sign area allowed on a double-post TSS is 40 ft\(^2\) (e.g. the 4’ x 8’ and 1’ x 8’ Project ID sign combination). For the single-post TSS, the maximum total sign area is 9 ft\(^2\). Due to dead load and wind loading limitations, and unknown crash-testing results, larger signs should not be installed on a TSS. A structural support (bridge, sign bridge, luminaire post, etc.), steel breakaway support (e.g. TBB), or equivalent, should be used.

**PORTABLE SIGN SUPPORT**

The Portable Sign Support (PSS) is used to mount a roll-up sign for short-term or intermittent work. According to the MUTCD, roll-up signs on Portable Sign Supports may be in place for a maximum of 72 consecutive hours. However, ODOT construction contracts limit the use of roll-up signs to **48 consecutive** hours to avoid having signs left in place over a weekend.

Roll-up signs are most useful for operations that occur on a daily basis – installed in the morning, and then taken down in the evening at the end of the work shift. It should be noted that when the sign is taken down at the end of a shift the “48 consecutive hour” clock starts over. This practice may be repeated for the duration of the project as long as the sign is not left in place for more than 48 **consecutive** hours.
Traffic Control Plans Design Manual

hours. If the sign is needed longer, it should be installed on a TSS or in-ground post. All signs should be turned, covered or removed when their messages are not applicable or appropriate to the work environment.

**CONCRETE BARRIER SIGN SUPPORT**

Barrier sign supports are used to install temporary signs on concrete barrier where space for a TSS or post-mounted sign is not available. See the ODOT Temporary Traffic Control Standard Drawings for design details for this support.

The barrier sign support can be used on either standard 32-in barrier or the taller 42-in “Tall F” barrier. The maximum total sign area allowed on the current barrier sign support is 9 ft².

If installing the initial “ROAD WORK AHEAD” sign on a barrier sign support in the median, do not include either sign flag boards or the “FINES DOUBLE” (or other) rider. Sign flag boards and the “FINES DOUBLE” rider can be added to the “ROAD WORK AHEAD” sign on the right shoulder, if the sign group is installed on a post or TSS.

**EXISTING SIGN SUPPORTS**

Temporary signs may be added to or replace existing signs installed on existing highway sign supports and structures with the appropriate approval from the local road jurisdiction. ODOT approval includes working with the ODOT Sign & Structures Engineer or equivalent.
2.5 – CATEGORY 3 DEVICES

<table>
<thead>
<tr>
<th>CATEGORY 3</th>
<th>Examples of Devices Included:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHWA Crashworthy</td>
<td>• Temporary Impact Attenuators</td>
</tr>
<tr>
<td>Devices or hardware expected to cause significant velocity change or other harmful reactions to impacting vehicles.</td>
<td>• Temporary Pre-cast Concrete Barrier</td>
</tr>
<tr>
<td></td>
<td>• Temporary Guardrail, Connections, Transitions, and End Terminals</td>
</tr>
<tr>
<td></td>
<td>• Temporary Bridge Rail</td>
</tr>
<tr>
<td></td>
<td>• Breakaway Sign Supports</td>
</tr>
</tbody>
</table>

2.5.1 - TEMPORARY CONCRETE BARRIER

Temporary concrete barrier is one of the most common temporary traffic control devices used in longer-term construction work zones. It provides traffic with positive separation from the work area and effective protection for construction workers.

Several factors should be considered when determining the need or quantity of temporary concrete barrier in the traffic control staging plan.

Temporary Concrete Barrier is primarily used to:

- Provide positive separation between the work area and live traffic
- Provide a well-protected work area for construction personnel
- Protect opposing traffic streams from cross-over crashes
- Protect traffic from deep excavations or hazards adjacent to the traveled way
- Contain or redirect errant vehicles away from roadside obstructions or active work areas

SPRECAST CONCRETE BARRIER

Requirements:

Standard “F” Barrier must meet the fabrication specifications shown on ODOT Standard Drawing RD500 and in Section 00820 of the Standard Specifications for Construction.

A flat, paved, 3 ft.-wide surface is required behind unpinned temporary concrete barrier to allow for proper deflection and energy dissipation. The 3-ft clearance behind barrier shall be free of all permanent and temporary obstructions, including construction materials, parked vehicles, etc.

When placing barrier in front of obstructions (e.g., bridge falsework, abutments, sheet piling, temporary retaining walls, columns, etc.), if a 3-ft clearance cannot be provided, the barrier must be pinned* to the pavement surface and provide a 1-ft minimum clearance from the obstruction. Barrier pinning details can be found on the Temporary Traffic Control Standard Drawings.

* For barrier placed on concrete bridge decks, see the ODOT Bridge Section’s Bridge Design and Drafting Manual (BDDM), Section 1.1.21.4 and Standard Details DET3295 and DET3296 for information.
Where the barrier run terminates, the following techniques can be used to protect the exposed blunt ends of the concrete barrier:

- Install a temporary impact attenuator (sand barrel array or narrow site system) at the end of the barrier run
- Temporarily place a Truck mounted impact attenuator (TMA) at the end of the run (for a maximum of three days)
- Use a temporary barrier connection between the barrier run and other railing system (e.g. guardrail, bridge rail, or other concrete barrier) – See ODOT Standard Details for connections
- Overlap the exposed end with an adjacent run of concrete barrier (see ODOT Standard Detail)
- Completely bury the blunt end in a roadside cut slope

**PRECAST TALL (42”) BARRIER**

**Requirements:**

With its 42-in height, Tall “F” barrier is primarily installed in the medians and on the shoulders of Interstate freeways and the State Highway Freight System. It is used at sites of adverse geometry (e.g. alignments with curve radii < 280 (205 ft.) where severe consequences would result if a heavy vehicle penetrates the barrier. It can also be installed on facilities with high truck percentages (DHV > 250).

Tall “F” barrier must meet the specifications shown on ODOT Standard Drawing RD545. The same placement requirements for Standard “F” barrier apply to Tall “F” barrier.

Tall “F” barrier provides effective protection against median crossover crashes – particularly from large trucks. In Test Level 3 (TL-3) and 4 (TL-4) testing, Tall “F” barrier performed very well, seeing deflections of approximately 32 inches.

In the Traffic Control Plan, Tall “F” barrier may be used as temporary barrier. However, Tall “F” barrier, when used as temporary barrier, is often left on the project and used as permanent barrier. Due to the limited availability and greater difficulty with moving this type of barrier, it is impractical to specify Tall “F” barrier to be used **exclusively** as temporary barrier.

For pinning “Tall F” barrier to the roadway, see ODOT Standard Drawing RD516.
2.5.2 - TEMPORARY GLARE SHIELDS

Temporary glare shields are installed along the top of concrete barrier between two opposing traffic lanes. Glare shields are used to prevent opposing traffic headlight glare from impairing a driver’s visibility.

Glare shields are typically installed where traffic must maneuver through a curvilinear alignment (e.g. freeway crossover) resulting in vehicle headlight beams aiming into the path of oncoming vehicles.

Space glare shields along the top of concrete barrier in accordance with the following table:

<table>
<thead>
<tr>
<th>Curve Radius (ft.)</th>
<th>Number of Blades per Section</th>
<th>Spacing (Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>To</td>
<td></td>
</tr>
<tr>
<td>Tangent Sections</td>
<td>5</td>
<td>2’ 6” +</td>
</tr>
<tr>
<td>∞</td>
<td>1500</td>
<td>2’ 1” +</td>
</tr>
<tr>
<td>1500</td>
<td>750</td>
<td>1’ 10” +</td>
</tr>
<tr>
<td>750</td>
<td>500</td>
<td>1’ 7” +</td>
</tr>
<tr>
<td>500</td>
<td>350</td>
<td>1’ 5” +</td>
</tr>
<tr>
<td>350</td>
<td>275</td>
<td>1’ 3” +</td>
</tr>
</tbody>
</table>

2.5.3 – TEMPORARY GLARE SCREEN

Temporary glare screens are installed along the top of concrete barrier between a traffic lane and the work zone. Do not mount glare screens on concrete barrier located between opposing traffic lanes. Glare screens are used to prevent traffic from slowing down due to gawking to view adjacent construction activities.

Glare screens are typically installed in bridge projects on freeways where construction activities are near traffic, to prevent drivers from slowing down to view the activities.

Temporary Glare Screens are measured and paid for as, “per foot”.

2.5.4 - REFLECTIVE BARRIER PANELS

Reflective barrier panels are 4-in wide, 36-in long corrugated aluminum panels with either fluorescent orange or silver-white reflective sheeting covering one side of the panel (see photo, right).

Reflective barrier panels are used to delineate the face of concrete barrier and enhance their conspicuity.

Barrier panels are typically installed in curvilinear sections of a barrier run; however, the beginning and ending curves of a temporary barrier run are most beneficial in assisting drivers through the unfamiliar alignment.

Reflective barrier panels are measured and paid for as, “per each”.

2.5.5 - TEMPORARY IMPACT ATTENUATORS

Temporary impact attenuators (or “crash cushions”) are crashworthy systems that mitigate the effects of errant vehicles that strike fixed objects. Temporary impact attenuators, when struck by a vehicle, absorb the energy of the vehicle and dissipate it within the system in a variety of ways – by breaking apart (drum arrays), by rapidly collapsing and decelerating (TMAs and some gating narrow-site systems), or deflecting slightly and redirecting the errant vehicle (non-gating narrow-site systems). Impact attenuators for temporary applications are listed in the ODOT QPL under “Impact Attenuator, Temporary”. Impact attenuators are available in a wide variety of styles for use under various applications:

- **Drum Array** – Sand-filled array of plastic drums (sand modules). See ODOT Temporary Traffic Control Standard Drawings for additional details.

- **Narrow-Site Systems** – A Narrow-Site impact attenuator system is used to protect the blunt end of concrete barrier, bridge rail, columns or other narrow, fixed objects within the clear zone. Most narrow-site systems are approximately two-feet wide, making them a valuable and practical device in protecting traffic from these hazards when a full-size drum array attenuator will not physically fit.

- **Truck Mounted Attenuator (TMA)** – A TMA is a mobile impact attenuator attached to a work or shadow vehicle that is used to temporarily protect objects or small, active work areas or exposed hazards. A TMA should be used to protect the active work areas. Locate the TMA in advance of the object, work area, equipment or workers as recommended by the manufacturer and approved by the Engineer. A TMA should not be used for the long-term protection of barrier or other fixed objects (no more than approximately 3 consecutive days).

See Section 6F.86 of the MUTCD for additional information regarding temporary impact attenuators.

2.5.6 - TEMPORARY BARRIER OR GUARDRAIL CONNECTIONS

Use Temporary Connectors to connect one type of barrier system to another. Use Temporary Connectors as an alternative to Temporary Impact Attenuators, overlapped or buried ends, or other blunt end treatments for these devices. Several devices are available to connect runs of temporary concrete barrier with other barrier systems including existing barrier, bridge rail and guard rail sections.

**BARRIER-TO-GUARDRAIL CONNECTORS**

Some barrier installations are situated where either the leading or trailing end may need to be connected to guardrail or other railing system. This requires a secure connection between the two runs to prevent a vehicle from snagging on the joint between the two systems. See ODOT Standard Drawing RD530 and others for examples of a barrier-to-barrier connection system.

Temporary Connectors are paid for under the “Temporary Protection & Direction of Traffic” (TP&DT) lump sum pay item. Connectors are measured as “per each”.

Oregon Department of Transportation
Traffic Control Plans Unit

April 2014
Chapter 2
**BRIDGE RAIL CONNECTORS**

Frequently, bridge rail is terminated by attaching the rail to a run of guardrail to protect the hazard. See ODOT Standard Drawings BR203 for an example of this type of connection. This connection detail may be used for temporary or permanent applications.

**MOVEABLE CONCRETE BARRIER (ZIPPER)**

Moveable Concrete Barrier is typically used for staging projects requiring multiple and frequent moves of the concrete barrier.

Moveable Concrete Barrier must be moved by a special machine designed to transfer the barrier in a mobile operation. Both the barrier and the machine are included in the contract as a pay item. ODOT currently owns a transfer machine and over two miles of Moveable Concrete Barrier. If it is advantageous to include this device on the project, consult with ODOT Region 1 in Portland.

There are specific Narrow Site Attenuators available for the Moveable Concrete Barrier. The attenuators attach to the end of the barrier run and can be picked up and placed by the same machine used for the barrier.

Moveable Concrete Barrier has a higher deflection when struck by an errant vehicle. Use caution in placing this barrier too close to a deep excavation. Due to the nature of this device, Moveable barrier should never be pinned to the roadway.
2.6 – CATEGORY 4 DEVICES

<table>
<thead>
<tr>
<th>CATEGORY 4</th>
<th>Examples of Devices Included:</th>
</tr>
</thead>
</table>
| **FHWA** Crashworthy or protected | • Sequential Arrows (‘Arrow Boards’)  
• Portable Changeable Message Signs (PCMS)  
• Automated Flagger Assistance Devices (AFAD)Portable Traffic Signals  
• Portable Light Plants (Not flagger station lighting) |
| • Portable, primarily trailer-mounted  
• Need to be shielded or, at a minimum, delineated  
• **FHWA** continues to monitor in-service crash performance  
• **MASH** encourages the design and testing of crashworthy versions  
• Good placement practices |

2.6.1 - TEMPORARY ELECTRICAL SIGNS

SEQUENTIAL ARROW SIGNS

Sequential Arrows (arrow boards) are large truck or trailer-mounted lighted signs used to indicate the direction traffic needs to merge as part of a lane closure. Several approved sequential arrows are listed on the ODOT QPL.

Sequential arrows shall only be used to indicate a lane closure. Do not use a sequential arrow sign to indicate a traffic shift. Do not use a sequential arrow to indicate a “Keep Left” or “Keep Right” condition. Sequential arrows are measured and paid for as either “per each” or on an hourly basis. See Section 6F.61 of the MUTCD for additional information.

PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)

PCMS are large lighted signs used to display programmable, dynamic messages that reflect work zone conditions to be encountered by approaching traffic. PCMS can be mounted on either a trailer or work vehicle. Trailer-mounted PCMS can display three lines of text. Depending on the size of the unit, a vehicle-mounted PCMS can display either two or three lines of information. Several approved PCMS are included on the ODOT QPL.

Installation and delineation details for a PCMS can be found in the ODOT Temporary Traffic Control Standard Drawings.

ODOT has published a quick reference field guide “Oregon Portable Changeable Message Sign Handbook”, which provides guidance for the operation of portable changeable message signs (PCMS), including proper messages, application and placement of the devices.

Messages displayed on a PCMS should be complete, independent thoughts. Avoid displaying a message that relies on the second message to complete the thought. In practice, one message (**panel**) should be used to describe a situation or condition. The second panel should be used to convey supplemental information, an additional warning or direction for drivers.
Standard practice for a PCMS dictates that a maximum of two alternating panels are to be displayed on a single PCMS. However, under limited circumstances, it may be necessary to use an additional panel address a specific segment of drivers or complex thought (e.g., oversize vehicles, or a complex detour). In no case should there be more than three panels on a single PCMS. If more than three panels are needed, an additional PCMS should be installed in sequence. If a second PCMS is installed, do not install any temporary signing between the two PCMS to maintain the integrity of the complex PCMS message sequence.

Due to limitations in the number of characters, abbreviations may be required. Abbreviations should follow the guidance in the MUTCD on Tables 1A-1, 1A-2, and 1A-3. Messages may include distance information expressed in feet or miles. Each panel is limited to three lines with eight characters per line (including spaces). Additional PCMS information can be found in Section 6F.60 of the MUTCD.

A PCMS may be used to display arrows and chevrons to simulate a sequential arrow board. Do not combine arrows/chevrons with text on the same panel. Arrows and chevrons used on a PCMS must comply with the graphical guidance given in the MUTCD. Animation, other graphics, logos, web sites, etc, shall not be displayed on a PCMS.

When including suggested messages on a TCP sheet, use the following format:

```
<table>
<thead>
<tr>
<th>TRAFFIC SHIFT</th>
<th>LANES SHIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MILE</td>
<td>LEFT</td>
</tr>
</tbody>
</table>
```

(Suggested Message)
(Locate As Directed)

### 2.6.2 - TEMPORARY TRAFFIC SIGNALS

A temporary traffic signals is typically used to control the flow of traffic through a one-lane, two-way work area. Signals are often used in lieu of flaggers due to the duration of the two-way, one-lane operation.

The use of a temporary signal is limited to applications where a number of criteria are examined and can be met, as follows:

- ADT is typically below 3500
- Analysis shows delays of less than 20 minutes
- Adequate sight distance can be provided between STOP bars at each end of the work area
- Cost comparison made between the signal and flagging show the signal being more economical
- Other environmental conditions that would favor the signal over human flagger control

Public roadways between the limits of the temporary signal must be considered. The intersecting roadway can either be incorporated into the operation of the signal with the addition of another signal head or the roadway can be closed and a detour route determined.
Private accesses (driveways, businesses) within the signalized area should not be allowed. Attempts should be made to provide a reasonable alternative access. However, depending on volumes, right-of-way constraints, economic impacts and political climates, it may be necessary to incorporate the private access into the signal as described above.

Other road users, including pedestrians and bicyclists, should be considered when designing a temporary signal. If a significant number of other road users can reasonably be expected, then the project and the temporary signal needs to accommodate them. Bike lanes, bike detection, separate bike/ped facilities are some of the options available to designers.

Temporary Signals can be used for the following work zone conditions:

- One-lane, two-way configurations
- During the installation of a new permanent signal
- To control traffic through an intersection being reconfigured
- For the reconstruction of an interchange ramp terminal

Temporary traffic signals are often selected over flagging when construction staging will require the one-lane, two-way traffic operations for several weeks or more*. In lieu of two flaggers 24-hours/day and two Advance flaggers 8-hours/day during peak times, temporary signals are preferred for:

- Two-lane bridge replacements
- Rock fall or side slope excavation projects

* Use of a temporary traffic signal becomes more cost-effective where one-lane, two-way traffic staging lasts approximately 28 consecutive days or more.

The design of the temporary signal may be prepared by an ODOT Region Tech Center Signal Designer, a consulting engineer, or by qualified staff within the individual agency.

Approval for the installation of a temporary signal on a State highway is granted by the State Traffic Engineer. Similar to a permanent signal, a plan showing the locations of all portable traffic signal equipment, as well as any other traffic control devices to be used in conjunction with the portable traffic signal must be submitted for approval. Approval for temporary signals on city or county roadways is granted by the responsible Traffic Engineer within these individual agencies.

2.6.3 - PORTABLE TRAFFIC SIGNALS

Portable traffic signals are temporary traffic signals mounted on a trailer. Portable traffic signals are subject to all of the same requirements for temporary traffic signals, including State Traffic Engineer review and approval.

Portable traffic signals should be considered when a temporary signal is needed for a limited duration, ideally less than one month. Portable traffic signals are also ideal when electricity is not readily available. Most portable traffic signals are powered by batteries, recharged by generators or solar panels.
Portable traffic signals should not be used at locations where there is more than one travel lane in each direction. However, they may be permissible on divided four-lane roadways, two lanes in each direction, if a separate set of signal heads is provided for each additional travel lane. Portable traffic signals typically should be used at locations where the posted construction speed is less than 35 MPH; however, for limited applications, speeds up to 55 mph may be applicable. When not in use, signal indications and all related traffic control devices should be either removed or covered.

Portable traffic signals are no longer limited to two phase operations. Newer signal technologies are allowing multiple phases and wireless connectivity. Under proper conditions, a portable signal can be used at intersections for limited durations. At most intersections, a temporary traffic signal (span wire) is usually a better option.

Use portable traffic signals from the QPL. Refer to the ODOT Traffic Control Plan Standard Drawings for additional guidance as to the layout and additional TCD needed for the signal.

2.6.4 - FLAGGER STATION LIGHTING

Flagger Station Lighting shall be reasonably glare-free. Flagger Station Lighting must come from the QPL. Flagger station lighting illuminates the Flagger during nighttime operations, while minimizing the glare experienced by approaching drivers.

2.6.5 - AUTOMATED FLAGGER ASSISTANCE DEVICES (AFAD)

The AFAD is an automated device used as an option to control traffic within a two-way, one-lane work zone operation. The AFAD is a trailer-mounted device that includes a remotely controlled gate arm that can be raised or lowered across a single travel lane to control the flow of traffic. In addition, 12” red and flashing yellow signal lights are installed on the trailer; steady “red” to alert drivers of a STOP condition; and, flashing “yellow” to allow drivers to proceed through the work area.

Currently, ODOT allows the use of AFADs from the QPL to be used in its work zones with a number of application and operational conditions. ODOT has adopted these conditions based on recently published standards and guidance in the 2009 MUTCD. ODOT has developed both a Standard Detail (DET4700) and Special Provision language addressing the use of AFADs within an ODOT highway construction project.

ODOT practice in using AFADs differs from the 2009 MUTCD by disallowing the use of a single AFAD trailer at one end of the work zone to be operated by a Flagger who is simultaneously flagging traffic at the other end of the work area.

Review the current AFAD Special Provision language and the Standard Detail for additional design standard and practice information. See Sections 6E.04 and 6E.05 of the MUTCD for more information regarding AFADs.
2.7 – SPECIALTY TCD BID ITEMS

2.7.1 – PEDESTRIAN CHANNELIZING DEVICE (PCD)

Use pedestrian channelizing devices (PCD) for providing a continuous, ADA-compliant accessible pedestrian facility during construction. PCD are orange/white retro-reflectorized, 32” tall lightweight continuous barriers designed to be ADA compliant and to channelize pedestrians. Pedestrian channelizing devices are interlocked to form a rigid, stable, continuous guidance system through or around a work site.

PCD may be used at the following locations:

- Street or sidewalk construction activities adjacent to or in the vicinity of pedestrian facilities (e.g. pole base, footing or other excavations)
- As channelization for sidewalk diversions

See ODOT Standard Drawing TM844 for typical applications for the PCD and accompanying signing. Use Pedestrian Channelization Devices from the ODOT QPL. The Pedestrian Channelization Device bid item is paid for “per foot” by the total length of the installed system.

Pedestrian Channelizing Devices should be used on both sides of a facility when providing a continuous, ADA compliant route. The PCD may be omitted on one side of a continuous, ADA compliant route if that side of the route has a detectable edge and there is no falling or tripping hazard. When an ADA compliant route is not necessary, but the PCD is used to channelize pedestrians through or separate them from a work zone, the PCD may be used on either side of the route.

When pedestrians are not expected but there is still a need for a soft barrier between public traffic and the work area, use Work Zone Fencing.

2.7.2 - OVERHEIGHT VEHICLE WARNING SYSTEM (OVWS)

The OVWS is a warning system used to alert over-height vehicles of an upcoming restricted vertical clearance. The device relies on microwave and infrared technologies to signal a vehicle whose physical height exceeds that of the posted height restriction. The OVWS provides both an audible and visual warning. The PCMS displays instructions as to an alternate route around the restriction.
The OVWS are most effective on high-volume facilities with a significant percentage of truck traffic. Interstate freight routes are prime facilities.

Typically, the request to use this device comes from members of the Project Development Team who are familiar with the construction limitations and the available roadway facilities around the project site. Use OVWS from the QPL.

### 2.7.3 – PROTECTIVE NETTING

Protective netting refers to the material used to protect traffic passing below a bridge under construction. When construction occurs over travel lanes, or when there is the danger of construction equipment, tools, material, or debris falling onto pedestrians or traffic, use protective netting.

Protective netting may also be called for on projects where an overhead work area crosses an active stream, creek, river or other body of water.

Construction activities using protective netting may include:

- Overpass construction (e.g. deck preparation, rail work, protective fencing, painting, etc.)
- Sign bridge construction
- Bridge falsework
- Bridge maintenance
- Tunnel repair/construction

Contact the ODOT Bridge Section to determine design details, measurement/payment, and necessary specifications for protective netting.

### 2.7.4 - FALSEWORK ILLUMINATION

Falsework Illumination refers to a temporary lighting system attached to the falsework of a structure under construction, where the falsework is located adjacent to live travel lanes and/or extends over the travel lanes. Falsework Illumination typically consists of a long string of amber-yellow lights framing the falsework portal that traffic passes through.

Falsework Illumination is paid for as part of the “Temporary Protection & Direction of Traffic” (TP&DT) lump sum pay item.

### 2.7.5 - POLE BASE COVERS

Pole base covers protect pedestrians from open footing excavations created as part of the installation of a utility pole. Pole base covers are typically comprised of utility grade plywood sheeting.

Pole Base Covers are paid for as part of the “Temporary Protection & Direction of Traffic” (TP&DT) lump sum pay item.