Chapter 1010 Work Zone Safety and Mobility

1010.01 General

Effective work zone traffic control (WZTC) strategies allow all road users to successfully maneuver through or around work areas while still permitting needed work to be completed efficiently and economically. How the project is built is just as important as what is built. Work zones are interdependent with design, construction, maintenance, and traffic operations. Understanding this relationship promotes more successful and cost-effective projects. Identify WZTC strategies early in the project development process as WZTC strategies can affect design elements. Planners, designers, construction engineers, maintenance personnel, and others all play a role in developing a comprehensive work zone design.

There is no "cookbook" solution to work zone design. Work zone design is based on general guidance and best practices; however, effective work zone design requires innovation, adaptation, and ingenuity and is as much art as science. This chapter provides the designer with guidance to develop comprehensive work zone strategies and plans to address a project's safety and mobility benefits/improvements for all modes, as well as constructability. A systematic process for addressing work zone impacts is required by federal regulations and state policy.

1010.02 Work Zone Design Strategy Meeting & Statement

In the Scoping phase, hold a Work Zone Design Strategy Meeting with Region Transportation Operations ("Region Traffic") and other attendees as appropriate such as:

- Bridge and Structures
- Construction
- Maintenance
- Communications
- Virtual Coordination Center
- Rail
- Freight and Ports
- Public Transportation
- Active Transportation
- Local Agencies
- Law Enforcement

Participation will help determine whether a project is classified significant or non-significant, develop work zone mitigation strategies to address the needs of various divisions and road users, and establish an understanding for the project's initial direction.

The Design Team develops a Work Zone Strategy Statement and submits it to Region Transportation Operations for acceptance early in design. Include the accepted Work Zone Strategy Statement in the 30% or 60% Design Approval package. The Statement is meant to be a high-level, concise overview of the project and proposed work zone mitigation strategies. The Statement includes the following information as a minimum:

- Whether the project is classified as significant or non-significant
- Anticipated WZTC strategies, closures, and staged traffic configurations (state if used or not)
- Concurrence from Region Transportation Operations on any anticipated proposed regulatory speed limit reduction and/or advisory speeds
- An explanation/justification for any proposed high-impact closures or restrictions.

1010.03 Transportation Management Plans and Significant Projects

1010.03(1) Transportation Management Plan (TMP)

A TMP is a set of strategies to manage the work zone mobility and safety impacts of a project. TMP development begins in Scoping by assessing various WZTC strategies, evaluating their expected impacts, and then selecting mitigation strategies and design solutions to manage those impacts. It is very important to continue the development of the TMP throughout the project development process as it is an iterative process.

See Section 1010.03(2) for TMP requirements for non-significant and significant projects.

Traffic Control Plans and Contract Provisions are required for all projects. Not all work zone impacts have to be addressed with traffic control plans only. Many work zone impacts can be reduced or eliminated through project design elements like alignment choice, materials selection, structure types, overbuilding, and phased construction. Work zone impacts related to work duration may be resolved or reduced through innovative bidding and contract administration.

For design-bid-build projects, the TMP is developed by Design and reviewed/approved by the Region Transportation Operations Office. For design-build projects, WSDOT may begin a preliminary TMP during Scoping and Project Development, but the TMP is completed by the Design-Builder and approved per the requirements of the RFP.

A TMP may include temporary modification to design elements outside the ranges discussed in the Design Manual. For example, a work zone may temporarily reduce lane and shoulder widths. These temporary design element modifications are justified and documented in the TMP. They do not require a Design Analysis.

The TMP Document Checklist in Exhibit 1010-2 will help identify and organize TMP components; not all components will be used on every project. For significant projects, develop this checklist and the supporting plans, data, impacts assessment, strategies, work zone traffic analysis and endorsements into a formal TMP Document to be included in the Project File.

For TMP Document examples, see:

- Traffic: Work zone traffic control (WZTC) | WSDOT (wa.gov), "Tools, templates & links" tab.
- http://ops.fhwa.dot.gov/wz/resources/final_rule/tmp_examples/sample_tmps.htm
- http://ops.fhwa.dot.gov/wz/resources/publications/trans_mgmt_plans/trans_mgmt_plans.pdf

1010.03(1)(a) Temporary Traffic Control

Temporary Traffic Control (TTC) components are those strategies for directing traffic through the work zone and mitigating adverse impacts. These components are to be included in the Plans, Specifications, and Estimates (PS&E) as Traffic Control Plans or Staged Traffic Plans along with contract provisions.

See the following sections for detailed information on the several types of TTC strategies:

- 1010.04(5) Temporary Traffic Control Strategies
- 1010.04(6) Staged Traffic Control Strategies
- 1010.04(7) Roadway Closures and Detours
- 1010.04(8) Pedestrian and Bicyclist Accommodations

1010.03(1)(b) Transportation Systems Management and Operations (TSMO)

The TSMO components are those operations-focused strategies for managing transportation demand, corridor/networks, and traffic incidents in addition to work zone safety enhancements and smart work zone systems that improve traffic flow and safety through the work zone. Some of these strategies may be included in the PS&E but could also be WSDOT-managed elements outside the contract. See Section 1010.04(9) for detailed information.

1010.03(1)(c) Public Information

The Public Information (PI) components are those strategies for raising awareness of the upcoming project impacts or current restrictions. PI strategies may be developed and implemented by WSDOT through the region or Headquarters (HQ) Communications offices and implemented before and during construction. See Section 1010.04(10) for detailed information.

1010.03(2) TMP Requirements for Significant & Non-Significant Projects

Transportation Management Plan components for design-bid-build and *design-build* projects are as follows:

Non-Significant Projects	Significant Projects
Temporary Traffic Control Plans	Temporary Traffic Control Plans
Contract Special Provisions *Request for Proposal Section 2.22*	Contract Special Provisions *Request for Proposal Section 2.22*
TMP Document Not Required + Temporary Modification to Design Element Explanations + Commitments/Agreements with Other Agencies & Stakeholders	TMP Document Required 1. Temporary Traffic Control (TTC) Strategies 2. Transportation Systems Management & Operation (TSMO) Strategies 3. Public Information (PI) Strategies + Temporary Modification to Design Element Explanations + Commitments/Agreements with Other Agencies & Stakeholders + TMP Roles & Responsibilities, Contact Information

Significant projects, as defined per federal law in 23 CFR Part 630 J, are defined as:

1. A project that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable by state policy and/or engineering judgement (Since Washington has no state policy, region/local agency management will determine this threshold).
2. All Interstate system projects within the boundaries of a designated Transportation Management Area that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects unless FHWA grants an exception request based on the State's ability to show the project does not cause sustained work zone impacts.

For Significant Projects: A TMP Document is required per 23 CFR Part 630 J in addition to the temporary traffic control plan and contract provisions. The TMP Document's size and scale depends on the project's complexity and extent of adverse road user impacts but should be expanded as appropriate.

Significant Projects may require a Value Engineering (VE) study (see Chapter 310) and a Cost Risk Assessment (CRA) or Cost Estimate Validation Process (CEVP) that could help define strategies or identify risks.

For Non-Significant projects: temporary traffic control plans and contract provisions included in the construction contract will be considered the TMP. A TMP Document is still used to document commitments/agreements with other agencies/stakeholders, temporary modification to design element explanations. Temporary Traffic Control, TSMO, and Public Information components to address the work zone impacts should still be considered.

1010.04 Developing TMP Strategies

1010.04(1) Key Considerations

The following list of actions and issues need to be addressed per WSDOT's work zone policy and federal regulations and are key to the successful development of a project's TMP:

- Hold a Work Zone Design Strategy Meeting during Scoping. Afterwards, create the Work Zone Design Strategy Statement and submit it to the Region Transportation Operations Office for acceptance.
- Integrate work zone impacts strategies during Scoping and early in Project Development to develop an accurate scoping estimate and integrate project constructability, work efficiency, and cost efficiency.
- Designers need to possess a good understanding of project constructability (work methods, needed work area, and reasonable work durations to complete the work). Contact the Construction Project Engineering Offices when making decisions on assessing and addressing constructability impacts.
- Designers need to possess a strong understanding of WZTC strategies. Contact the Region Transportation Operations Office to discuss WZTC strategies and obtain preliminary closure hours used to develop traffic control plans, determine project duration, and estimate project costs.
- Designers need to circle back with Construction to assess the project's constructability with the WZTC strategies and preliminary closure hours. This may be an iterative process involving both Construction, the Region Transportation Operations Office, and others as appropriate to arrive to the final WZTC strategies and project's permitted closures and closure hours.
- Identify work zone safety and mobility impacts accounting for all needed work areas, operations, and possible staging areas. Implement appropriate safety strategies based on Work Zone Safety Management in *Traffic Manual* Chapter 5. Address traffic impacts extending beyond the project limits and impacting other roads and consider seasonal/special event/business impacts. The Region Transportation Operations Office can help determine an impact assessment via work zone traffic analysis and develop mitigation strategies.
- Continue developing the Transportation Management Plan throughout Design, refer to the TMP Checklist in Exhibit 1010-2 to help identify and organize TMP components.
- Take work zone training to better understand requirements, standard practices, and expectations including the legally adopted *Manual on Uniform Traffic Control Devices* (MUTCD) with Washington State modifications per WAC 468-95 as the minimum standard to develop adequate traffic control plans

- Approach work zone design from the road user's perspective. Except when required, consider positive protection devices when practical. Use established design criteria in work zone roadway and roadside design. A TMP will justify temporary design element modifications; a Design Analysis is not required.
- Address work vehicle ingress and egress to each work area.
- Consider impacts to freight based on Commercial Vehicle Considerations in *Traffic Manual* Chapter 5.
- Consider impacts to transit operations and impacts to pedestrian/bicycle access to transit facilities.
- Accommodate pedestrian access (including ADA requirements) and bicycle access through or around the work zone.
- Consider school, hospital, emergency services, and postal delivery impacts.
- Consider maintenance issues and needs through the duration of the project.
- Consider law enforcement assistance and enforcement.

1010.04(2) Impacts Assessment

One of the most important tasks in developing a TMP is assessing the mobility impacts and safety performance. Work zone traffic analysis (see Section 1010.05) is used to determine mobility impacts and the right combination of queue mitigation strategies, good public information, advance signing and notification, alternate routes, detours, and work hour restrictions that are needed in addition to innovations such as strategic extended closures, accelerated construction schedules, or other strategic improvements that can be very effective in managing mobility impacts while enhancing constructability and maximizing cost effectiveness.

In general, the longer the work duration the more enhanced the WZTC and mitigation, see Section 1010.04(4). Designers need to work with the construction PE to clearly understand how project features will be constructed, including work methods, equipment, materials, and duration. A complete and accurate impacts assessment allows for the development of an effective TMP that should only need minor modifications.

An early and ongoing impact assessment allows time to develop work zone mitigation and innovative strategies within the design features of the project (such as bridge type/size/location & materials selection, advertisement dates, and extended or full closures to shorten project duration) involving many stakeholders.

Some impacts may be difficult to completely mitigate and may ultimately need a management decision to determine if the mitigated impact is acceptable. These decisions need to be clearly addressed in the TMP Document with documentation supporting and explaining the decision.

The following are some examples of impacts that need to be managed during the design of a project:

Bridge construction sequence or falsework opening plans need to match the Staged Traffic plans. Coordination with the HQ Bridge and Structures Office is essential as the bridge design schedule may differ than the project schedule. Maintain 16 feet 6 inches vertical clearance as the minimum falsework opening whenever possible; if this height cannot be maintained, see Section 1010.06(5). Reduction in right shoulder widths may affect active transportation access and mobility, see Section 1010.04(8)).

1. If existing signal and illumination systems are not able to be maintained during the construction phases, plans for temporary systems or connections need to be included in the project.
2. Temporary relocation or modification of existing signing (including overhead signing) may be required and shall be detailed in the plans.
3. Permanent traffic loop installation (advance loops, turn pockets, stop bars, and ITS loops) and pavement marking installations (crosswalks, arrows, and so on) may require specific TTC plans.

4. The type of temporary markings to be used based on work duration, pavement surface and reducing the potential for a "ghost stripe" on the final pavement surface need to be considered.
5. Staged traffic with long-term lane reductions and/or shifts, see Section 1010.04(6)(b).
6. Roundabout construction at an existing intersection requires site-specific staging plans to address the unique design features.
7. Evaluate impacts to the existing drainage system as discussed in Chapter 5 of the *Hydraulics Manual*, particularly for narrowed shoulders, superelevation and/or widening transitions.

1010.04(3) Transportation Management Plan Strategies (New 2024)

With a completed impact assessment, strategy and mitigation development can begin. There are often several methods available and engineering judgment is used to select the best option. Work closely with bridge, construction, maintenance, and transportation operations office personnel. It is critical to understand the extent of mobility impacts and needed mitigations versus gains in safety for workers and the traveling public, constructability benefits (quality of product and time savings), and cost savings. High short-term impacts (roadway closures or weekend-duration lane closures) may have substantially less overall adverse impacts while allowing Contractors to complete a substantial amount of work versus low impact strategies over longer durations.

Public's acceptance of mobility impacts has a limit, obtain region executive acceptance for strategies with significant impacts and delays. Selecting a strategy is often a compromise and involves many engineering and non-engineering factors. Do not assume strategies from similar past projects will work again, as each project is unique and traffic volumes change. Always look for other options or innovative approaches; many projects have unique features that can be turned to an advantage if carefully considered.

1010.04(4) Work Duration

The duration of work is a major factor in determining a strategy and the amount and types of devices to use for work zone traffic control. In general, longer work duration use temporary pavement markings, post-mounted signs, and temporary barriers (when practical) in addition to TTC devices used for shorter work durations to enhance the work zone traffic control. Projects may have work operations that meet several or all the following:

1010.04(4)(a) Long-Term Stationary Work Zone

Work occupying a location continuously for more than three days. Construction signs may be larger and typically post or barrier-mounted but tripod-mounted is allowed. All conflicting signs, including overhead signs, must be modified, covered, or removed. Larger and more stable channelizing devices should be used, offset 2' from traffic to reduce movement. Temporary barriers, pavement markings, illumination, and other considerations may be required. Staged traffic plans including temporary alignment/channelizing are required for this type of work.

1010.04(4)(b) Intermediate-Term Stationary Work Zone

Work occupying for up to three days. Construction signs are typically tripod or barrier-mounted but may be post-mounted. All conflicting signs, except overhead signs, must be temporarily covered. In addition to channelizing devices, temporary pavement markings lane lines are required but edge lines optional when multiple lanes are laterally shifted in the same direction of travel. Temporary barrier is generally not used. Temporary illumination is used at flagging stations and stop bars of temporary traffic signals during hours of darkness.

1010.04(4)(c) Short-Term Stationary Work Zone

Work occupying a location for more than one hour within a single day; otherwise, are intermediate-term stationary work zones. All short-term work zone devices are placed and removed during the working period.

1010.04(4)(d) Short-Duration Work Zone

Work occupying a location for up to one hour. Short-duration work zones usually apply to maintenance or some utility work and are not used on construction projects. See Work Zone Traffic Control Guidelines for Maintenance Operations, M54-44 for more information.

1010.04(4)(e) Mobile Work Zone

This is work that moves intermittently or continuously where workers are inside vehicles, except for a few minutes infrequently. Mobile operations include activities such as sweeping, paint striping, and raised pavement marker installation. Truck-mounted attenuators with truck-mounted Portable Changeable Message Signs (PCMS) or warning signs provide advance warning and shadow and protect the work vehicles with flashing lights as they move along at low speeds with infrequent stopping. Channelizing devices are typically not used.

Mobile closures are not appropriate for work operations such as pavement milling and paving activities where workers are on foot for significant durations. Instead, stationary WZTC closures are required.

1010.04(5) Temporary Traffic Control Strategies

Temporary traffic control strategies for intermediate or short-term stationary WZTC are in place for three days or less but are typically removed daily/nightly and include but not limited to the following:

1010.04(5)(a) Work Near Traveled Way **(Rewritten 2024)**

If work operations (workers, vehicles, equipment, and materials) remain outside of the work zone clear zone (WZCZ) or behind guardrail or barrier when within the WZCZ then neither warning signage or closure is required.

Work operations within WZCZ but more than 15 feet from the traveled way, appropriate warning signage and channelizing devices along the edge of shoulder should be considered but no closure is required.

1010.04(5)(b) Shoulder Closure

Except for short-duration work operations (less than 60 minutes), a shoulder closure shall be used when work operations or work vehicles are on or partially on the shoulder. When work operations are within 15 feet of the traveled way and within WZCZ, a shoulder closure should be used but appropriate warning signs are required at minimum. When work operations are not on the shoulder, a partial shoulder closure is permitted by placing channelizing devices along or near the edge of shoulder without a protective vehicle or transportable attenuator to maintain a 4-foot minimum pathway for active transportation.

On roadways 40 mph or less, channelizing devices may encroach into the adjacent open lane if a 10-foot minimum lane width is maintained (9-foot on low volume roadways). On roadways 45 mph or higher, if lane encroachment is necessary or work operations occur on paved shoulders less than 8 feet in width the adjacent lane shall be closed as well. Do not use sequential arrow signs and avoid using PCMSs for shoulder closures.

1010.04(5)(c) Lane Shift

On undivided roadways with three or more lanes, a single open lane can be shifted laterally into the closed two-way left turn lane or into the closed left lane in the opposing direction of travel to maintain a thru lane in each direction. Do not use a sequential arrow sign but PCMSs are optional for lane shifts.

1010.04(5)(d) Alternating One-Lane Two-Way Traffic

This strategy alternates traffic in a single open lane under the control of flagger, AFADs, or temporary traffic signals. Pilot cars are used to guide motorists between flaggers or AFADs when separated by more than 1000 feet or two or more intersecting roadways, driveways, or business accesses are present between flaggers. For long-duration closures, use temporary traffic signals during nonworking hours. Flaggers may be substituted for signals during working hours (turn off the temporary signals and modify the signal/flagger signing).

Except in emergencies, these stations shall be illuminated at night with either temporary illumination or existing illumination. Temporary rumble strips may be added in advance to increase driver alertness.

Refer to WAC 296-155-305 for flagging requirements. At least four advanced warning signs required on roadways 45 mph and higher and at least three on roadways 40 mph or less. Flaggers are prohibited on freeways or expressways. Using flaggers solely to instruct motorists to proceed slowly is an unacceptable practice.

Separate flaggers are required for each leg of the intersection; an additional flagger may be added at the center of an intersection. Reduce each direction to one lane approaching each flagger station on multilane roadways. When a signal is present, it shall be turned off or set to red flash mode when flagging.

Uniform police officers (UPOs) may flag from the center of an intersection without flaggers controlling each intersection leg; UPOs may supplement flaggers. It is optional to close lanes and turn pockets approaching UPO-controlled intersections. Two UPOs should be used on multilane roadways. See *Traffic Manual* Chapter 5 for more information on the use of law enforcement personnel in work zones.

1010.04(5)(e) Lane Closure on Multilane Roadways

On multilane roadways with two or more travel lanes in a direction, closing lanes and adjacent shoulders is a common strategy. Additional lanes shall be closed if encroachment is necessary on roadways 45 mph and above and should be closed if encroachment is necessary on roadways 40 mph or less with a 10-foot minimum lane width maintained (9-foot on low volume roadways). A separate sequential arrow sign shall be used at each lane closure taper on roadways 45 mph and above and should be used on roadways 40 mph or less with heavy traffic volumes or limited sight distance (W2-401 sign permitted otherwise on roadways 40 mph or less). Sequential arrow signs are not required to close the two-way left-turn lane or turn lanes at intersections. Sequential arrow signs at interior lane closure (traffic splits) or on-ramp merge tapers are prohibited.

On multilane roadways 45 mph and higher, a 2-foot lateral buffer is provided between the open travel lane and the work area; channelizing devices allowed within this area. Consider closing additional lanes to increase the lateral buffer space for enhanced safety if practical. Lateral buffers are optional on roadways 40 mph or less.

Except at merging and shifting tapers, channelizing devices shall not encroach on the open lanes unless a single open lane is shifted onto the paved shoulder on roadways 45 mph or higher; instead, additional lanes shall be closed if encroachment is necessary whenever two or more lanes are open.

1010.04(5)(f) Single Open Lane Shifted onto Shoulder on Multilane Roadways

For multilane roadways requiring channelizing devices to encroach into the only remaining open lane, that single open lane must be shifted over onto either the left or right paved shoulder. On directional roadways, this shoulder shift configuration is necessitated by work operations including but not limited to:

- Two-lane freeway or divided highway with the work area extending up to the lane line adjacent to traffic for work including HMA pavement, concrete pavement, and/or expansion joint rehabilitation.

- Three-lane freeway with the work area including both lanes and extending up to the lane line adjacent to traffic for work including HMA pavement, concrete pavement, and/or expansion joint rehabilitation.

Reduced speed limits are required for this strategy on freeways and divided multilane highways with existing speed limits 60 mph or higher. See Speed Limit Reductions in Work Zones in *Traffic Manual* Chapter 5.

For travel widths less than 16 feet, see Commercial Vehicle Considerations in *Traffic Manual* Chapter 5.

1010.04(5)(g) Chicane Shift on Multilane Roadways (New 2024)

For work operations requiring access across all lanes in the same work shift, and where it is not feasible or safe to reopen all lanes to swap the traffic control (e.g. switching from left to right lane closures), using a chicane after the initial lane closure to laterally shift a single open lane of traffic from the far right to far left lane, or vice versa, is a viable strategy. Then, the work can continue across the whole roadway within the closure.

Work operations they may necessitate this strategy include but is not limited to:

- Permanent traffic recorder installations with home runs going to one side of roadway.
- Installing/removing temporary roadway reconfigurations with shifted/narrowed lanes.
- Avoid several ramp closures by closing left lanes (to keep ramps open), then using a chicane to create needed right lane closures.

Most of the chicane can be installed within the existing lane closure; however, the portion across the existing open lane must be installed using a rolling slowdown. Typically, the distance between face of channelizing devices is 16 feet at chicane shifts. Do not use sequential arrow sign at chicane shifts.

1010.04(5)(h) Rolling Slowdown

This strategy involves using a slow-moving blockade of traffic control vehicles and/or law enforcement vehicles to create a large traffic gap enabling the completion of work activities requiring exclusive access across or over a directional multilane roadway that otherwise presents a significant risk to road users and workers.

Rolling slowdowns are not to be used for routine work that can be addressed by lane closures or other stationary traffic control strategies. Rolling slowdowns are intended for work operations needing up to 10 minutes of clear time. For longer durations, use directional freeway or roadway closure.

Typical traffic control plan is now available in the WSDOT Typical Traffic Control Plan Library; however, a site-specific traffic control plan is required for complex rolling slowdown scenarios. See Rolling Slowdowns in *Traffic Manual* Chapter 5 for detailed information.

1010.04(5)(i) Directional and Total Multilane Roadway Closures (New 2024)

For work operations requiring exclusive access across or over all multilane roadway lanes for more than 15 minutes, the multilane roadway should be closed either directionally or fully.

Such work operations include but are not limited to:

- Setting new bridge girders.
- Demolishing overhead bridge spans.
- Removing overhead structural falsework spanning over all lanes when lane closures are not sufficient.
- Installing a new sign structure spanning over all lanes.

See Section 1010.04(7) for additional information.

1010.04(5)(j) Traffic Holds

This strategy involves using flaggers and/or uniform police officers to stop traffic in all directions to enable completion of work activities requiring exclusive access across or over the roadway that otherwise presents significant risks to motorists and/or workers. On multilane highways, reduce each direction of traffic down to a single open lane approaching the flagger. Traffic holds are prohibited on freeways, except at on-ramps during rolling slowdowns. See Traffic Holds in *Traffic Manual* Chapter 5.

These traffic holds may be implemented in conjunction with shoulder or lane closures, including alternating one-lane two-way traffic control. Traffic hold durations typically range from a few minutes up to 15 minutes. For rock scaling, tree felling, or similar operations traffic holds up to 30 minutes are permitted when accepted by Region Transportation Operations. Avoid traffic holds exceeding 30 minutes.

Traffic holds are used for work operations including but not limited to:

- Rock scaling and/or tree clearing operations.
- Bridge painting/rehabilitation projects to install containment/falsework across roadway.
- Heavy truck ingress/egress or equipment crossing over roadway.
- Equipment crossing across roadway.

1010.04(6) Staged Traffic Control Strategies (New 2024)

Staged traffic control strategies are used for long-term stationary WZTC in place for eight days or more, and often for months. Staged construction requires combining multiple work operations into a logical order to provide large, protected work areas and separate traffic spaces for long durations, which maximizes work operations and minimizes daily impacts to traffic.

Design temporary alignment and staged traffic plans to place traffic in these semi-permanent locations using permanent geometric design criteria to the extent practical and feasible; otherwise, the TMP will explain modifications to temporary design elements (Design Analysis is not required). Design strategies such as overbuilding for future stages, or the use of temporary structures are often part of staged construction on significant impact projects. Region Transportation Operations performs detailed work zone traffic analysis for each stage, see Section 1010.05.

1010.04(6)(a) Temporary Alignment and Channelizing (Rewritten 2024)

Temporary alignments and/or channelizing may be an option for long-duration work zones or staged traffic control. The following are guiding principles for the design of temporary alignment and channelizing plans:

- Use site-specific base data to develop site-specific staged traffic plans.
- Provide all the layout information for all temporary features just as permanent plans do.
- To avoid confusion, do not show unnecessary details.
- Use Design Manual guidance for permanent features to the extent practical and feasible; when not feasible, explain modifications to design elements in the TMP. A Design Analysis is not needed.
- Provide beginning and ending station ties and curve data.
- Provide temporary roadway sections with lane and shoulder widths, temporary barrier type (if applicable), temporary barrier deflection distances, channelizing device, and work area limits.
- Use shoulder closure signing and channelizing devices to close a shoulder prior to a temporary impact attenuator/sloped terminal and run of temporary barrier.

- Existing signing may need to be modified, covered, or removed with temporary construction signage added for the new alignment may be needed.
- Do not use straight line tapers through curves; use curvilinear alignment at the feature's design speed.
- Extend straight lane shift tapers towards "L" to the extent practical on multilane roadways 45 mph or higher ("L/2" is still the minimum).
- For better guidance through lane shift tapers, consider solid lane lines. Typically, broken lane lines are used between shift areas. Temporary pavement markings required between open lanes in the same direction (otherwise channelizing devices get displaced frequently and are difficult to reinstall).
- At long-term lane closure or shift tapers remove (or cover with black temporary tape) all conflicting pavement markings and replace with temporary markings, including the temporary edge line. Outside of lane closure or shift tapers, a temporary edge line is required but conflicting pavement markings may remain if outside the temporary traveled way and behind temporary barrier or channelizing devices.
- Unless Region Transportation Operations accepts otherwise, long-duration temporary pavement markings shall be used with color and allowable pavement marking material type specified. Reconfigurations remaining in place between October to March shall use either profiled markings or be supplemented with Type 2 raised pavement markings (except at the right edge line).
- Consider existing crown points, lane/shoulder cross slope breaks, and super-elevation transitions that may affect a driver's ability to maintain control of a vehicle.
- Evaluate impacts to the existing drainage system as discussed in Chapter 5 of the *Hydraulics Manual*, particularly for narrowed shoulders, superelevation and/or widening transitions.
- If the project has multiple stages, from one stage to the next, show features constructed in previous stages as existing elements.
- Consider the time needed for removal of existing markings, temporary marking placement, and possibly placement of barriers and attenuators. In urban areas where work hours for lane closures are limited, may be necessary to extend worktime to implement the reconfiguration or provide an interim stage.
- Provide a list of the approved temporary impact attenuators that may be used for the plan, if applicable.

1010.04(6)(b) Lane/Shoulder Reductions & Lane Shifts (Renamed 2024)

Lane and shoulders may be reduced and lanes shifted to accommodate a long-duration work areas when it is not practicable, for capacity reasons, to reduce the number of available lanes. See Section 1010.06(1) for lane and shoulder width reduction information. Utilizing the existing shoulder may be necessary to accommodate the shifting movement. First, determine the structural capacity of the shoulder to ensure the existing shoulder pavement, catch basins, or junction boxes are adequate to carry the proposed traffic. Remove and inlay existing shoulder rumble strips prior to routing traffic onto the shoulder for long durations. For short/intermediate-term durations, a single open lane shifted onto paved shoulder is acceptable provided catch basins/junction boxes are adequate but existing rumble strips may remain.

Design clear zone, sight distance, and vertical clearances needs to be reevaluated when edge of traveled way is temporarily shifted long-term. Remove and fill existing rumble strips within the traveled way for long-duration shifts. Signal head may need to be adjusted when lanes laterally shifted approaching intersections.

1010.04(6)(c) Traffic Split or Island Work Zone

Also known as an interior lane closure, this strategy separates lanes of traffic traveling in the same direction around a work area or via median crossover. Some drivers have difficulty understanding the "traffic split" configuration resulting in braking or unnecessary late lane changes, which decreases the traffic capacity through the work zone and results in an unstable traffic flow approaching the traffic split.

Evaluate other strategies to keep traffic on one side of the work area to avoid a traffic split if possible, such as a median crossover that utilize a moveable barrier system to transfer the temporary center lane back and forth to the direction of heaviest traffic volumes. Traffic splits should be avoided in urban areas due to frequency of ramps. Avoid placing traffic splits within or following horizontal curves.

Consider the following guidance for traffic split operations:

- If used, limit the duration the traffic split can be in place. Consider incentives and disincentives to encourage the contractor to be as efficient as possible. A higher level of traffic impacts may be acceptable if offset with fewer impacted days.
- Advance warning signs advising drivers of the approaching roadway condition are required. Consider the use of PCMS, portable Highway Advisory Radio (HAR), and other dynamic devices. Overhead signing and in-lane pavement markings also may be necessary to give additional driver notice of the traffic split.
- Consider how the traffic split will impact truck traffic. If the truck volumes are high, restricted truck lanes approaching and through the traffic split may be appropriate. For questions concerning truck operations, contact the HQ Freight Systems Division.
- Collaborate with Region Transportation Operations for temporary traffic control/staged traffic layouts approach and through lane splits. Consider using a double solid white line marking approaching the traffic split with STAY IN LANE (black on white) signs to set up a "no pass" zone coordinated with Washington State Patrol for enforcement. To discourage lane changes, consider the use of solid lane line markings approaching the split or island.
- Supplement the existing roadway lighting with additional temporary lighting to improve the visibility of the island work area (see Chapter 1040).

Work area ingress and egress should be through an adjacent lane closure.

1010.04(6)(d) Temporary Bypass

This strategy involves total closure of one or both directions of travel on the roadway. Traffic is routed to a temporary diversion usually constructed within the highway right of way. Examples of this is the replacement of an existing bridge by building an adjacent temporary structure and shifting traffic onto the temporary structure or constructing a 1-lane or 2-lane bypass around a fish culvert under construction.

Regulatory work zone speed limit reductions and advisory speeds may be utilized if approved. The goal is to design bypasses within 10 mph of the posted speed limit unless site conditions require a lower design speed.

1010.04(6)(e) Median Crossover

This strategy involves placing both directions of traffic on one side of a multilane divided highway. The number of lanes is usually reduced in both directions and one direction is routed across the median. Existing even-lane configurations may be converted to temporary odd-lane configurations with a moveable barrier system to transfer the temporary center lane back and forth to the direction of heaviest traffic volumes. Be sure to determine the structural capacity of the shoulder to ensure the existing shoulder pavement, catch basins, or junction boxes are adequate to carry the proposed traffic. Remove and inlay existing shoulder rumble strips within the traveled way prior to routing traffic onto the shoulder for long durations.

The design for elements of temporary crossovers needs to follow the same guidance as permanent design for alignment, barriers, delineation, and illumination to the extent practical and feasible; otherwise, the TMP will explain modification to temporary design elements (Design Analysis is not required).

- The goal is to design crossovers not less than 10 mph below the posted speed limit unless site conditions require a lower design speed. Use warning signs with an advisory speed plaque based on the median crossover design speed at median crossovers. The continuous regulatory work zone speed limit is based on the geometric configuration of temporary roadway outside of isolated restrictive features, such as lane and shoulder widths.
- Median paving may be required to create crossover locations (consider drainage for the added pavement).
- When feasible, use temporary barrier on freeways to separate the two directions of traffic and evaluate the need for a glare screen. With Region Transportation Operations acceptance, it is acceptable to separate two directions of traffic with a double yellow centerline or an 18-inch yellow barrier line. Pavement-mounted tubular markers may be added but consider the frequency of Oversize/Superload commercial vehicle freight and impacts to snow plowing operations.
- Provide temporary illumination at the crossover locations (see Chapter 1040)
- Straight line crossover tapers work best for highways with narrow paved medians; otherwise, curvilinear crossovers are used to minimize the length of the crossover.
- Temporary pavement markings, removal of conflicting existing markings, and construction signs are also required. Use solid longitudinal lines through median crossover for enhanced guidance.
- Use channelizing devices to supplement temporary markings at the crossover locations. Use flared temporary barrier with proper end treatment to block the closed roadway, leaving a 10' construction access that is blocked with a transportable attenuator/protective vehicle during nonworking hours.
- Provide a design clear zone adjacent to the crossover and avoid placing crossover near structures.
- For traffic that is crossed over (going against the normal traffic flow direction) existing bridge rail ends, barriers, guardrails or other objects may require extending guardrail, replacing guardrail anchors, or temporary barrier with temporary impact attenuators for protection.

1010.04(7) Roadway Closures and Detours

Directional or total closures may be for the project duration or for a critical work operation because of major constructability considerations or safety performance. For the traveling public, closing the road for a short time might be less of an inconvenience than driving through a work zone for an extended period with multiple lane closures. Advanced notification is required, see Closure Notification Requirements in *Traffic Manual* Chapter 5 and RCW 47.48.020. Closures or use restrictions on the Interstate Highway System and Federal-aid primary system routes require advance notification from FHWA, and in some cases FHWA approval. See FHWA Notification Requirements for Closures & Use Restrictions in *Traffic Manual* Chapter 5 for more information.

The main requirement for total closures is the availability of a detour route and if the route can accommodate the increased traffic volumes and truck turning movements. Local roads may have lower geometric criteria than state facilities which may influence safety performance, especially when drivers are accustomed to the geometrics associated with state highways, that may need to be addressed via pavement enhancements or rehabilitation. When evaluating closure options, consider potential negative changes to active transportation users on both the route closed and local roadways and distances imposed by detours (See Section 1010.04(8)).

Consider the following road closure elements:

- Communication with all stakeholders (including road users, adjoining property owners, local agencies, transit agencies, the freight industry, emergency services, schools, etc.) is required when considering a total closure strategy. This helps determine the level of support for a closure and needed mitigations. Include the HQ Design Office Railroad Liaison, Rail, Freight, and Ports; Commercial Vehicle Services; and Public Transportation Divisions to help coordinate.
- Work with Region Transportation Operations to analyze a closure strategy and compare it to other strategies, such as staged work zones, to determine which is overall more beneficial. This information helps stakeholders understand the impacts if a closure is not selected.
- Closures other than short-term, minor-impact closures with reasonable alternative routes require stakeholder acceptance and Region management approval once impacts and benefits are analyzed.
- Closures that reopen to a new, completed roadway or other noticeable improvements are generally more accepted by the public.
- Route-to-route connections and other strategic access points may have to be maintained or a reasonable alternative provided.
- Material selection, production rates, and work operation efficiencies have a direct tie to the feasibility of the closure strategy. A strong emphasis has been placed on this area and several successful strategies have been implemented, such as weekend-long closures or extended-duration single-shift closures. These strategies use specific materials such as quick-curing concrete, accelerated work schedules, prefabricated structure components, on-site mix plants, and so on, and are based on actual production rates. The WSDOT Materials Laboratory and the HQ Construction Office are good resources for more information on constructability as a component of an effective work zone strategy.
- Detailed, project or site-specific traffic control/staged traffic plans, traffic operation plans, and public information plans are required for major closures on Significant Projects.
- Depending on the duration of the closure/detour and the anticipated amount and type of traffic that will use the route, consider upgrades to the route such as signal timing, intersection turning radius for large vehicle, structural pavement enhancements, or shoulder widening.
- An approved detour agreement with the appropriate local agency is required for detour routes using local roadways and are to be completed prior to project advertisement. Include in the TMP Document.
- Document road closure decisions and agreements in the Project File.

Roadway closures, detours, and alternate routes must be analyzed by for disproportionate impacts to EJ and LEP communities. If an EJ or LEP community is identified along a proposed route and will be disproportionately impacted, appropriate mitigation must be coordinated between WSDOT Communications and the Contractor. When additional changes are made to the route, it should be evaluated to determine if the detour adds congestion, noise or creates safety issues for adjacent residences and businesses and/or adds considerably longer distance to access residences/businesses that may affect low income and minority population. WSDOT will work with local agencies and conduct public outreach as necessary, to ensure that the proposed route will not have a disproportionately high and adverse effect on EJ or LEP populations. A Communications Plan must include appropriate accommodations for identified populations and businesses.

1010.04(8) Pedestrian and Bicycle Accommodations (Rewritten 2024)

Many public highways and streets accommodate pedestrians and bicyclists, predominately in urban areas. During construction, access must be maintained through or around the work zones if existing pedestrian and/or bicycle facilities exist unless accepted otherwise by Region Transportation Operations. In general, the longer the work duration the more enhanced the WZTC.

Due to the restrictive and temporary nature of work zones and practicality, it is understood different modes of transportation need to work together to negotiate limited space available when combined in the same travel path.

Roadway surfaces that are reasonably smooth provide for greater accessibility for those walking, biking and rolling.

Conditions such as loose gravel, uneven surfaces, milled pavement, or asphalt tack coats restrict access and may increase the potential for falling or tripping that should be avoided the extent feasible. When present, use warning signs to indicate the conditions.

For more information regarding pedestrian laws & safety, see Pedestrian laws & safety | WSDOT (wa.gov)

For more information regarding bicycle laws & safety, see Bicyclist laws & safety | WSDOT (wa.gov). For a list of Washington state highways permanently closed to bicycles, see WSDOT - Permanent Bike Restrictions.

1010.04(8)(a) Pedestrian Accommodation Strategies (New 2024)

When existing pedestrian access routes are closed, design and construct the temporary pedestrian access route to be detectable and to meet or exceed the existing level of accessibility to the maximum extent feasible meeting PROWAG accessibility criteria per R303: Alternative Pedestrian Access Routes. Consider the visually impaired and those with mobility limitations (ex., wheelchair and other assistive mobility devices users). Consider the impacts to transit stops for pedestrians. Covered walkways with vertical clearance of at least 80-inches are to be provided where there is a potential for falling objects.

Pedestrian accommodation strategies included but not limited to:

- Stop work operations and escort pedestrians through work area.
- Flaggers, when controlling traffic, may hold vehicles to allow pedestrians to cross the roadway.
- Provide free pedestrian shuttle through or around work area at 15-minute intervals. During off-peak or when pedestrian volumes are low, provide an on-demand shuttle via phone box.
- Extend pedestrian channelizing devices across entire sidewalk with SIDEWALK CLOSED sign attached. An audible information device should be attached that plays prerecorded voice messages informing visually-impaired pedestrians of the sidewalk closure and detour route.
- Close sidewalk and provide signed detour onto opposite sidewalk or parallel pathway via existing curb ramps or infrastructure. For sidewalk closures away from existing marked crosswalks, provide SIDEWALK CLOSED AHEAD, CROSS HERE notification at marked crosswalk to eliminate the need for pedestrians to backtrack.
- For sidewalk closure detoured onto the adjacent roadway (via closed lane or parking stalls), use either a constructed or modular pedestrian curb ramp. Longitudinal grades are typically 12:1 but may be steeper in certain circumstances per PROWAG. Handrailing on ramps are required for ramps rising greater than 6-inches or longer than 72” in length or part of a pathway requiring handrails (bridge). Only curb ramps leading into traffic are equipped with truncated domes.
- For long-term closures, use pedestrian channelizing devices to delineate temporary pedestrian pathways. When separating pedestrian and vehicular traffic on roadways 40 mph or less, water-filled

barriers may be used as a channelizing device. On roadways 45 mph or higher, temporary barrier is recommended to separate pedestrian and vehicular traffic on roadways.

Provide temporary pedestrian push-buttons at existing traffic signal crossings when existing push-buttons are inaccessible or at temporary traffic signals when applicable.

1010.04(8)(b) Bicyclist Accommodation Strategies (New 2024)

Information regarding bicycle volume, travel patterns, features, and connectivity can be gathered by contacting local bike clubs and local agencies. Coordination with local bike clubs increases the likelihood that their members are notified of work zone impacts, and it helps maintain good public relations. Headquarters & Region Active Transportation Division are resources for considering bicyclist work zone strategies and detour options.

Bicyclist accommodation strategies included but not limited to:

- Stop work operations and escort bicyclists through work area.
- Flaggers, when controlling traffic, may hold vehicles to allow bicyclists to cross roadway at marked crosswalks.
- Bicycles may be combined with vehicular traffic when alternating traffic is controlled via flagger, AFAD, or temporary signal on all roadways regardless of the posted speed limit.
- Provide a 4-foot minimum temporary bike lane either using channelizing devices or existing paved shoulder. For long-duration projects, if 4 feet of useable shoulder is not available between rumble strip and edge of paved shoulder then remove and fill existing rumble strip. Review existing drain grates for bicycle compatibility and address if needed.
- On highways 30 mph or less without separated bicycle lanes, a shared vehicle-bicycle lane may be used with a R4-11 sign (Bicycles MAY USE FULL ROADWAY).
- On highways 35 mph or higher without separated bicycle lanes, a shared-bicycle lane may be used with additional W11-15 MOD (Bicycles SHARE THE ROAD) warning signs placed in advance and along the route every ½ ± mile. This strategy should be limited to right shoulder closures, detours, or alternative routes with low bicycle volumes unless it is impractical to provide alternative bicycle accommodations.
- When existing separated bicycle lanes are closed during construction, bicycles are to be detoured onto the adjacent sidewalk. If that sidewalk is also closed, then a combined bicycle-pedestrian detour route, free shuttle, or another reasonable accommodation is to be provided.

Shared bicycle-vehicle lanes are prohibited on freeways and multilane roadways 45 mph and higher. On these routes, bicyclists will need either a 4-foot minimum shoulder, detour/alternate route (via sidewalk, shared path, or another roadway), shuttle, or some other reasonable accommodation through or around the work zone.

1010.04(9) Transportation Systems Management and Operations (TSMO) Strategies

The following are operational strategies to consider based on project specific needs:

1010.04(9)(a) Transportation Demand Management (Rewritten 2024)

- Implement work zone mobility and congestion management strategies per *Traffic Manual* Chapter 5, including permitted closure hours with special event and holiday restrictions.
- Encourage carpooling and traveling during early AM/late PM hours during significant closures.
- Provide alternative route guidance and/or improvements to increase capacity (update/retime traffic signals with improved signage, paving, and/or delineation).

- Promote and provide transit service and public transportation alternatives, such as free shuttle services for pedestrians and/or bicyclists.

1010.04(9)(b) Corridor/Network Management (Rewritten 2024)

- Implement work zone corridor/network management strategies per *Traffic Manual* Chapter 5.
- Roadway improvements on detour and/or alternative routes (signal retiming/coordination improvements, widening, bus pullouts, added guide signage, etc.)
- Deploy dynamic traffic control technology such as temporary ramp metering and dynamic lane merging.
- Deploy road user information systems (PCMSs, travel time and congestion information, and integration with third-party trip planning applications).
- Alternate temporary center lane via moveable temporary barrier on temporary reconfigured 3/5-lane multilane roadways (existing 2/4-lanes) with both directions of travel on same side of median.
- Provide a temporary express lane with no access through the project.
- Use Oversize/Superload freight restrictions, provide alternative routes if feasible.
- Use heavy-vehicle restrictions and provide alternate routes or lane use restrictions.

1010.04(9)(c) Traffic/Incident Management and Enforcement (Rewritten 2024)

- Stage WSDOT Incident Response Team with towing service on site during major closures.
- Provide emergency pull offs for long narrow-shoulder sections with no other access points with drop sites for disabled vehicles (typically Contractor's staging yard).
- Utilize Region Traffic Management Centers and GPS technology for real-time management of incidents.
- Utilize active Agency-provided law enforcement patrols to reduce speeding, aggressive, and/or impaired drivers. Headquarters-managed speed safety cameras may be implemented.
- Enhance traffic control via Contractor-provided uniform police officers (closure enforcement, controlling traffic at intersections, supplementing rolling slowdowns or traffic holds)

1010.04(9)(d) Work Zone Safety Management (New 2024)

- Use temporary barrier on long-term work zones to separate workers and road users.
- Use advanced queue mitigation systems for work zone congestion on roadways 45 mph or higher.
- Provide temporary access road with ingress/egress at near interchange ramp terminals on freeways.
- Refer to the *Traffic Manual* Chapter 5 for additional information, guidance, and approval requirements for speed limit reductions and advisory speeds in work zones. Consider radar speed display signs.
- Employ temporary transverse rumbles strips and/or AFADs on highways 45 mph or higher, but consider noise impacts to local residents and businesses.
- Use temporary portable traffic control systems for long duration one-lane, two-way traffic control.
- Provide fences and/or traffic screens to reduce driver distraction.

1010.04(9)(e) Smart Work Zone Systems

- Use advanced queue mitigation systems for work zone congestion on roadways 45 mph or higher.
- Deploy roadway monitoring, mobile surveillance, and over-dimension vehicle detection.
- Deploy dynamic traffic control technology such as temporary ramp metering, variable speed control, and dynamic lane merge.

- Deploy driver information systems such as connected sequential arrow signs (required on freeways), PCMS, travel time and congestion information, and integration with third-party trip planning applications.

See Section 1010.09(5) for more information on smart work zone systems (including queue warning system) and potential integration with TMCs and broader ITS operations.

1010.04(10) Public Information

The Public Information (PI) strategies help raise awareness of upcoming impacts and/or current restrictions.

Typical public awareness strategies planned during Design and performed during Construction typically include:

- Advanced closure notification via R11-1501 signage or using PCMSs, Highway Advisory Radio (HAR), and/or Transportation management Center (TMC).
- Schematics detailing maps of the closure along with detour/alternative route information.
- Oversize and vertical clearance restrictions via WSDOT Commercial Vehicle Services and construction warning signs. Coordinate freight information and restrictions with Rail, Freight, and Ports Division.
- Coordinate transit travel information and restrictions with the Public Transportation Division.
- Pedestrian and bicycle access information/alternative routes via signing and maps/brochures.
- Brochures or mailers, press releases, paid advertisements, and project website (consider providing information in other languages if appropriate).

Public awareness strategies are typically developed by WSDOT Region/HQ Communications offices and implemented before and during construction closures by utilizing different public outreach tools such as news coverage via press releases, WSDOT social media (Facebook, Instagram, YouTube), WSDOT Construction Projects webpage, and WSDOT Blog. Consider providing information in other languages when appropriate.

Maintain effective public relations throughout both design and construction phases for projects with high-impact closures. Avoid surprising stakeholders and the public by informing them answers to “What is closed and when?”, “How do you get to where you need to go?”, and “What are the anticipated delays and times to avoid traveling through the work zone?” Be sure to explain the benefits of high-impact closures: Why is the inconvenience worth it and what work will be/was completed?

1010.04(10)(a) Public Awareness

One PI strategy is a public awareness campaign using the media, project websites, public meetings, e-mail updates, and mailed brochures. This gives regular road users advance notice of impacts they can expect and time to plan for alternate routes or other options to avoid project impacts. Involve the region communications office, and HQ Communications Office in developing and implementing these strategies. Coordinate transit travel information and restrictions with the Public Transportation Division. Public transportation contacts | WSDOT (wa.gov)

Coordinate freight travel information and restrictions with the Rail, Freight, and Ports Division and Commercial Vehicle Services:

https://geo.wa.gov/datasets/WSDOT::wsdot-freight-data-truck-freight-economic-corridors/about

Commercial vehicles | WSDOT (wa.gov)

1010.04(10)(b) Road User Information

In addition to work zone signs, provide information using highway advisory radio (HAR) and changeable message signs (existing or portable). Involve the region TMC in the development and implementation of these strategies on existing changeable message signs.

Queue mitigation systems provide advance notification to motorists about slowed or stopped traffic ahead, a critical safety enhancement on roadways 45 mph or higher. See Section 1010.09(5) for more information on smart work zone systems and potential integration with TMCs and broader ITS operations.

Include pedestrian and bicycle access information and alternate routes in the public awareness plans, see Section 1010.04(8) for additional information on pedestrian and bicycle accommodation strategies.

1010.04(11) Project Delivery Methods (New 2024)

To reduce construction times and minimize impacts to the traveling public, consider alternative delivery techniques to accomplish this such as incentives/disincentives, using precast members, or rapid cure materials. For more information, see: Project delivery methods | WSDOT (wa.gov).

1010.04(11)(a) Innovative Design/Construction Methods (New 2024)

- Coordinate projects along corridors to utilize extended closures downstream of a significant closure, taking advantage of the lower traffic volumes downstream.
- Rebuild shoulders to full-depth to reconfigure 2-lane or 4-lane directional roadway into 3-lane or 5-lane temporary roadway configurations respectively with all traffic on one side of median to create a directional roadway closure. Enhance this by utilizing moveable barrier to transfer the temporary center lane back and forth to direction of heaviest traffic volume to manage work zone congestion.
- Overbuild beyond normal project needs to maintain additional traffic or facilitate staged construction.
- Replace bridges using new alignments so they can be built with minimal impacts.
- Bring adjacent lifts of hot mix asphalt (HMA) to match the latest lifts (lag up) and require a tapered wedge joint to eliminate drop-off and abrupt lane edges.
- Require permanent pavement markings supplemented with Type 2 raised pavement markers at intervals during multi-season projects to limit the duration temporary markings are needed and to support pavement marking visibility during winter shutdown.

1010.05 Work Zone Traffic Analysis (Rewritten 2024)

Expected work zone congestion and delay are significant considerations for many highway projects. Unless delegated otherwise, Region Transportation Operations performs work zone traffic analysis to determine which WZTC strategy is appropriate and needed mitigation measures versus gains in safety for workers and the traveling public, constructability benefits (quality of product and time savings), and cost savings.

Maintain work zone traffic analysis documents in the Project File and TMP Document.

Sometimes a significant mobility impact strategy may be the only realistic option. High short-term impacts may have substantially less overall adverse impacts versus low impacts over a longer duration. There is no statewide policy on the acceptable level of work zone-created congestion and delay allowed on a project and are determined by region management, or Region Transportation Operations if delegated. Engineering judgement and working knowledge of the traffic patterns and conditions, available alternate routes, and constructability needs help determine an acceptable level of congestion and delays, which may vary depending on location.

See *Traffic Manual* Chapter 5 Work Zone Traffic Analysis for additional information.

1010.06 Work Zone Design

Part 6 of the MUTCD mostly addresses short/intermediate-term temporary traffic control.

For Staged Traffic requiring temporary alignments, channelizing, barrier, attenuator/sloped terminal, illumination, and signals use Design Manual guidance for permanent features to the extent practical and feasible with temporary modification to design elements explained in the TMP; a Design Analysis is not required.

1010.06(1) Reduced Lane and Shoulder Widths (Rewritten 2024)

Due to the restrictive nature of work zones, temporary reductions in lane and shoulder widths and lateral lane shifts are often necessary to need space to complete work when it is not practicable, for capacity reasons, to reduce the number of available lanes. Determining the lane and shoulder reductions and lateral shifts is an iterative process dependent on the site-specific location, starting with the preferred cross-section. To maintain the minimum lane widths, temporary widening may be needed.

Work with Region Transportation Operations to determine number of temporary lanes needed based on work zone traffic analysis and to appropriate temporary roadway configurations with considerations for the following:

- Overall roadway width available and needed work area.
- Length and duration of temporary roadway reconfiguration.
- Existing roadway geometry (cross slope/crowns, horizontal/vertical curves, and shoulder slope breaks).
- Treat lane lines and construction joints to provide a smooth flow.
- Vertical clearances, specially at existing arched overhead structures.
- Transit and freight vehicles, including over-sized commercial vehicles.

Avoid abrupt geometric transitions in the work zone. Make transitions as smooth as available space allows. Check transitions for the appropriate design vehicle and widen lanes within horizontal curves as appropriate. Lane width reductions may occur concurrently with lateral lane shifts if a "L" shift taper is provided but avoid locating them within horizontal curves. Do not reduce curve radii and lane widths simultaneously.

For freeways and divided multilane highways 45 mph or higher, lane and shoulder reduction iterations are:

Iteration	Lane Width	Left Shoulder	Right Shoulder	Comment
1st	11.0'	3.0'	8.0'+	Accommodates vehicle breakdowns, active transportation, and 3.0' deflection for median unanchored barriers
2nd	11.0'	2.0'	4.0'	Remove/fill existing rumble strip to accommodate bicycles.
3rd	11.0'	2.0'	2.0'	Active transportation modes no longer accommodated. Accommodates 60 mph design speed.
4th	11.0'	1.0'	1.0'	Accommodates 55 mph design speed.
5th	10.5'	1.0'	1.0'	Accommodates 50 mph design speed.
6th	10.0'	0.5'	0.5'	Accommodates 45 mph design speed.
For greater freeway/divided multilane highway roadway reductions, contact State Work Zone Engineer.				

For highways posted 45 mph or higher, it is desired to maintain at least 11.0' lanes and 4.0' right shoulder (remove/fill existing rumble strip to accommodate bicycles) but may be reduced to 10.0' lanes and 0.5' shoulder.

For highways posted 40 mph or less, it is desired to maintain at least 11.0' lanes and 4.0' right shoulder (remove/fill existing rumble strip to accommodate bicycles) but may be reduced to 10.0' lanes and no shoulder.

1010.06(2) Buffer Space

Buffer spaces separate road users from the work area or other areas off limits to travel. Buffer spaces also might provide some recovery space for an errant vehicle.

- A lateral buffer provides space between the vehicles and adjacent workspace, traffic control device, or a condition such as an abrupt lane edge or drop-off. A 2-foot lateral buffer space is recommended on roadways 45 mph or higher, except for alternating traffic where lateral buffer space is optional. Consider positive protection devices for long-duration closures (2 weeks or more) when workers are substantially exposed to vehicular traffic.
- A longitudinal buffer space is used immediately downstream of a closure or shift taper to provide a recovery area for errant vehicles to stop as they approach the work area or oncoming traffic.

To achieve the minimum lateral buffer, there may be instances where pavement widening or a revision to a stage may be necessary. For short/intermediate-duration lane closures, close the adjacent lane or shift a single open lane onto the shoulder to maintain a lateral buffer space. Identify the lateral buffer in a cross-section to show the space in relation to the traffic and work area.

1010.06(3) Clear Zones in Work Zones (Rewritten 2024)

A clear roadside border area beginning at the edge of the traveled way is an important consideration. The intent is to provide a clear, traversable area for vehicle driver or active transportation users to recover when their path is altered due to environmental, human, or road user factors.

1010.06(3)(a) Work Zone Clear Zone

The contractor's operations present opportunities for errant vehicles to impact the clear area adjacent to the traveled way. The work zone clear zone(s) (WZCZ) in a project are determined by the posted speeds of the roadways in the project using Exhibit 1010-1. The WZCZ applies only to roadside objects introduced by the contractor's operations (vehicles, equipment, and materials). It is not intended to resolve existing objects in the Design Clear Zone or clear zone values established at the completion of the project.

During nonworking hours, vehicles, equipment, or materials shall not be within the WZCZ unless they are protected by permanent guardrail or temporary barrier. The use of temporary concrete barrier shall be permitted only if the engineer approves the installation and location.

During actual hours of work, unless protected as described above, only equipment and materials absolutely necessary to construction shall be within the WZCZ, and only construction vehicles absolutely necessary to construction shall be allowed within the WZCZ or allowed to stop or park on the shoulder of the roadway.

Exhibit 1010-1 Minimum Work Zone Clear Zone Distance

Posted Speed	Distance From Traveled Way (ft)
35 mph or less	10
40 mph	15
45 to 50 mph	20
55 to 60	30

Posted Speed	Distance From Traveled Way (ft)
65 mph or greater	35

1010.06(4) Abrupt Lane Edges and Drop-offs

Minimize, mitigate, or eliminate abrupt lane edges and drop-offs whenever practicable. When unavoidable, traffic control plans should provide a protection method. Consider temporary barriers for long duration drop off protection and contract provisions limiting the duration of edges from daily paving operations consistent with Standard Specification section 1-07.23(1).

When a temporary barrier is used to protect a drop-off, provide a lateral offset from the drop-off to the back side of the barrier with an offset distance equal-to or greater than the distance listed in DM Exhibit 1610-3. Provide an edge line on the traffic side of the temporary barrier (typically 2-feet from the face of the barrier). Provide a barrier end treatment such as an impact attenuator or end terminal, when the barrier end is located inside the Design Clear Zone. For two-way traffic, barrier end treatment may be required on both ends.

Unless behind guardrail or barrier, open trenches are prohibited within the Traveled Way, Auxiliary Lanes, Shoulders, or other areas in the work zone clear zone. Backfilling and paving operations are required to reopen to vehicular traffic. Steel plates are allowed for open and closed Pathways, provided the walking surface is painted with either a non-slip paint, anti-slip tape, or rolled roofing surface and transverse edges are beveled at 2:1 with a maximum ¼" vertical lip.

When backfilling is not possible, steel plates may be used. Detailed steel plate drawings and Special Provisions (including steel plate dimensions, maximum allowable span and overlap dimensions, and nonskid surface, anchorage/shoring, and material requirements) shall be included in the PS&E in collaboration with Bridge & Structures and Region Transportation Operations. Steel plate shall be anchored and either embedded flush with the existing road surface or a wedge of suitable material or steel plate locks provided for a smooth transition between the pavement and the steel plate.

Abrupt lane edges, and drop-offs and steel plates require additional warning and considerations for motorcyclists, bicyclists, and pedestrians, including pedestrians with disabilities.

Signing to warn motorcycle riders of these conditions is required, see Section **Error! Reference source not found.**. For pedestrian accommodations in work zones, see Section 1010.04(8)(a) and Chapter 1510.

1010.06(5) Vertical Clearance

In accordance with Chapter 720, the minimum vertical clearance over new highways is 16 feet 6 inches. For locations where this minimum cannot be met, follow the reduced clearance criteria discussed in Chapter 720 and include it in the traffic control or staged traffic plans. Maintain legal height on temporary falsework for bridge construction projects. If legal height on temporary falsework cannot be provided, consider over-height vehicle impacts and possible additional signing needs and coordination with Commercial Vehicle Services. See Low Vertical Clearance in *Traffic Manual* Chapter 2 for signage and Chapter 5 for additional information.

Widening of existing structures can prove challenging when the existing height is at or less than legal height, so extra care is required in the consideration of over-height vehicles when temporary falsework is necessary. Coordination with the HQ Bridge and Structures Office is essential to ensure traffic needs have been accommodated. Vertical clearance requirements associated with local road networks may be different than what is shown in Chapter 720. Coordinate with the local agency.

1010.06(6) Speed Limit Reductions & Advisory Speeds (Rewritten 2024)

All work zone speed limit reduction and/or advisory speed requests shall be submitted through Region Transportation Operations for review and approval per Secretary's Executive Order E1060 (until replaced by *Traffic Manual Chapter 5*). See *Traffic Manual* Chapter 5 for additional information, guidance, and approval in addition to required documentation templates. Include approval documents in the Project File.

Designers shall collaborate with Region Transportation Operations and obtain their concurrence early in project development in the Work Zone Designer Strategy Meeting. The length of regulatory speed limit reductions shall be minimized to the extent possible, beginning no more than ½ mile prior to the restrictive roadway feature or condition, with the existing speed limit restored within ¼ mile afterwards. Drivers tend to reduce their speed only if they perceive a need to do so; thus, the roadway configuration needs to change for drivers to perceive reasons to comply with the lower speed limit.

1010.06(7) Warning Signs for Motorcyclists (Rewritten 2024)

Per second paragraph in RCW 47.36.200 and WAC 468-095-305, "MOTORCYCLE USE EXTREME CAUTION" (W21-1701) and warning signs of the condition is required when construction includes or uses grooved pavement, abrupt lane edges, steel plates, gravel, or earth surfaces.

W21-1701 is the first temporary sign followed by pavement condition(s) signs for roadway condition present. For durations 8 days or more, pavement condition sign with "MOTORCYCLES USE EXTREME CAUTION" supplemental plaque as Class A construction signs may be used. Repeat signage every 1± mile where practical.

See Section 1010.07(2) for work zone sign size information.

Short/Intermediate-Term Signage

Long-Term Signage (Class A)

1010.06(8) Oversized and Superload Commercial Vehicles

Commercial Vehicle Services (CVS) issue permits allowing vehicles that exceed the legal width, height, or weight limits on certain routes. If a proposed work zone will reduce roadway width or vertical clearance, or have weight restrictions, adequate warning signs and 7 calendar day advance notification to CVS is required as a minimum and included in the Contract Provisions. In the notification, identify the restriction type (length, height, weight, or width) and specify the maximum accommodated size.

When the total roadway width is reduced to less than 16 feet continuously for more than three days on T-1, T-2, or T-3 FGTS Class Freight Corridors, communication with CVS and stakeholders is required (include documentation in the Project File) and include contract provisions that require the Contractor to provide a 30 calendar day advance notice prior to placing the restriction. In addition, provide a designated oversize detour

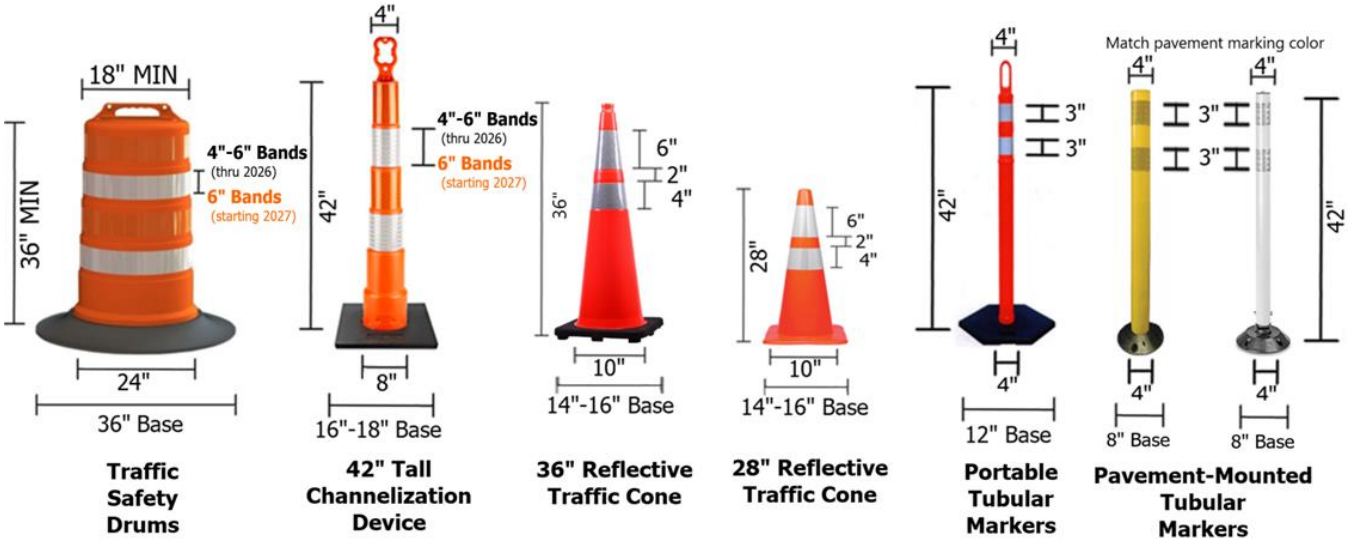
route when practical. Oversized vehicles may arrive unexpectedly in work zones even with warning, restriction, or prohibition signs in place. Some, but not all, oversized loads may overhang the temporary barrier or channelizing devices and encroach on areas where workers are present; assess worker exposure and add additional protective features or active early warning devices if appropriate. The structure design, staging, and falsework openings may need to be reconsidered to accommodate oversized loads passing through these structures without striking them. If vertical clearance is reduced less than 16 feet 6 inches, use advanced height restriction and warning signage (see Low Vertical Clearance in *Traffic Manual* Chapter 2) and Section 1010.06(5). Consider additional bridge strike mitigation measures in cases where an over-height load has the potential to cause significant damage to structures or expose workers to injury.

See Commercial Vehicle Considerations in *Traffic Manual* Chapter 5 for more information.

1010.07 Temporary Traffic Control Devices

FHWA regulations require that temporary traffic control devices be compliant with the 2016 edition of the Manual for Assessing Safety Hardware (MASH) crash test requirements. In some cases, either the 2009 MASH or the National Cooperative Highway Research Program (NCHRP) Report 350 compliant devices may be used. See Standard Specification 1-10.2(3) for more information.

1010.07(1) Channelizing Devices



Channelizing devices warn and guide road users through the work zone by channelizing traffic away from the work area, pavement drop-offs, or opposing directions of traffic. Typical channelizing devices include:

On freeways and multilane roadways 45 mph or higher, traffic safety drums are required on lane closure and lane shift tapers and recommended on the tangents. In narrow, restrictive locations (narrow lanes & shoulders) 42-inch tall channelizing device, 36-inch traffic cone, or 28-inch traffic cones may be used. When a single open lane is shifted onto the shoulder, delineate the edge of the shoulder pavement with 28-inch traffic cones during hours of darkness (these 28-inch traffic may remain in place when lanes reopened).

For one-lane, two-way traffic configurations using 28-inch traffic cones is recommended.

Portable tubular markers are not a recommended device unless they are being used to separate 40 mph or less traffic and are located near or on existing pavement markings.

Pavement-mounted tubular markers may be added to supplement long-term temporary pavement markings (such a double yellow centerline for two-lane, two-way traffic) but its color shall match the adjacent lane line.

Longitudinal channelizing devices are interconnected devices that provide channelizing with no gaps but are not approved positive protection devices.

Barricades are a channelizing device mostly used to supplement other channelizing devices in traffic control operations involving road and ramp closures. Avoid using barricades to delineate sidewalk closure limits.

Pedestrian channelizing devices shall be used to delineate sidewalk closure limits and may be used to delineate pedestrian detour routes.

1010.07(2) Construction Signs (Rewritten 2024)

Construction signs are used to regulate, warn, or guide road users through a work zone. Class A construction signs remain in place throughout the entire or a major phase of the project and are typically mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Class A signs will be designated as such on the staged traffic plan. Class B construction signs remain in place for durations up to 7 calendar days and typically mounted on portable crashworthy sign stands with a minimum mounting height of 1 foot but increased to 5-foot when mounted behind channelizing device or in urban areas with roadside parking that may obstruct sign visibility unless accepted otherwise by Region Transportation Operations.

Class B signs may be barrier-mounted. Construction signs need to be placed such that they do not obstruct active transportation facilities.

For Class A construction signs, use “ROAD WORK AHEAD” (W20-1) for projects up to 2.4 miles in length and “ROAD WORK NEXT # MILES (G20-1) on mainline for longer projects, intersecting roadways and ramps can still use W20-1. At end of the project limits, add “END ROAD WORK” (G20-2) with “FOR PROJECT INFORMATION…” (G24-501) stacked beneath. For projects obliterating existing pavement markings on highways, “DO NOT PASS” (R4-1) and “PASS WITH CARE” (R4-2) Class A signs shall mark the passing zones, see *Standard Specification* 1-10.3(3)A. Specify actual diamond-shape sign sizes for Class A signs, not 36”x36” MIN.

Per WAC 468-95-300, the recommended temporary sign spacing is as follows, but may be adjusted to fit:

RECOMMENDED TEMPORARY SIGN SPACING = X (1)		
FREEWAYS & EXPRESSWAYS	50-75 MPH	1500’ ±
RURAL HIGHWAYS	60-70 MPH	800’ ±
RURAL ROADS	45-55 MPH	500’ ±
RURAL ROADS & URBAN ARTERIALS	35-40 MPH	350’ ±
RURAL ROADS & URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25-30 MPH	200’ ± (2)
URBAN STREETS	25 MPH OR LESS	100’ ± (2)
ALL SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERCHANGE RAMPS, AT-GRADE INTERSECTIONS AND DRIVEWAYS. THIS SPACING MAY BE REDUCED IN URBAN AREAS TO FIT ROADWAY CONDITIONS		

Typical work zone sign size is provided below. For more details, see MUTCD Table 6F-1, Page 578-580.

Roadway Description	Diamond-Shape Signs	Speed Limit (R2-1) Signs	Detour Signs
Freeway (Mainline & Ramps)	48”x48”	36”x48”	Generic: 48”x36” Route-Specific: 48”x48”
Highways, 45 mph or higher	48”x48”	Multilane: 36”x48” 30”x36”	
Highways, 40 mph or lower	36”x36” MIN 30”x30” (30 mph or less)	Multilane: 30”x36” 24”x30”	Generic: 30”x24” Route-Specific: 36”x36”
Pedestrian and/or Bicycle Detour Signs: 24”x18”			

When barrier-mounted, a special 24”x48” rectangular warning sign, black on orange, may be used in lieu of a diamond-shaped warning sign.

Regulatory work zone speed limit signs are always black on white. Do not use the “WORK ZONE” (G20-5aP) plaque above the speed limit sign. “FINES DOUBLE” (R2-6aP) below the speed limit sign or a separately mounted “NOTICE TRAFFIC FINES DOUBLE IN WORK ZONES” (I20-301) is optional and are not required to enforce double fine citations. When utilizing reduced work zone speed limits, all conflicting existing speed limit signs must be removed or temporarily covered.

Use a work zone speed limit reduction ahead sign (W3-5, black on orange) in advance of approved regulatory speed limit reductions of 10 mph or greater with the following temporary sign spacing in advance:

RECOMMENDED SPEED REDUCTION AHEAD SIGN SPACING = Z									
REDUCED SPEED LIMIT	EXISTING SPEED LIMIT (MPH)								
	70	**65**	**60**	**55**	**50**	**45**	**40**	**35**	**30**
60	720	390							
55	1000	660	350						
50	1250	910	600	310					
45	1470	1140	820	540	270				
40		1340	1030	740	470	230			
35		1520	1200	920	650	410	200		
30			1360	1070	810	570	350	160	
25				1200	940	700	480	290	120
20					1040	800	590	390	230
W3-5 SIGN IS OPTIONAL FOR 5 MPH SPEED REDUCTIONS.									

W3-5

For work zone regulatory speed limit reductions of 25 mph or greater, use two separate reductions unless accepted otherwise by Region Transportation Operations.

Work zone advisory speed signs, black on orange, shall be used with warning signs. The advisory speed is based on the design speed of the restrictive feature. Work crew advisory signs have also been created.

W13-1P

W23-5

W23-6

See Chapter 1020 and the *Standard Plans* for signing details. Sign messages, color, configuration, and usage are shown in the MUTCD and the *Sign Fabrication Manual*.

1010.07(3) Warning Lights

Warning lights are either flashing or steady burn and can be mounted on channelizing devices, barriers, and signs. Secure crashworthy mounting of warning lights is required. Except for special circumstances permitted by Region Transportation Operations, warning lights will be phased out completely by January 1, 2027.

1010.07(4) Sequential Arrow Sign (Renamed 2024)

A sequential arrow sign ("arrow board") is usually trailer mounted with battery-powered matrix electronic display elements. Sequential arrow or flashing arrow display is required near beginning of each lane closure merge taper on multilane roadways 45 mph or higher. Connected sequential arrow signs provide real time information and are required on freeways. Caution display (four corner lights) is used for shoulder work or when within lane closures away from the merge tapers.

Sequential arrow signs are not used at flagger tapers, shifting tapers, or two-way left turn lane closures. These devices are not crashworthy and shall be removed when not in use or placed behind barrier or guardrail.

1010.07(5) Portable Changeable Message Signs (PCMS)

PCMS have electronic displays that can be modified and programmed with specific messages and may be used to supplement other warning signs. PCMSs shall not replace required signage. PCMSs are usually trailer mounted with solar power and batteries to energize the electronic displays. PCMS are best used to provide notice of unexpected situations like the potential for traffic delays or queuing and to provide a notice of future closures or restrictions. A two-second display of two messages is the recommended method to provide time to motorists to read the sign's message twice but may be reduced to 1.5-second display for three messages.

PCMSs are not crashworthy and shall be removed when not in use or placed behind barrier or guardrail.

Use full-size PCMSs on freeways with 3 or more lanes in a direction; mini PCMSs are permitted elsewhere.

1010.07(6) Portable Temporary Traffic Control Signals

These versatile trailer-mounted portable temporary traffic control signals (temporary signals) that are battery powered, with the ability to be connected to AC power. When used for longer than 4 months, pole-mounted versions are more economical. Temporary signals can be traffic actuated (video/radar), pre-timed, or manually operated. Where this is no line of sight between stop bar locations, add a digital timer delay showing the time remaining to the next green indication. Other additional features include but not limited to pedestrian/bicycle push buttons and emergency vehicle/railroad preemption.

Temporary signals are typically used on highways to alternate traffic in a single lane for extended durations, but versions exist to control multilane approaches at complex intersections. When alternating traffic, it is best to limit distance between temporary signals to 1,500 feet with business accesses or driveways in between controlled by separate single-headed temporary signals. Temporary stop bars and illumination at the stop bars is required. Reduced regulatory work zone speed limit of 25 mph is typically used, but 35 mph may be used if distance between mainline temporary signals exceed 1500 feet. For guidance, contact Region Transportation Operations.

1010.07(7) Portable Highway Advisory Radio

Highway Advisory Radio (HAR) can be used to broadcast AM radio messages about work zone traffic and travel-related information. The system may be a permanently located transmitter or a portable trailer-mounted system that can be moved from location to location as necessary. Contact Region Transportation Operations for specific guidance.

1010.07(8) Automated Flagger Assistance Device

An Automated Flagger Assistance Device (AFAD) is a flagging machine that is operated remotely by a flagger located off the roadway and away from traffic, often positioned in a nearby traffic control vehicle. If used, a Red/Yellow lens AFAD is required. AFADs are recommended on roadways 55 mph or higher except near signalized intersections where paved shoulders are least 4 feet wide to enhance flagger safety, especially on highways with reduced sight distance or limited escape routes. See the MUTCD for additional guidance.

1010.07(9) Radar Speed Display Sign

RSDS are a work zone speed management device that display motorist's speed in real time along with a regulatory speed limit sign or advisory speed sign mounted above the speed display. RSDS work best when a single lane of traffic remains open but may be used when multiple lanes remain open. RSDS is a passive feedback system to drivers and yields speed reductions of 3 to 6 mph when used within an active work zone.

1010.08 Positive Protection Devices

Channelizing devices will not provide worker and road user protection in some work zones. Positive protection devices such as temporary barriers, impact attenuators, transportable attenuators, and protective vehicles shall be considered per federal law (23 CFR Part 630 K).

Unless Region Transportation Operations decides otherwise, situations when positive protection devices are required include:

- In advance of work areas within shoulder and lane closures that are adjacent to vehicular traffic
- To separate opposing traffic traveling 45 mph and faster if separated by an existing median or barrier.
- Where existing traffic barriers or bridge railings are to be removed.
- For drop-off protection during widening or excavations (see Standard Specification 1-07.23(1)).
- When temporary slopes change clear zone requirements.
- For bridge falsework protection.
- When equipment or materials are to remain in the work zone clear zone.
- When newly constructed features in the clear zone will not have permanent protection until later in the project.
- Where temporary signs or light standards are not crashworthy.
- To separate workers from motorized traffic when work zone offers no means of escape for the worker, such as tunnels, bridges, and retaining walls, or for long-duration worker exposure within one lane-width of high-volume traffic with speeds of 45 mph and faster.

1010.08(1) Temporary Barriers

Temporary barriers are meant to reduce the overall severity of crashes, but do not prevent crashes or injuries from occurring nor will they restrain or redirect all vehicles in all conditions. Consequently, barriers should not be used unless a reduced crash severity potential is likely as barrier itself may be struck.

To use temporary barriers effectively and economically, it usually requires a long-term (2 weeks or longer) stationary work zone to be cost effective as it will increase the traffic control costs of a project. The safety benefit versus the cost requires careful consideration, and cost should not be the only or primary factor determining the use of barrier.

Temporary barrier should be anchored or pinned per the standard plans when the lateral deflection space is reduced. Narrow base barrier shall always be anchored. When anchoring temporary barrier across existing bridge expansion joints, a special steel plate spanning a barrier opening over the expansion joint may be required to avoid damaging the structure; contact Bridge & Structures Office. The lateral deflection space ("slide distance") of the traffic barrier must be shown on the staged traffic plan, desirably using a cross-section.

F-shape concrete barrier with scuppers (holes in bottom of barrier to allow stormwater drainage off roadway) may be needed depending on roadway hydraulics due to pooling water. See *Hydraulics Manual* Chapter 5.

On roadways 30 mph or higher, temporary barrier that begins inside the design clear zone is mitigated with a temporary impact attenuator, parallel to traffic, and is laterally offset from the traveled way as far as feasible before flaring to the proposed lateral offset from the edge of traveled way. On roadways 25 mph or less, a sloped barrier terminal may be used. Consideration must be given to construction vehicles access to the work area (provide 10-foot-wide construction access where feasible), location of existing barriers or guardrails and placement space for the temporary impact attenuator which should begin a minimum 4 feet laterally from any retaining wall or existing barrier. When flared temporary barrier begins at existing guardrail or existing barrier, a transition section is needed to connect them.

Use Chapter 1610 for guidance and design criteria on traffic barriers. Design temporary barrier to Chapter 1610 criteria where feasible, otherwise explain temporary modification to design elements in the TMP Document. For example, an unanchored temporary precast concrete barrier deflection distance could be reduced to 1 foot (from 3 feet) for a temporary bypass with a 25-mph regulatory speed limit.

1010.08(1)(a) Concrete Barriers

Concrete barriers are the safety-shape barriers (Type F, Type 2, and Type 4) shown in the Standard Plans that can be unanchored or anchored. See Chapter 1610 for more detailed information on these barriers and their deflection characteristics.

1010.08(1)(b) Road Zipper System (Renamed 2024)

Road Zipper System are specially designed segmental barriers that can be moved laterally one lane width or more as a unit with specialized equipment. This allows strategies with frequent or daily relocation of a barrier. The ends of the barrier must be located out of the design clear zone or fitted with a temporary impact attenuator and storage sites at both ends of the barrier will be needed for the barrier-moving machine. Road Zipper System is a proprietary item. Contact HQworkzone@wsdot.wa.gov for additional information.

1010.08(1)(c) Portable Steel Barriers

Portable steel barriers have a lightweight stackable design. They have options for gate-type openings and relocation without heavy equipment. Steel barriers can be unanchored or anchored per the manufacturer's specifications.

The lateral displacement of unanchored steel barriers from vehicle impacts typically ranges from 5 to 8 feet depending on manufacturer.

The lateral displacement of anchored steel barriers from vehicle impacts typically ranges from 1 to 3 feet depending on manufacturer and anchor pinning arrangement.

Steel barriers are proprietary items. See manufacturer website for more information.

1010.08(1)(d) Mobile Barrier Systems (New 2024)

Mobile barrier systems are truck-mounted transportable steel barrier with an attenuator in the rear that can be maneuvered within closures to provide 42 to 102 feet of lateral positive protection between workers and adjacent traffic. The steel barrier portion is about two feet wide and can be flipped to provide left or right lane closure protection. Due to their limited maneuverability, usage is limited to freeways and divided multilane highways and particular attention is needed at ramp terminals for turning movement. Mobile Barrier Systems is a proprietary item.

Mobile barrier can be used for work operations including but not limited to:

- Work on bridges or tunnels limited escape paths.
- Expansion joint replacement.
- Bridge approach slab replacement or installation.
- Concrete bridge deck repairs.
- Concrete panel replacement, with closed lane adjacent or single open lane shifted onto wide shoulder.

1010.08(2) Temporary Impact Attenuators

Within the Design Clear Zone, the approach ends of temporary barriers shall be fitted with impact attenuators on roadways 30 mph or faster. On roadways 25 mph or slower, a sloped concrete terminal is permitted. In addition to the guidance in Chapter 1620, consider the characteristics of the work zone when selecting an attenuator. For example, for two-way traffic choose attenuators that are 2 feet or less to avoid oncoming traffic snagging the attenuator. Selection should consider site specific conditions and the dynamic nature of work zones throughout the project.

Contract plans showing temporary impact attenuator placement need to include a list of the approved attenuators that a contractor may use for that installation. See the Attenuator Selection Template at: www.wsdot.wa.gov/publications/fulltext/design/ProductFolder/Impact_attenuator_selection_template.xlsx

W12-501 series signage shall be mounted to the upstream face of temporary impact attenuators and shown in traffic control and staged traffic plans.

1010.08(3) Transportable Attenuators

A transportable attenuator is a positive protection device attached to the rear of a large truck or as a trailer that can be positioned to provide protection for a work area just in front of the device after a proper roll ahead distance is provided in case of an impact. A transportable attenuator shall be used for active work areas when speeds are 45 mph and greater (except for alternating traffic controlled via flagger, AFAD, or temporary signal) when other positive protection devices are not in place.

1010.08(4) Protective Vehicles

A protective vehicle is typically a work truck (without an attenuator) that can be positioned to provide protection for a work area just in front of the vehicle after a proper roll ahead distance is provided in case of an impact. A protective vehicle is suitable for active work areas when speeds are 40 mph or less but may be used for any speed when alternating traffic is controlled via flagger, AFAD, or temporary signal. Protective vehicles may be used behind channelizing devices to block closed on-ramps.

1010.09 Other Traffic Control Devices or Features

1010.09(1) Delineation (Rewritten 2024)

Temporary pavement markings are required when permanent pavement markings are obliterated due to construction operations or temporary reconfigurations needed for long-term work zone strategies. All temporary pavement markings shall be retroreflective and match permanent pavement marking colors. All conflicting pavement markings are to be completely removed.

Short-duration temporary pavement markings (short-duration markings) are intended to be used up to two months until permanent markings can be installed on paving and BST projects. Short-duration markings consist of one application of paint with glass beads, Type C-2 preformed tape, raised pavement markers, or flexible raised pavement makers (required on BST projects). Short-duration markings are abbreviated patterns. Broken line patterns typically consist of a 4-foot line with a 36-foot gap for paint and tape markings or a grouping of three raised pavement markings at 3-foot spacing with a 34-foot gaps. Contract Provisions may require a 10-foot broken line pattern for short-duration markings as an enhancement. Short-duration traffic arrows, HOV symbols, and other symbols mimic the *Standard Plans* Section M. Edge lines and gore lines are not installed unless otherwise specified in the Contract. When specified, temporary edge lines are either solid lines or raised pavement markers at 5-foot spacing. Specify short-duration marking material type in the contract provisions.

Long-duration temporary pavement markings (long-duration markings) consist of two applications of paint with glass beads, Type C-1 profiled preformed tape, raised pavement markers, hot-applied thermoplastic, or cold applied MMA. Pre-formed tapes should be used on the final pavement surface to avoid leaving scars when removed. Long-duration markings match the *Standard Plans* Section M and shall be used on long-term staged traffic configurations and projects spanning multiple seasons and/or wintering over. To enhance wet-weather visibility, supplement markings with reflective Type 2 Raised Pavement Markers when wintering over. Long-duration markings need to be detailed in the contract plans for installation and material type.

Lateral clearance markers (W12-401 series) are used at the angle points of barriers where they encroach on or otherwise restrict the adjacent shoulder. Temporary impact attenuators shall have W12-501/502 series delineation signage. Temporary barrier delineation is required for its entire length and shall match the color of the adjacent edge line. Consider specifying linear delineation systems for barrier delineation on roadways 45 mph and higher for enhanced nighttime delineation. Barrier delineation shall match the adjacent edge line color.

Pavement-mounted tubular markers may supplement pavement markings, such as in temporary no passing zones when separating two-way traffic or to separate temporary bicycle lanes but consider needed oversize freight accommodations. Markers shall match the adjacent pavement marking color.

Guideposts may be considered to aid nighttime driving through temporary alignments or diversions. (See Chapter 1030 for delineation requirements.)

1010.09(2) Screening

Screening devices can be used to reduce motorists' distraction due to construction activities adjacent to the traveled way. Consider screening when a highway operates near capacity during most of the day.

Screening should be positioned behind traffic barriers to prevent impacts by errant vehicles and should be anchored or braced to resist overturning when buffeted by wind. Commercially available screening or contractor-built screening can be used, provided the device meets crashworthy criteria if exposed to traffic and is approved by the Engineer prior to installation.

Glare screening may be required on concrete barriers separating two-way traffic to reduce headlight glare from oncoming traffic. Woven wire and vertical blade-type screens are commonly used in this installation. This screening also reduces the potential for motorist confusion at nighttime by shielding construction equipment and the headlights of other vehicles on adjacent roadways.

Make sure that motorists' sight distance is not impaired by these glare screens. Shoulder widths may need to be widened on the inside of horizontal curves. Contact the HQ Design Office and refer to AASHTO's Roadside Design Guide for additional information on screening.

1010.09(3) Temporary Illumination (Rewritten 2024)

Temporary illumination helps improve the visibility of approaching road users, highlight decision points, and draw attention to specific location, feature, or objects. Chapter 1040 provides detailed information on illumination, including work zone and construction lighting. Temporary illumination shall be designed for design clear zone based on the existing posted speed limit unless behind guardrail and temporary barrier meeting length of need requirements.

Temporary illumination is required when:

- The distance from edge of travel way to edge of impact attenuator is less than 4 feet on roadways 45 mph or higher, freeway on-ramps, or within 500 feet of the gore nose of exit-ramps. (Temporary barrier may flare closer than 4 feet without illumination)
- The distance from edge of travel way to edge of impact attenuator is less than 2 feet on roadways posted 30, 35, or 40 mph. (Temporary barrier may flared closer than 2 feet without illumination)
- Temporary or portable signal systems alternating two-way traffic, including cross-streets or commercial driveways within the alternating traffic section.
- AFAD and flagger stations (Refer to *Standard Specification* 1-10.3(1)A)
- Traffic flow is split around or near an obstruction.

Temporary illumination should be considered when:

- Staged traffic configurations at tapers where lanes are significantly narrowed and laterally shifted.
- Median crossovers on multilane roadways 45 mph or higher.
- Complex temporary alignment or channelizing on multilane roadways.
- Road closures with detours or diversions.
- Haul road crossings (if operational at night).
- Temporary ramp connections.
- Projects with existing illumination that needs to be removed as part of the construction process.
- Temporary crosswalks.

High-mast temporary light is used to illuminate median crossovers and staged traffic control that requiring multiple reconfigurations on freeways while also illuminating as much of the work area as possible.

1010.09(4) Signals

A permanent signal system can be modified for a temporary configuration such as temporary pole locations during intersection construction, span wire systems, and adjustment of signal heads and alternative detection systems to accommodate a construction stage (see Chapter 1330).

1010.09(5) Smart Work Zone Applications

A Smart Work Zone System (SWZS) uses real time information to optimize the safety and efficiency of traffic through the work zone and should be used when queuing is expected to exceed two miles.

SWZS can provide information such as queue detection for "slowed or stopped traffic ahead" messaging before motorists see brake lights, merging instructions (zipper merging where motorists are instructed to use all open lanes up to the merge point and take turns merging) to reduce the queue lengths, or travel time information so drivers can choose alternate routes. A SWZS may be limited to the highway approaching the work area or a more complex highway network system to manage regional impacts from the projects mobility impacts.

Portable equipment used in a SWZS may include PCMSs, portable roadside traffic sensors and cameras that communicate wirelessly through a web-based central management platform. Pre-determined messages will be displayed on the changeable message signs approaching a work area based on traffic data from the portable sensors also placed approaching the work area. A SWZS technician will install, program, and monitor the system.

Refer to the Traffic Manual for additional information and guidance on work zone queuing mitigation.

Additional information on smart work zone systems can be found at: Traffic: Work zone traffic control (WZTC) | WSDOT (wa.gov). For more information on TSMO, see Home | TSMO | WSDOT (tsmowa.org)

1010.10 Traffic Control Plan Development and PS&E

WSDOT projects need to include plans and payment items for controlling traffic based on a strategy that is consistent with the project construction elements, even though there may be more than one workable strategy. A constructible and biddable method of temporary traffic control is the goal. The contractor has the option of adopting the contract plans or proposing an alternative method.

1010.10(1) Traffic Control Plans

"Typical" traffic control plans are generic in nature and are not intended to address all site conditions. They are intended for use at multiple work locations when they can be applied with little or no modifications to address site conditions. They include spacing tables to address different roadway speeds. Typical plans may be all that are needed for basic paving projects. Some typical plans are located at: Design - Work Zone Typical Traffic Control Plans | WSDOT (wa.gov)

"Project-specific" traffic control plans are typical-type plans that have been modified to fit a specific project or roadway condition. Dimension lines for signs and device placement provide the distances based on the regulatory speed limit, and only minimal spacing tables should remain; the lane and roadway configuration may also be modified to match the project conditions.

"Site-specific" traffic control plans are drawn for a specific location. Scaled base data drawn plans will be the most accurate as device placement and layout considerations can be resolved by the designer; however, schematic plans are also permitted. Making a "project-specific" plan applicable for a site-specific location is another option if the device layout matches the site-specific location. Site-specific plans have minimal tables (avoid "X", "B", "L", etc.); instead, the actual spacing, stationing, or mileposts needs to be provided in the plan.

"Staged Traffic" plan should be used for temporary alignment and channelizing for long-duration traffic control.

For additional information, see Division 4 of the Plans Preparation Manual.

In addition to the TTC and staged traffic plans, 1010.10(1)(a) through 1010.10(1)(g) may also be included in the PS&E:

1010.10(1)(a) Construction Sign Plan

Show Class A Construction Signs that will remain in place for the duration of the project located by either station or milepost. Verify the locations to avoid conflicts with existing signing or other roadway features. These locations may still be subject to movement in the field to fit specific conditions. For simple projects these signs are often shown on the vicinity map sheet.

1010.10(1)(b) Construction Sign Specification Sheet

Provide a Class A Construction Sign Specifications sheet on complex or staged projects. Include location, post information, and notes for Standard Plans or other specific sign information and sign details.

1010.10(1)(c) Quantity Tabulation Sheets

Quantity Tabulation sheets are recommended for barrier and attenuator items and temporary pavement markings on projects with large quantities of these items or for staged construction projects.

1010.10(1)(d) Traffic Control Plan Index

An Index sheet is a useful tool for projects that contain a large quantity of traffic control plans and multiple work operations at various locations throughout the project. The Index sheet provides the contractor a quick referencing tool indicating the applicable traffic control plan for the specific work operation.

1010.10(1)(e) Construction Sequence Plans

Sequence plans are placed early in the plan set and are intended to show the proposed construction stages and the work required for each stage. Each stage should refer to corresponding plans for the traffic control details.

1010.10(1)(f) Temporary Signal Plan

The temporary signal plan will follow conventions used to develop permanent signals (as described in Chapter 1330) but will be designed to accommodate temporary needs and work operations in order to prevent conflicts with construction operations. If channelizing has been temporarily revised then opposing left-turn clearances should be maintained as described in Chapter 1310, or signal timing should be adjusted to accommodate the revision. Some existing systems can be maintained using temporary span wires for signal heads and video, microwave actuation, or timed control.

1010.10(1)(g) Temporary Illumination Plan

Full lighting is normally provided through traffic control areas where power is available. The temporary illumination plan will follow conventions used to develop permanent illumination (as described in Chapter 1040) but will be designed to accommodate temporary needs and work operations so that there will be no conflicts with construction operations.

1010.10(2) Contract Specifications

Work hour restrictions for lane closure operations are to be specifically identified for each project where traffic impacts are expected and liquidated damages need to be applied to the contract. Refer to the Plans Preparation Manual for additional information on writing traffic control specifications.

1010.10(3) Cost Estimating

Temporary traffic control devices and traffic control labor can be difficult to estimate. There is no way of knowing how many operations a contractor may implement at the same time. The best method is to follow the working day estimate schedule and the TCPs that will be used for each operation. Temporary signs and devices will be used on many plans, but the estimated quantity reflects the most used at any one time. A lump sum item can be used to pay for temporary traffic control when an assessment of the cost risk associated with that approach indicates that the traffic control operation is sufficiently well defined. Criteria to use in the assessment include the number and complexity of planned intersection, interchange, mainline, transit, bicycle, pedestrian, and other high impact closures; rolling slowdowns; multiple work shifts; and roadway detours. A template for assessing risk is available at the design support webpage www.wsdot.wa.gov/design/support/.

1010.11 Training and Additional Guidance

Temporary traffic control-related training is an important component in an effective work zone safety and mobility program. Federal regulations require that those involved in the development, design, implementation, operation, inspection, and enforcement be trained at a level consistent with their responsibilities. Contact the State Work Zone Engineer at HQWorkZone@wsdot.wa.gov for training options.

For additional guidance, contact Region Transportation Operations, Construction, and/or Design offices.

1010.12 References

1010.12(1) Federal/State Laws and Codes

23 Code of Federal Regulations (CFR) Part 630 Subpart J and Subpart K – Work Zone Safety and Mobility and Temporary Traffic Control Devices

See Chapter 1510 for Americans with Disabilities Act policy and references.

Manual on Uniform Traffic Control Devices for Streets and Highways, USDOT, FHWA; as adopted and modified by Chapter 468-95 WAC "Manual on uniform traffic control devices for streets and highways" (MUTCD)

1010.12(2) Design Guidance

A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO

Executive Order E 1001, Work Zone Safety and Mobility

wwwi.wsdot.wa.gov/publications/policies/fulltext/1001.pdf

Executive Order E 1060, Speed Limit Reductions in Work Zones

wwwi.wsdot.wa.gov/publications/policies/fulltext/1060.pdf

Executive Order E 1033, WSDOT Employee Safety

wwwi.wsdot.wa.gov/publications/policies/fulltext/1033.pdf

Plans Preparation Manual, M 22-31, WSDOT

Standard Plans for Road, Bridge, and Municipal Construction (Standard Plans), M 21-10, WSDOT

Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specifications), M 41-10, WSDOT

Traffic Manual, M 51-02, WSDOT

Work Zone Traffic Control Guidelines, M 54-44, WSDOT

1010.12(3) Supporting Information

Construction Manual, M 41-01, WSDOT

"Crashworthy Work Zone Traffic Control Devices," Report 553, NCHRP, 2006

Environmental Manual, M 31-11, WSDOT

Highway Capacity Manual, 2010, TRB

ITE Temporary Traffic Control Device Handbook, 2001

ITS in Work Zones http://ops.fhwa.dot.gov/wz/its/

"Recommended Procedures for the Safety Evaluation of Highway Features," Report 350, NCHRP, 1993

Roadside Design Guide, AASHTO, 2011

Manual for Assessing Safety Hardware, AASHTO, 2009

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Work Zone & Traffic Analysis, FHWA http://ops.fhwa.dot.gov/wz/traffic_analysis.htm

Work Zone Operations Best Practices Guidebook, FHWA, 2007
http://ops.fhwa.dot.gov/wz/practices/practices.htm

Work Zone Safety and Mobility, FHWA http://ops.fhwa.dot.gov/wz/index.asp

Work Zone Safety Web Page, WSDOT https://wsdot.wa.gov/engineering-standards/design-topics/traffic-work-zone-traffic-control-wztc

WSDOT Project Management website: Project management guide | WSDOT (wa.gov)

Exhibit 1010-2 Transportation Management Plan Components Checklist

Use the following checklist to develop a formal TMP document on significant projects. ☐

1. Introductory Material
    a. Cover page ☐
    b. Licensed Engineer stamp page (if necessary) ☐
    c. Table of contents ☐
    d. List of figures ☐
    e. List of tables ☐
    f. List of abbreviations and symbols ☐
    g. Terminology ☐
2. Executive Summary
3. TMP Roles and Responsibilities
    a. TMP manager ☐
    b. Stakeholders/review committee ☐
    c. Approval contact(s) ☐
    d. TMP implementation task leaders (public information liaison, incident management coordinator) ☐
    e. TMP monitors ☐
    f. Emergency contacts ☐
4. Project Description
    a. Project background ☐
    b. Project type ☐
    c. Project area/corridor ☐
    d. Project goals and constraints ☐
    e. Proposed construction phasing/staging ☐
    f. General schedule and timeline ☐
    g. Adjacent projects ☐
5. Existing and Future Conditions
    a. Data collection and modeling approach ☐
    b. Existing roadway characteristics (history, roadway classification, number of lanes, geometrics, urban/suburban/rural) ☐
    c. Existing and historical traffic data (volumes, speed, capacity, volume-to-capacity ratio, percent trucks, queue length, peak traffic hours) ☐
    d. Existing traffic operations (signal timing, traffic controls) ☐
    e. Incident and crash data ☐
    f. Local community and business concerns/issues ☐
    g. Traffic growth rates (for future construction dates) ☐
    h. Traffic predictions during construction (volume, delay, queue) ☐
6. Work Zone Impacts Assessment Report
    a. Qualitative summary of anticipated work zone impacts ☐
    b. Impacts assessment of alternative project design and management strategies (in conjunction with each other) ☐
        I. Construction approach/phasing/staging strategies ☐
        II. Work zone impacts management strategies ☐

- c. Traffic analysis results (if applicable) ☐
  - I. Traffic analysis strategies ☐
  - II. Measures of effectiveness ☐
  - III. Analysis tool selection methodology and justification ☐
  - IV. Analysis results ☐
- d. Traffic (volume, capacity, delay, queue, noise, design vehicle) ☐
- e. Safety ☐
- f. Adequacy of detour routes ☐
- g. Business/community impact ☐
  - I. Emergency services ☐
  - II. Utility and delivery services (i.e., trash collection, postal, etc.) ☐
- h. Seasonal impacts ☐
- i. Cost-effectiveness/evaluation of alternatives ☐
- j. Selected alternative ☐
  - I. Construction approach/phasing/staging strategy ☐
  - II. Work zone impacts management strategies ☐

7. Selected Work Zone Impacts Management Strategies
   - a. Temporary Traffic Control (TTC) strategies ☐
     - I. Control strategies ☐
     - II. Traffic control devices ☐
     - III. Corridor Project coordination, contracting, and innovative construction strategies ☐
   - b. Public Information (PI) ☐
     - I. Public awareness strategies ☐
     - II. Motorist information strategies ☐
   - c. Transportation Systems Management and Operations (TSMO) ☐
     - I. Demand management strategies ☐
     - II. Corridor/network management strategies ☐
     - III. Work zone safety management strategies ☐
     - IV. Traffic/incident management and enforcement strategies ☐

8. TMP Monitoring
   - a. Monitoring requirements ☐
   - b. Evaluation report of successes and failures of TMP ☐

9. Contingency Plans
   - a. Trigger points ☐
   - b. Decision tree ☐
   - c. Contractor's contingency plan ☐
   - d. Standby equipment or personnel ☐

10. TMP Implementation Costs
    - a. Itemized costs ☐
    - b. Cost responsibilities/sharing opportunities ☐
    - c. Funding source(s) ☐

11. Special Considerations (as needed)
12. Attachments (as needed)