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1010.01 General

Addressing work zone impacts is an important component in the design of a project and needs to be given adequate consideration early in the design process. Most work zones create some level of traffic impacts and require additional safety features; therefore, all work areas and operations needed for construction must be identified and addressed during the project design. It is not acceptable to allow a project to move forward to advertisement without appropriately addressing work zone impacts, as the costs can account for up to 30% of the project cost. Planners, designers, construction engineers, maintenance personnel, and others all play a role in developing a comprehensive work zone design.

This chapter provides the designer with guidance to develop comprehensive work zone strategies and plans to address a project's safety, mobility, and constructibility issues. A systematic process for addressing work zone impacts is required by federal regulations and state policy.

1010.02 References

(1) Federal/State Laws and Codes

23 CFR 630 Subpart J

Americans with Disabilities Act of 1990 (ADA) (28 Code of Federal Regulations [CFR] Part 36, Appendix A, as revised July 1, 1994)

“Final Rule on Work Zone Safety and Mobility,” Federal Highway Administration (FHWA), Effective Date October 12, 2007

www.ops.fhwa.dot.gov/wz/resources/final_rule.htm

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)

(2) Design Guidance

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

Accessible Rights-of-Way: A Design Guide, U.S. Access Board, Washington DC

🔗 www.access-board.gov/prowac/alterations/guide.htm

Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines (ADAAG), July 23, 2004, U.S. Access Board

🔗 www.wbdg.org/ccb/astand/ada_aba.pdf

Executive Order E 1001, Work Zone Safety and Mobility

🔗 <http://wwwi.wsdot.wa.gov/docs/operatingrulesprocedures/1001.pdf>

Executive Order E 1033, WSDOT Employee Safety

🔗 <http://wwwi.wsdot.wa.gov/docs/operatingrulesprocedures/1033.pdf>

Plans Preparation Manual, M 22-31, WSDOT

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

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

Traffic Manual, M 51-02, WSDOT

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

(3) Supporting Information

Construction Manual, M 41-01, WSDOT

“Crashworthy Work Zone Traffic Control Devices,” Report 553, NCHRP, 2006

Environmental Procedures Manual, M 31-11, WSDOT

Highway Capacity Manual, 2000, TRB

ITE Temporary Traffic Control Device Handbook, 2001

ITS in Work Zones

🔗 www.ops.fhwa.dot.gov/wz/its/

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

Roadside Design Guide, AASHTO, 2006

Work Zone & Traffic Analysis, FHWA

🔗 www.ops.fhwa.dot.gov/wz/traffic_analysis.htm

Work Zone Operations Best Practices Guidebook, FHWA, 2000

🔗 www.ops.fhwa.dot.gov/wz/practices/practices.htm

Work Zone Safety and Mobility, FHWA

🔗 www.ops.fhwa.dot.gov/wz/index.asp

Work Zone Safety Web Page, WSDOT

🔗 www.wsdot.wa.gov/safety/workzones/

1010.03 Definitions

transportation management plan (TMP) A set of traffic control plans, transportation operations plans, and public information strategies for managing the work zone impacts of a project. A TMP is required for all projects to address work zone safety and mobility impacts.

traveling public Motorists, motorcyclists, bicyclists, pedestrians, and pedestrians with disabilities.

work zone An area of a highway with construction, maintenance, or utility work activities. A work zone is identified by the placement of temporary traffic control devices that may include signs, channelizing devices, barriers, pavement markings, and/or work vehicles with warning lights. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last temporary traffic control device (MUTCD).

work zone impact Highway construction, maintenance, or utility work operations in the traveled way, adjacent to the traveled way, or within the highway's right of way that creates safety and mobility concerns for workers or the traveling public.

work zone traffic control The planning, design, and preparation of contract documents for the modification of traffic patterns due to work zone impacts.

1010.04 Work Zone Safety and Mobility

In September 2004, the Federal Highway Administration (FHWA) published updates to the work zone regulations in [23 CFR 630 Subpart J](#), Work Zone Safety and Mobility. The updated regulation is referred to as “the Final Rule” on work zone safety and mobility and applies to all state and local governments that receive federal-aid highway funding. At the heart of the Rule is a requirement for agencies to develop an agency-level work zone safety and mobility policy. The policy is intended to support systematic consideration and management of work zone impacts across all stages of project development. Also required by the Rule is the development of processes and procedures to sustain the policy and transportation management plans (TMPs) for project-level procedures to manage work zone impacts.

WSDOT policy and the guidance to carry out the policy are outlined in [Executive Order E 1001, Work Zone Safety and Mobility](#). The policy states:

All WSDOT employees are directed to make the safety of workers and the traveling public our highest priority during roadway design, construction, maintenance, and related activities.

Designers need to be familiar with this document. The policy defines how WSDOT programs address work zone safety and mobility issues during project planning, design, and construction, and during highway maintenance.

1010.05 Transportation Management Plans and Significant Projects

(1) Transportation Management Plan (TMP)

A transportation management plan is a set of strategies for managing the corridor-wide work zone impacts of a project. A TMP is required for all projects and is a key element in

addressing all work zone safety and mobility impacts. The TMP development begins in the scoping phase of a project by gathering project information, traffic data, impacts assessments, strategies, and mitigation and design solutions.

The three major components of a TMP are described below.

(a) Temporary Traffic Control (TTC)

- Control Strategies: Could include staged construction, full road closures, lane shifts or closures, night work, or one-lane two-way operations (flagging and or pilot car).
- Traffic Control Devices: Temporary signing, channelizing devices (cones, drums), changeable message signs, arrow panels, temporary signals, and temporary pavement markings.
- Project Coordination, Contracting Strategies, and Innovative Construction Strategies: A+B bidding, incentives/disincentives, and precast members or rapid cure materials.

These strategies are to be included in the Plans, Specifications, and Estimates (PS&E) as traffic control plans (TCPs) and contract provisions.

(b) Transportation Operations (TO)

- Demand Management Strategies: Transit service improvements, transit incentives, and park & ride promotion.
- Corridor/Network Management (traffic operations) Strategies: Signal timing/coordination improvements, temporary signals, bus pullouts, reversible lanes, and truck/heavy-vehicle restrictions.
- Work Zone Safety Management Strategies: Speed limit reductions, barrier and attenuators, and automated flagger assistance devices.
- Traffic/Incident Management and Enforcement Strategies: Work Zone Intelligent Transportation Systems (ITS), Washington State Patrol, tow service, WSDOT Incident Management vehicle(s), and traffic screens.

Some of these strategies may be included in the PS&E, but could also be WSDOT-managed elements outside the contract.

(c) Public Information (PI)

- Public Awareness Strategies: Brochures or mailers, press releases, paid advertisements, and project website (consider providing information in other languages if appropriate).
- Motorist Information Strategies: Highway advisory radio (HAR), changeable message signs, and transportation management center (TMC).

Public awareness strategies may be developed and implemented by WSDOT through the region or Headquarters (HQ) Communications offices and implemented before and during construction. Motorist information strategies may be WSDOT-managed elements with state equipment outside the contract or identified on plans in the PS&E. Refer to the *Rule on Work Zone Safety and Mobility* at:

http://www.ops.fhwa.dot.gov/wz/resources/publications/trans_mgmt_plans/trans_mgmt_plans.pdf

(2) Significant Projects

The FHWA definition of a “significant project” is as follows:

A significant project is one 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 based on state policy and/or engineering judgment.

All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects.

It is possible to request an exception from FHWA for Interstate projects if sufficient justification is present to demonstrate that a project will not have sustained work zone impacts.

Note: Significant projects require a TMP document addressing safety and mobility impacts.

Required TMP components are:

- **Traffic Control Plans (TCPs):** Required (includes appropriate contract specifications) for all projects.
- **Transportation Operations Plans (TOPs):** Required for significant projects.
- **Public Information Plans (PIPs):** Required for significant projects.

(a) Addressing Impacts Within a Project Not Defined as Significant

Within a given project, significant work zone safety and mobility impacts can exist for a specific element of work. Those individual work zone-related impacts must be addressed and mitigated to an acceptable level. An acceptable level will be defined by the region based on an impact assessment and the adverse effects on safety and mobility. Some examples of these impacts are:

- Traffic delay beyond a local accepted level—possibly in the range of 15 to 20 minutes, but could vary based on local expectations.
- Traffic impacts that extend beyond the project limits and impact other roads.
- Safety or access impacts to emergency services or to a school, hospital, or community that exceed local expectations based on public input.
- Economic impacts due to traffic delays or restricted access beyond normal local expectations.
- Seasonal impacts that affect recreation or business due to work zone impacts.

If these examples or other impacts exist, the TMP should reflect a mitigating solution that is incorporated into the project. A formal TMP document would not be required. If the impacts cannot be mitigated to an acceptable level, elements of a PIP or TOP may be appropriate for inclusion in the TMP. This does not change the designation of the project as significant.

(b) Significant Project Definition and Evaluation

The Final Project Definition document must include a Work Zone Strategy Statement and indicate whether the project is significant in regard to work zone impacts.

Significant projects often 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:

🔗 www.wsdot.wa.gov/projects/projectmgmt/riskassessment/

(3) TMP Process

It is very important to continue the development of the TMP throughout the project development process. Not all work zone impacts will be addressed within the specific work zone elements of the contract plans. This is why it is critical to consider work zone impacts during the ongoing design of the actual project features, materials selection, working day considerations, overbuilding, temporary widening, phasing, structures, and so on. Many work zone impacts will need to be addressed by design solutions that resolve the impacts within staging plans, structure plans, and various construction plans and details. Some work zone impacts, especially those that are related to time duration may be resolved through innovative bidding and contract administration. Ongoing communication with the designer(s) of project features that will have work zone impacts is critical to ensure design solutions and mitigation measures are included within the project and TMP.

Use the TMP Checklist in [Exhibit 1010-3](#) to help identify issues and strategies for the above-three TMP components. Include the completed checklist in the Project File. For significant projects, develop this checklist and the supporting plans, data, impacts assessments, strategies, and endorsements into a formal TMP document to be included in the Project File. For TMP examples, see:

🔗 http://www.ops.fhwa.dot.gov/wz/resources/final_rule/tmp_examples/sample_tmpls.htm

1010.06 Work Zone TMP Strategy Development**(1) Work Zone Key Considerations**

The following list provides a quick review of the elements contained within or related to this chapter. These elements are part of WSDOT's work zone policy and are required or are key to the successful development of work zone design decisions. Federal and state regulations set the level of compliance for work zones. This list is intended to alert the designer that these items are not optional and must be addressed. The elements summarized below have more detailed information within this chapter or are contained within related manuals and documents such as the MUTCD, Revised Codes of Washington, and Washington Administrative Codes.

- Minimize, mitigate, and manage work zone impacts.
- Integrate work zone impacts strategies early, during planning, programming, and design.
- Develop an accurate scoping estimate based on the work zone strategies.
- Utilize the Work Zone TMP Checklist/TMP document required for significant projects.
- Hold a Work Zone Design Strategy Conference early in the design process.

- Emphasize flagger safety.
- Address work zone mobility through a capacity analysis.
- Determine work zone impacts through an impact assessment process.
- Integrate project constructibility into the work zone design strategy.
- Attend required work zone training.
- Address state of Washington traffic and safety regulations as provided for by state law.
- Use the legally adopted *Manual on Uniform Traffic Control Devices* (MUTCD), with Washington State modifications as the minimum standard.
- Provide an appropriate level of traffic control plans (TCPs).
- Consider work zone ITS elements.
- Use established design criteria in work zone roadway and roadside design.
- Accommodate pedestrian (including ADA requirements) and bicycle traffic.
- Consider maintenance of existing transit stops.
- Consider school zone impacts.
- Consider risk management and tort liability exposure.
- Consider work efficiency and cost containment.
- Approach the work zone design from the road user's perspective.
- Incorporate worker and other roadway user needs in your work zone designs.
- Account for all needed work areas and operations.
- Address work vehicle ingress and egress to each work area.

(2) Impacts Assessment

One of the most important tasks in developing TMP strategies is assessing all project impacts to mobility and safety. Impacts that are not identified and addressed in the TMP during design will undoubtedly become issues during the construction phase of the project. Addressing these impacts later during construction can significantly affect a project's costs and schedule, as well as increase traffic delays and safety concerns. The construction project may be well underway by the time these unidentified impacts are discovered, and the options to address them may be limited. A complete impacts assessment allows the project designer to develop more effective TMPs that should only need minor modifications to address construction issues.

An impacts assessment allows you to:

- Manage identified impacts within the structure of the TMP, even though the project may not be identified as significant.
- Develop TTC, TO, and PI strategies to address identified impacts as needed to effectively manage the project.
- Resolve potential work zone impacts within the project design features as design decisions are made. Informed decisions that consider work zone impacts during bridge type selection, materials selection, advertisement dates, and more have the potential to resolve work zone impacts before they happen.
- Engage construction PEs at the design level for input and decisions on the management of impact issues. The TMP needs to reflect those decisions.

- Consider innovative mitigation strategies such as staged closures or ITS solutions to solve an otherwise difficult impact that would be hard to manage during construction.

Impacts assessment starts in the scoping phase of a project and is an ongoing process through construction completion. During the design process, design details can produce a need for traffic control strategy revisions. Changes in design, such as types of materials (HMA vs. PCCP) or bridge footings types (shafts vs. spread) can have a big effect on the traffic control strategy. A designer needs to possess a clear understanding of all the features and how they will be constructed to determine the impact. Work closely with the roadway and bridge designers and construction personnel when assessing the impacts.

Once the designer knows what will be constructed and how, including the required work methods, equipment, materials, and duration to complete the work, an accurate assessment can be made. With this information, work areas can be determined. The work area and the duration of time it will be needed define the impact. If the work area requires a lane closure during actual work operations only on a low-volume highway, the impacts are minor. The strategy may be a typical single-lane closure during nonpeak traffic hours to perform the work. If the work area requires a lane closure until the work is completed over several weeks on a high-volume highway, the impact can be significant. The strategy may be to reduce the lane widths to maintain the same number of lanes and provide barrier to protect the work area. If traffic will be shifted onto the shoulder, the pavement depth on the shoulder needs to be determined. This strategy is much more complex and requires project-specific traffic control plans with temporary channelization and possible pavement reconstruction. If a project has many work areas, consider combining the work areas, if possible, or constructing the project in stages.

Not all impacts need to be addressed with traffic restrictions, closures, or other traffic control methods. Design changes, materials selection, construction methods, or construction sequence may reduce or eliminate some impacts. This is why the traffic control designer needs to understand design and construction issues and work closely with project designers and the Construction Office to develop the best overall traffic control strategy.

Some impacts may be difficult to completely solve and may ultimately need a management decision to determine the level of mitigation or impact to accept. These types of impacts need to be clearly addressed in the TMP with documentation supporting and explaining the decision.

(a) Impacts to Manage During Design

The following impacts should be managed during the design of a project:

1. Bridge construction sequence or falsework openings need to match the TCP staging or temporary channelization plans. The bridge falsework opening detail shown in the plans must be consistent with how the traffic will be maintained through the opening. Coordination with the HQ Bridge and Structures Office is essential. Maintain the legal height of 16 feet 6 inches as the minimum falsework opening whenever possible; anything less than this must consider overheight vehicle impacts and possible additional signing needs. Refer to [Chapter 720](#) for additional requirements. Coordination with the Permits Office may be needed.

2. Can the existing signals and lighting be maintained during the construction phases or do temporary connections need to be considered or temporary systems installed? Existing lighting at the exit and entrance ramps must be maintained at all times during construction and are often one of the first items of work that the contractor disables.
3. Temporary traffic loops and signal detection: Consider the detection needs in relation to the work operation and duration (such as temporary loops, video, radar, and timed system).
4. Permanent traffic loop installation (such as advance loops, turn pockets, and stop bars): Consider access to these locations and what types of traffic control will be needed.
5. Temporary pavement marking needs: What type of marking is most appropriate for the work operation and the pavement surface? When removed, how are existing markings going to impact the roadway surface? Consider how to best minimize for “ghost stripe” potential.
6. Pavement marking installations (crosswalks, arrows, and so on).
7. Utility relocation needs: How will existing utilities conflict with temporary needs?
8. Temporary impact attenuator installation needs: Determine the appropriate type for the location proposed and the specific needs or materials for the installation pad.
9. Lane shifts onto existing shoulders:
 - Is the depth of the existing shoulder adequate to carry the extra traffic?
 - Are there any existing catch basins or junction boxes located in the shoulder that cannot accept traffic loads over them? Are there existing shoulder rumble strips to be addressed?
 - What is the existing sideslope rate? If steeper than 4H:1V, does it need mitigation? Are there existing roadside objects that, when the roadway is shifted, are now within the clear zone limits?
 - Shifting of more than one lane in a direction is only allowed with temporary pavement markings. Shifting lanes by using channelizing devices is not allowed due to the high probability that devices used to separate the traffic will be displaced.
 - Existing drainage features: Will they be adversely impacted by temporary lane shifts or by anticipated work operations?
 - Signal head alignment: When the lane is shifted approaching the intersection, is the signal head alignment within appropriate limits?
10. Roundabout construction at an existing intersection requires site-specific staging plans. Roundabouts create many unique construction challenges and each roundabout usually has very specific design features. There are no established national standards or guidelines for the construction of roundabouts under traffic. Each roundabout must be approached individually for the location and the traffic operational movements that exist.

(3) Work Duration

The duration of work is a major factor in determining a strategy and the amount and types of devices to use in traffic control work zones. A project may have work operations with durations that meet several or all of the following conditions. Refer to the MUTCD for additional information regarding work duration.

(a) Long-Term Stationary Work Zone

This is work that occupies a location continuously for more than three days. There is ample time to install and realize benefits from the full range of traffic control procedures and devices. Construction signs should be post-mounted and larger; more stable channelizing devices should be used for increased visibility. Temporary barriers, pavement markings, illumination, and other considerations may be required for long-term stationary work. Staged construction or temporary alignment/channelization plans are required with this type of work.

(b) Intermediate-Term Stationary Work Zone

This is work that occupies a location for up to three days. Signs may still be post-mounted if in place continuously. Temporary pavement markings, in addition to channelization devices, may be required for lane shifts. Barrier and temporary illumination would normally not be used in this work zone duration.

(c) Short-Term Stationary Work Zone

This is work that occupies a location for more than one hour within a single day. At these locations, all devices are placed and removed during the single period.

(d) Short-Duration Work Zone

This is work that occupies a location for up to one hour. Because the work time is short, the impact to motorists is usually not significant. Simplified traffic control set-ups are allowed, to reduce worker exposure to traffic. The time it may take to set up a full complement of signs and devices could approach or exceed the amount of time required to perform the work. Short-duration work zones usually apply to maintenance work and are not used on construction projects. (See [Work Zone Traffic Control Guidelines](#) for more information.)

(e) Mobile Work Zone

This is work that moves intermittently or continuously. These operations often involve frequent stops for activities such as sweeping, paint striping, litter cleanup, pothole patching, or utility operations, and they are similar to short-duration work zones. Truck-mounted attenuators, warning signs, flashing vehicle lights, flags, and channelizing devices are used, and they move along with the work. When the operation moves along the road at low speeds without stopping, the advance warning devices are often attached to mobile units and move with the operation.

Pavement milling and paving activities are similar to mobile operations in that they can progress along a roadway several miles in a day. These operations, however, are not considered mobile work zones, and work zone traffic control consistent with construction operations is required.

(4) TMP Strategies

When the list of project impacts is complete, the designer can begin to develop strategies for addressing them. There are often several strategies that can be employed to manage traffic through a work zone. The designer will need to analyze the traffic capacity, consider the cost/benefit of the strategy, and consider constructibility issues.

Constructibility is a key element in a successful work zone strategy. Safety and mobility are the main concerns, but if the proposed strategy has constructibility issues, the construction costs can escalate, and safety and mobility impacts may not be addressed. Selecting a strategy is often a compromise and involves many engineering and nonengineering factors. Continue to work closely with roadway and bridge designers and construction and maintenance personnel when selecting strategies. The selected strategies are developed into the traffic control PS&E or included in the TMP document to be performed outside the contract.

Do not assume that strategies chosen for past projects will adequately address the impacts for similar projects in the future. There may be similarities with the type of work, but each project is unique and is to be approached in that manner. Always look for other options or innovative approaches; many projects have unique features that can be turned to an advantage if carefully considered. Even a basic paving project on a rural two-lane highway may have opportunities for detours, shifting traffic, or other strategies.

For a list of work zone analysis tools, see:

☞ http://ops.fhwa.dot.gov/wz/traffic_analysis/index.htm#tools

(5) Temporary Traffic Control (TTC) Strategies

(a) Lane Closure

One or more of the traffic lanes are closed in this work zone type. A capacity analysis is necessary to determine the extent of congestion that might result. This may require night work or peak hour restriction. Consider traffic safety drums and truck-mounted attenuators for freeway or expressway lane closures.

(b) Shoulder Closure

A shoulder closure is used for work areas at the edge of the paved shoulder or off the pavement edge. On high-volume freeways or expressways, they should not be in place during peak traffic hours.

(c) Alternating One-Lane Two-Way Traffic

This strategy involves using one lane for both directions of traffic. Flaggers are normally used to alternate the traffic movements. Do not include alternating traffic with flaggers as a traffic control strategy until all other reasonable means of traffic control have been considered. Options to remove flaggers during alternating traffic operations are temporary portable traffic signals or automated flagging assistance devices (AFAD).

If flaggers are used at an intersection, a flagger is required for each leg of the intersection. Only law enforcement personnel are allowed to flag from the center of an intersection. When multiple lanes are present at an intersection, close the lanes so only one lane of traffic approaches the flagger location. When an existing signal is present

at the intersection, the signal is to either be turned off or set to flash mode when flagging.

Flagger safety is a high emphasis area. Flagging stations need to be illuminated at night. Flaggers need escape routes in case of errant vehicles. Provide a method of alerting them to vehicles approaching from behind. Two-way radios or cellular phones are required to allow flaggers to communicate with one another. The flagger's location, escape route, protection, signing, and any other safety-related issues all need to be incorporated into the traffic control plan for the flagging operation. Flaggers are not to be used on freeways or expressways. The WSDOT publication, [Work Zone Traffic Control Guidelines](#), and the [Standard Specifications](#) have more information on flaggers, including the Washington State Department of Labor and Industries safety regulations for flaggers.

Using flaggers solely to instruct motorists to proceed slowly is ineffective and is an unacceptable practice. A spotter (not to be confused with a flagger) is used solely to alert workers of an errant vehicle. A spotter does not use a flagging paddle, but instead uses a warning device like an air horn. Intended spotter locations are to be shown on traffic control plans. Additional information on the use of spotters is available in the [Standard Specifications](#).

Law enforcement personnel may be considered for some flagging operations and can be very effective where additional driver compliance is desired. The [Traffic Manual](#) contains information on the use of law enforcement personnel at work zones.

(d) Rolling Slowdown

Rolling slowdowns are commonly practiced by the Washington State Patrol (WSP) for emergency closures. They are a legitimate form of traffic control for contractors or utility and highway maintenance crews for *very specific* short-duration closures (to move large equipment across the highway, to pull power lines across the roadway, to switch traffic onto a new alignment, and so on). They are not to be used for routine work that can be addressed by lane closures or other formal traffic control strategies. Traffic control vehicles, during off-peak hours, form a moving blockade, which reduces traffic speeds and creates a large gap (or clear area) in traffic, allowing very short-term work to be accomplished without completely stopping the traffic.

Consider other forms of traffic control as the primary choice before the rolling slowdown. A project-specific traffic control plan (TCP) must be developed for this operation. The TCP or contract provisions should list the work operations in which a rolling slowdown is allowed. The gap required for the work and the location where the rolling slowdown begins needs to be addressed on the TCP. Use of the WSP is encouraged whenever possible. Refer to the [Standard Specifications](#) and [Work Zone Traffic Control Guidelines](#) for additional information on rolling slowdown operations.

(e) Intermittent Closure

This work zone type involves stopping all traffic in both directions for a relatively short time to allow the work to proceed. After a certain amount of time, based on traffic volume, the roadway is reopened. An example of this type of closure would be a girder-setting operation for a bridge project: typically, the closure would be limited to a ten-minute maximum and would occur in early morning hours when traffic

volumes are at a minimum. A traffic control plan is required for this operation detailing the method that will be used to stop traffic. Typically, this will be done by closing the lanes of a multilane roadway to a single lane and using either a flagger or law enforcement at the point of closure. These closure points must be shown on a plan.

(f) **Temporary Bypass**

This strategy involves total closure of one or both directions of travel on the roadway. Traffic is routed to a temporary bypass usually constructed within the highway right of way. An example of this is the replacement of an existing bridge by building an adjacent temporary structure and shifting traffic onto the temporary structure. A temporary channelization plan is required to show pavement markings, barrier and attenuators, and sign and device placement.

(g) **Median Crossover**

This strategy involves placing all multilane highway traffic on one side of the median. Lanes are usually reduced in both directions and one direction is routed across the median. Median paving may be required to create crossover locations. For long-duration crossovers, temporary channelization plans are required, with barrier to separate the two directions of traffic and temporary illumination required at the crossover locations (see [Exhibit 1040-24](#)).

(h) **Lane Shift/Reduced Lane Width**

Traffic lanes may be shifted and/or width-reduced in order to accommodate a long-duration work area when it is not practicable, for capacity reasons, to reduce the number of available lanes. Shifting more than one lane of traffic requires the removal of conflicting pavement markings and the installation of temporary markings; the use of channelization devices to separate multiple lanes of traffic is not allowed. Use advanced warning signs to show the changed alignment when the lateral shifting distance is greater than one-half of a lane width, and consider the use of solid lane lines through the shift areas.

Utilizing the existing shoulder may be necessary to accommodate the shifting movement. First, analyze the structural capacity of the shoulder to determine its ability to carry the proposed traffic. Remove and inlay existing shoulder rumble strips prior to routing any traffic onto the shoulder.

(i) **Total Closures**

Total closures may be for the project duration or for a critical work operation that has major constructibility or safety issues. The main requirement for total closures is the availability of a detour route and whether or not the route can accommodate the increased traffic volumes. 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 of time (see the [Traffic Manual](#) and [RCW 47.48](#)). Advance notification of the closure is required, and a signed detour route may be required.

Consider the following road closure issues:

- Communication with all stakeholders, including road users, local businesses, local agencies, transit agencies, emergency services, schools, and others, is

required when considering a total closure strategy. This helps determine the level of support for a closure and development of an acceptable closure duration.

- 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.
- A closure decision (other than short-term, minor-impact closures) will require stakeholder acceptance and management approval once impacts and benefits have been 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 constructibility as a component of an effective work zone strategy.
- Short-duration closures of ramps or intersecting streets during off-peak hours do not require extensive approval if advance notice is provided and reasonable alternate routes are available.
- Detailed, project-specific traffic control plans, traffic operation plans, and public information plans are required.
- Document road closure decisions and agreements in the Project File.

(j) Staged Construction

Staged construction entails combining multiple work areas into a logical order to provide large protected work areas for long durations, which maximizes work operations and minimizes daily impacts to traffic. Temporary alignment and channelization plans must be designed to place traffic in these semipermanent locations. Minimum geometric design criteria are to be used when developing these plans. Design strategies such as overbuilding for future stages or the use of temporary structures are often part of staged construction on significant impact projects or mega projects. Develop detailed capacity analysis and traffic modeling for each stage.

Implementation of the staged temporary alignment and channelization or transitioning from one stage to the next can be a safety and mobility impact. Production rates for removing and replacing pavement markings, temporary barrier, or pavement work at the tie-in locations can create lane and duration impacts that need to be considered. Strategies and plans to implement or change stages must be considered.

(k) Traffic Split or Island Work Zone

This strategy separates lanes of traffic traveling in one direction around a work area. On higher-speed roadways, temporary barriers are provided to prevent errant vehicles

from entering the work area. Some drivers have difficulty understanding "lane split" configurations, which sometimes results in poor driving decisions such as unnecessary or late lane changes. Braking and erratic lane changes decrease the traffic capacity through the work zone, which results in an unstable traffic flow approaching the lane split. Evaluate other strategies, such as overbuilding, to keep traffic on one side of the work area to avoid a traffic split if possible.

Consider the following guidance for traffic split operations:

- Define the work operation and develop the traffic control strategy around the specific operation.
- 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 Portable Changeable Message Signs (PCMS signs), portable Highway Advisory Radio (HAR), and other dynamic devices.
- Consider how the operation will impact truck traffic. If the truck volumes are high, additional consideration may be prudent to control in which lane the trucks drive. If the trucks are controlled, it eliminates much of the potential for truck/car conflicts and sorts out undesirable truck lane changes through the work zone. For questions concerning truck operations, contact the HQ Freight Systems Division.
- To discourage lane changing, consider the use of solid lane line markings to delineate traffic approaching the split or island. Refer to the MUTCD for additional details.
- Consider the use of STAY IN LANE (black on white) signs, or set up a "no pass" zone approaching the lane split and coordinate with the Washington State Patrol (WSP).
- Supplement the existing roadway lighting with additional temporary lighting to improve the visibility of the island work area (see Exhibit 1040-23).
- Coordinate with the Region Traffic Office for signing and pavement marking details when designing island work zones.

(l) **A+B Bidding**

Use A+B bidding to reduce the contract time by requiring bidders to determine the working days as part of their bid. For more information, see:

🔗 www.wsdot.wa.gov/projects/delivery/alternative/abbidding

(m) **Incentive/Disincentive Clauses**

These are contract provisions that place financial consequences, good or bad, to ensure high-impact work or projects are finished as soon as possible. These provisions could also include accelerated work schedules for high-impact work operations.

(n) Innovative Design/Construction Methods

- 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.
- Design bridges using super girders, falsework restrictions, or temporary structures.
- Bring adjacent lifts of hot mix asphalt (HMA) to match the latest lifts (lag up), to minimize abrupt lane edges to improve motorist safety.
- Require a tapered wedge joint on HMA lifts to eliminate an abrupt drop-off.

(6) Transportation Operations (TO) Strategies**(a) Demand Management**

- Provide transit service improvements and possible incentives to help reduce demand.
- For long-term freeway projects, consider ramp metering.
- Provide a shuttle service for pedestrians and bicyclists.
- Provide local road improvements (signals modifications, widening, and so on) to improve capacity for use as alternate routes.
- Provide traffic screens to reduce driver distraction.

(b) Corridor/Network Management

- Provide a temporary express lane with no access through the project.
- Consider signal timing or coordination modifications.
- Provide emergency pullouts for disabled vehicles on projects with narrow shoulders.
- Use heavy-vehicle restrictions and provide alternate routes or lane use restrictions.

(c) Work Zone Safety Management

- Provide temporary access road approaches for work zone access.
- Use positive protective devices (barrier) for long-term work zones to improve the environment for workers and motorists.
- Install intrusion alarms or vehicle arresting devices.
- Use speed limit reductions when temporary conditions create a need for motorist slow-downs.

(d) Traffic/Incident Management and Enforcement

- Provide law enforcement patrols to reduce speeding and aggressive drivers.
- Provide incident response patrols during construction to reduce delays due to collisions in the work zone.
- Include work zone ITS elements in the project or coordinate with TMC to use existing equipment.
- Provide a dedicated tow service to clear incidents.

(7) Public Information (PI) Strategies

(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 or HQ Communications Office in developing and implementing these strategies.

(b) Driver Information

In addition to work zone signs, provide driver information using highway advisory radio (HAR) and changeable message signs (existing or portable). Provide additional work zone ITS features that could include traffic cameras or queue detection along with changeable message signs to provide drivers with real time information on delays and traffic incidents. Involve the region TMC in the development and implementation of these strategies. Coordinate freight travel information and restrictions through the Freight Systems Office. Additional information on work zone ITS can be found on the Work Zone Safety web page:

www.wsdot.wa.gov/safety/workzones/

Work zone strategy development is a fluid process and may be ongoing as project information and design features are developed during the design process. There may be many factors involved with strategy development, and it is necessary to be well organized to make sure all the relative factors are identified and evaluated.

(c) Pedestrian and Bicycle Information

Include pedestrian and bicycle access information and alternate routes in the public awareness plans. Pedestrian and bicyclist information signing, including alternate route maps specifically for these road users, could be considered.

1010.07 Capacity Analysis

Work zone congestion and delay is a significant issue for many highway projects. High-volume locations with existing capacity problems will certainly be candidates for further capacity problems when a work zone is in place. Work zones can create many types of roadway restrictions, such as lane closures, shoulder closures, narrowed lanes, closures and detours, and diversions, which all reduce capacity. Even when the construction work does not affect adjacent traffic lanes, slowdowns in the traffic flow are common because these activities can distract a motorist.

All work zone restrictions need to be analyzed to determine the level of impacts. Short-term impacts may only require work hour restrictions; long-term impacts require a detailed capacity analysis of the proposed mitigation strategies to select the best method of maintaining mobility. Include the *Work Zone & Traffic Analysis* in the Project File.

Work zone mobility impacts can have the following effects:

- **Crashes:** Most work zone crashes are congestion-related, usually in the form of rear-end collisions due to traffic queues. Traffic queues beyond the advance warning signs increase the risk of crashes.

- **Driver Frustration:** Drivers expect to travel to their destinations in a timely manner. If delays occur, driver frustration can lead to aggressive or inappropriate driving actions.
- **Constructibility:** Constructing a project efficiently relies on the ability to pursue work operations while maintaining traffic flow. Delays in material delivery, work hour restrictions, and constant installation and removal of traffic control devices all detract from constructibility.
- **Local Road Impacts:** Projects with capacity deficiencies can sometimes cause traffic to divert to local roadways, which may impact the surrounding local roadway system and community. Local roads may have lower geometric criteria than state facilities. Placing additional and new types of traffic on a local road may create new safety concerns, especially when drivers are accustomed to the geometrics associated with state highways. Pavement integrity and rehabilitation may need to be addressed when traffic is detoured to local roadways.
- **Public Credibility:** Work zone congestion and delay can create poor credibility for WSDOT with drivers and the surrounding community in general.
- **Restricted Access:** Severe congestion can effectively gridlock a road system, preventing access to important route connections, businesses, schools, hospitals, and so on.
- **User Cost Impacts:** Congestion and delay, as well as associated collisions and other impacts, can create significant economic impacts to road users and the surrounding community. Calculate user costs as part of a work zone capacity analysis; the costs may be used to determine liquidated damages.

WSDOT has a responsibility to maintain traffic mobility through and around its projects. The goal is to keep a project's work zone traffic capacity compatible with existing traffic demands. Maintaining the optimum carrying capacity of an existing facility during construction may not be possible, but an effort must be made to maintain existing traffic mobility through and/or around the work zone.

Maintaining mobility does not rule out innovative strategies such as roadway closures. Planned closures can accelerate work operations, reducing the duration of impacts to road users. These types of traffic control strategies must include a plan to notify road users and mitigate and manage the congestion as much as possible. Traffic capacity mitigation measures are important since many projects cannot effectively design out all the work zone impacts.

A capacity analysis helps determine whether a work zone strategy is feasible. Mitigation measures that provide the right combination of good public information, advance signing and notification, alternate routes, detours, and work hour restrictions, as well as innovations such as strategic closures, accelerated construction schedules, or parallel roadway system capacity improvements, can be very effective in reducing mobility impacts.

Some of the impact issues and mitigating measures commonly addressed by traffic analyses include:

- Work hour time restrictions
- Hourly liquidated damage assessment
- Use of staged construction

- Working day assessment
- Public information campaign
- User cost assessment
- Local roadway impacts
- Special event and holiday time restrictions
- Closure and detour options
- Mitigation cost justification
- Level of service
- Queue lengths
- Delay time
- Running speed
- Coordination with adjoining projects (internal and local agency)

Many projects will have several potential work zone strategies, while other projects may only have one obvious work zone strategy. It is possible that a significant mobility impact strategy may be the only option. TMP strategies still need to be considered. An analysis will help show the results of these mitigating measures.

There is no absolute answer for how much congestion and delay are acceptable on a project; it may ultimately become a management decision.

Reductions in traffic capacity are to be mitigated and managed as part of the TMP. The traffic analysis process helps shape the TMP as the work zone strategies are evaluated and refined into traffic control plans and specifications. Maintain analysis documents in the Project File.

(1) Collecting Traffic Volume Data

Current volume data in the project vicinity is required for accurate traffic analysis results. Seasonal adjustment factors may be needed depending on when the data was collected and when the proposed traffic restrictions may be in place. Assess existing data as early as possible to determine whether additional data collection may be required. The region Traffic Office and the HQ Statewide Travel & Collision Data Office can assist with collecting traffic volume data. Coordination with local agencies may be needed to obtain data on affected local roads.

(2) Short-Term Lane Closure Work Zone Capacity

For short-term lane closures on multilane highways or alternating one-way traffic on two-lane highways, see [Exhibit 1010-1](#), General Lane Closure Work Zone Capacity. It provides information for a quick analysis when compared to current hourly volumes on the highway. The basic traffic analysis programs QUEWZ 98 and QuickZone, along with hourly volume input, the number of lanes to be closed, the hours of closure, and other default information, will output queue length, delay time, user costs, and running speed.

Roadway Type	Work Zone Capacity
Multilane Freeways/Highways	1300 VPHPL*
Multilane Urban/Suburban	600 VPHPL*
Two-Lane Rural Highway	400 VPHPL/ 800 VPH total*

*These are average capacity values. The actual values would be dependent on several factors, which include the existing number of lanes, number of lanes closed, traffic speed, truck percentage, interchanges/intersections, type of work, type of traffic control, and seasonal factors (among others). For further information, consult the *Highway Capacity Manual*.

General Lane Closure Work Zone Capacity

Exhibit 1010-1

(3) Long-Term Work Zone Capacity

For complex strategies that change traffic patterns, a more detailed analysis is required using advanced traffic modeling software. These strategies could include reducing lane and shoulder widths for extended lengths, reducing the number of lanes for extended durations, moving all lanes of traffic onto a temporary alignment, changing access locations to and from the highway, or closures with detours (including public information and traffic operation plans with anticipated reduction in demand). Work with the region Traffic Office for assistance with this level of analysis.

The following resources are also available to assist with the actual analysis and mitigation strategy development upon request:

- HQ Statewide Travel & Collision Data Office
- HQ Traffic Offices
- Region Work Zone Specialist
- Region Public Information Office

Training is also available to obtain further knowledge and expertise in traffic analysis (see 1010.12).

1010.08 Work Zone Design Standards

Part 6 of the MUTCD mostly addresses short-duration temporary traffic control standards. Some long-duration work zones may require temporary alignments and channelization, including barrier and attenuator use, temporary illumination and signals, and temporary pedestrian and bicycle routes. Refer to the *Design Manual's* chapters on permanent features for design guidance.

(1) Lane Widths

Maintain existing lane widths during work zone operations whenever possible. For projects that require lane shifts or narrowed lanes due to work area limits and staging, consider the following before determining the final lane width to be implemented:

- Overall roadway width available
- Posted speed limit

- Traffic volumes through the project limits
- Number of lanes
- Existing lane and shoulder widths
- Length of project
- Duration of lane width reduction (if in place)
- Roadway geometry (cross slope, vertical and horizontal curves)
- Truck percentage

Work zone geometric transitions should be minimized or avoided if possible. When necessary, such transitions should be made as smoothly as the space available allows. Maintain approach lane width, if possible, throughout the connection. Design lane width reductions prior to any lane shifts within the transition area. Do not reduce curve radii and lane widths simultaneously.

The minimum allowable striped lane width is 11 feet to a maximum allowable lane width of 14 feet when the radius is greater than 500 feet. Follow existing lane widths when delineating temporary lanes with channelizing devices. For low-speed low-volume roadways, 10-foot lanes are allowed with approval from the region Traffic Engineer.

When determining lane widths, the objective is to use lane geometrics that will be clear to the driver and keep the vehicle in the intended lane. Lane lines and construction joints are treated to provide a smooth flow through the transition area. In order to maintain the minimum lane widths and shy distances, temporary widening may need to be considered.

(2) Buffer Space and Shy Distance

Buffer spaces separate road user flow from the work space or other areas off-limits to motorists, and they might provide some recovery space for errant vehicles.

- A lateral buffer provides space between the vehicles and adjacent work space, traffic control device, or a condition such as an abrupt lane edge or drop-off. At a minimum, a 2-foot lateral buffer space is recommended.
- A longitudinal buffer is used after traffic lanes or shoulders are closed or shifted. This space provides a recovery area for errant vehicles before the work space.
- Shy distance is the distance from the edge of the traveled way beyond which a roadside object will not be perceived as an immediate concern by the typical driver to the extent that the driver will change the vehicle's placement or speed. A 2-foot shy distance to barriers is required.

Devices used to separate the driver from the work space should not encroach into adjacent lanes. If encroachment is necessary, it is recommended to close the adjacent lane to maintain the lateral buffer space.

In order to achieve the minimum lateral clearances, there may be instances where temporary pavement widening or a revision to a stage may be necessary. In the case of short-term lane closure operations, the adjacent lane may need to be closed or traffic may need to be temporarily shifted onto a shoulder to maintain a lateral buffer space. During the design of the traffic control plan, the lateral clearance needs to be identified on the plan to ensure additional width is available; use temporary roadway cross sections to show the space in relation to the traffic and work area.

(3) Work Zone Clear Zone

The contractor's operations present opportunities for errant vehicles to impact the clear area adjacent to the traveled way. A work zone clear zone (WZCZ) is established for each project to ensure the contractor's operations provide an appropriate clear area. The WZCZ addresses items such as storage of the contractor's equipment and employee's private vehicles and storage or stockpiling of project materials. The WZCZ applies during working and nonworking hours and applies only to roadside objects introduced by the contractor's operations. It is not intended to resolve preexisting deficiencies in the Design Clear Zone or clear zone values established at the completion of the project. Those work operations or objects that are actively in progress and delineated by approved traffic control measures are not subject to the WZCZ requirements.

Minimum WZCZ values are presented in [Exhibit 1010-2](#). WZCZ values may be less than Design Clear Zone values due to the temporary nature of the construction and limitations on horizontal clearance. To establish an appropriate project-specific WZCZ, it may be necessary to exceed the minimum values. The following conditions warrant closer scrutiny of the WZCZ values, with consideration of a wider clear zone:

- Outside of horizontal curves or other locations where the alignment presents an increased potential for vehicles to leave the traveled way.
- The lower portion of long downgrades or other locations where gradient presents an increased potential for vehicles to exceed the posted speed.
- Steep fill slopes and high traffic volumes. (Although it is not presented as absolute guidance, the Design Clear Zone exhibit in [Chapter 1600](#) may be used as a tool to assess increases in WZCZ values.)

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

Minimum Work Zone Clear Zone Distance
Exhibit 1010-2

(4) Abrupt Lane Edges and Drop-offs

Minimize, mitigate, or eliminate abrupt lane edges adjacent to the traveled lane whenever possible. There are work operations where drop-offs are unavoidable in order to perform the work, but in these instances, the drop-off can generally be anticipated and addressed in the work zone traffic control plan design. Contract provisions should be included limiting the duration of edges from planing and paving operations and requiring a step wedge on new pavement edges or a lag up requirement to minimize the instances of abrupt lane edges. Use the following guidance examples for drop-off protection measures. Note: These are general guidance examples only. For a complete discussion of abrupt lanes edges and drop-offs, see Standard Specification 1-07.23(1):

~ www.wsdot.wa.gov/publications/manuals/fulltext/m41-10/d1.pdf

- Drop-offs up to 0.20 foot may remain exposed with appropriate warning signs alerting motorists of the condition.
- Drop-offs more than 0.20 foot are not allowed in the traveled way or auxiliary lane unless protected with appropriate warning signs, channelization devices, or barrier.
- Drop-offs more than 0.20 foot, but no more than 0.50 foot, that will not be within the traveled way shall be protected with appropriate warning signs, a wedge of compacted stable material at a slope of 4:1 or flatter, channelization devices, or barrier.
- Drop-offs more than 0.50 foot, but less than 2 feet, not within the traveled way or auxiliary lane shall be protected with appropriate warning signs, wedge of compacted stable material at a slope of 4:1 or flatter, channelization devices, or barrier. This drop-off is allowed only if it is less than 1 mile in length, does not remain for more than three working days, and is only on one side of the roadway.
- Drop-offs more than 0.50 foot that will not be within the traveled way or auxiliary lane and are not otherwise covered by the above shall be protected with appropriate warning signs and wedge of compacted stable material at a slope of 4:1 or flatter or barrier. (See [Chapter 1610](#) for information on deflection if using barrier.)
- Open trenches within the traveled way or auxiliary lane shall have a steel-plate cover placed and anchored over them. A wedge of suitable material, if required, shall be placed for a smooth transition between the pavement and the steel plate. Warning signs shall be used to alert motorists of the presence of the steel plates.

Abrupt lane edges and drop-offs require additional warning and considerations for motorcyclists, bicyclists, and pedestrians, including pedestrians with disabilities. Adequate signing to warn the motorcycle rider of these conditions is required. (See [RCW 47.36.200](#), [WAC 468-95-305](#), and [Work Zone Traffic Control \(WZ\)](#) for signing details.)

(5) Vertical Clearance

In accordance with [Chapter 720](#), the minimum vertical clearance over new highways is 16.5 feet. Anything less than the minimum must follow the reduced clearance criteria discussed in [Chapter 720](#) and be included in the temporary traffic control plans. Maintain legal height on temporary falsework for bridge construction projects. Anything less than this must consider overheight vehicle impacts and possible additional signing needs and coordination with permit offices. 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 overheight 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.

(6) Temporary Median Crossover Requirements

When two-way traffic is placed on one side of a multilane divided highway, consider the following guidelines when designing the crossover:

- Separate opposing traffic with either temporary traffic barriers (on high-speed roadways) or with channelizing devices throughout the length of the two-way operation. Temporary pavement markings, removal of conflicting existing markings, and construction signs are also required.

- The crossover locations are to be paved, and temporary pavement markings are required. Temporary illumination is required to improve the visibility of the crossover location. Temporary drainage may be necessary under the median fill when applicable.
- Geometrics design for temporary crossovers needs to follow the same guidance as permanent construction and have horizontal curves calculated to fit the location.
- Design crossovers for operating speeds not less than 10 mph below the posted speed limit unless unusual site conditions require a lower design speed.
- Straight line crossover tapers work best for highways with narrow paved medians.
- Provide a buffer space between the lane closures and crossover locations.
- Design crossovers to accommodate all roadway traffic, including trucks, buses, motor homes, motorcycles, and bicycles.
- A good array of channelizing devices and properly placed pavement markings is essential in providing clear, positive guidance to drivers.
- Provide a clear roadside recovery area adjacent to the crossover. Consider how the roadway safety hardware (guardrail, crash cushions, and so on) may be impacted by the traffic using the crossover if the traffic is going against the normal traffic flow direction. Avoid or mitigate possible snagging potential. Avoid placing crossover detours near structures.
- A site-specific traffic control plan is required.

(7) Temporary Alignment and Channelization

Temporary alignment and channelization plans may be necessary for some long-term work zones.

The following are guiding principles for the design of temporary alignment and channelization plans:

- Use site-specific base data.
- Use permanent geometric design criteria.
- Provide beginning and ending station ties and curve data.
- Include lane and shoulder widths.
- Provide temporary roadway sections.
- To avoid confusion, do not show existing conflicting or unnecessary details on the plan.
- Do not use straight line tapers through curves; use circular alignment.
- Be aware of existing crown points, lane/shoulder cross slope breaks, and superelevation transitions that may affect a driver's ability to maintain control of a vehicle through a work zone.
- If the project has multiple stages, from one stage to the next, show newly constructed features as existing elements. For example, if an edge line is removed in one stage, the following stage would show the change by indicating where the new edge line is located.
- Consider the time constraints for the removal of existing markings and the time required to install new markings, especially if the work is for multilane staged construction. In urban areas where work hour restrictions for lane closures are

limited, special consideration may be necessary to allow for time to address pavement markings, or interim stages may be necessary. Reopened temporary traffic lanes are to be marked and in compliance with criteria established in this chapter.

- Use shoulder closure signing and channelizing devices to close a shoulder prior to a temporary impact attenuator and run of temporary concrete barrier.
- Existing signing may need to be covered or revised, and additional construction warning signs may be needed for the new alignment.
- For better guidance through shifting or taper areas, consider solid lane lines. Return to broken lane lines between shift areas.

(8) Reduced Speeds in Work Zones

As part of the design process for construction projects, speed reductions are an option requiring thorough traffic analysis prior to adopting this option. Traffic control design assumes that drivers will reduce their speed only if they clearly perceive a need to do so. Reduced speed limits are used only where roadway and roadside conditions or restrictive features are present, such as narrow, barrier-protected work areas with major shifts in roadway alignment and where a reduced speed is truly needed to address the altered geometry of the roadway. Speed reductions are not applied as a means for selecting lower work zone design criteria (tapers, temporary alignment, device spacing, and so on). Avoid frequent changes in the speed limit.

Speed limit reductions are categorized as follows:

- Continuous Regulatory Speed Limit Reduction: A speed reduction in place 24 hours a day during the number of days that construction is present.
- Variable Regulatory Speed Limit Reduction: A speed reduction in place, usually during an active work shift.
- Advisory Speed Reduction: A specific signed warning message with an advised safe speed for that given work zone condition.

Proposed speed limit reductions of more than 10 mph on any route or less than 60 mph on freeways require HQ Traffic Office approval. The Regional Administrator is authorized to approve regulatory speed limit reductions in work zones as provided for in RCW 47.48. The region Traffic Engineer is responsible for recommending or denying a speed limit reduction request to the Regional Administrator. (See the [Traffic Manual](#) for additional guidance on speed limit reductions.) Include speed limit reduction approvals in the Project File.

Do not use the advisory speed plaque alone or in conjunction with any sign other than a warning sign. In combination with a warning sign, an advisory speed plaque may be used to indicate a recommended safe speed through a work zone. Refer to the [MUTCD](#) for additional guidance.

(9) Accommodation for Pedestrians and Bicyclists

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. When existing pedestrian routes that are accessible to pedestrians with disabilities are closed, the alternate routes must be designed and constructed to the same level of accessibility. Temporary pedestrian facilities within the work zone must meet accessibility criteria to the maximum extent feasible. (See [1510.06](#) and [1510.07](#) for

pedestrian circulation path and pedestrian access route accessibility criteria.) Covered walkways are to be provided where there is a potential for falling objects. In work areas where the speeds are low (25 mph), or the ADT is 2,000 or less, bicyclists can use the same route as motorized vehicles. For work zones on higher-speed facilities, bicyclists will need a minimum 4-foot shoulder or detour route to provide passage through or around a work zone. Bicyclists may be required to dismount and walk their bikes through a work zone on the route provided for pedestrians (see Exhibit 1520-1).

It may be possible to make other provisions to transport pedestrians and bicyclists through a work zone or with a walking escort around the active work area. Roadway surfaces are an important consideration for pedestrian and bicycle use. Loose gravel, uneven surfaces, milled pavement, and asphalt tack coats endanger the bicyclist and restrict access to pedestrians with disabilities.

Information can be gathered on bike issues by contacting local bike clubs. Coordination with local bike clubs goes a long way to ensuring their members are notified of work zone impacts, and it helps maintain good public relations. (See [Chapter 1520](#) for more bicycle design requirements and [Chapter 1510](#) and [MUTCD Chapter 6D](#) for pedestrian work zone design requirements.)

(10) Motorcycles

The same road surfaces that are a concern for bicyclists are also a concern for motorcyclists. Stability at high speed is a far greater concern for motorcycles than cars on grooved pavement, milled asphalt, and transitions from existing pavement to milled surfaces. Contractors must provide adequate warning signs for these conditions to alert the motorcycle rider. The WSDOT publication, *Work Zone Traffic Control Guidelines* (www.wsdot.wa.gov/publications/manuals/fulltext/m54-44/workzone.pdf) has more information on regulations for providing warnings to motorcyclists ([RCW 47.26.200](#)).

(11) Oversized Vehicles

The region Maintenance offices and the HQ Commercial Vehicle Services Office issue permits to allow vehicles that exceed the legal width, height, or weight limits to use certain routes. If a proposed work zone will reduce roadway width or vertical clearance, or have weight restrictions, adequate warning signs and notification to the HQ Commercial Vehicle Services Office and the appropriate region Maintenance Office is required as a minimum. Document communication with these offices and any other stakeholders in the Project File.

In the permit notification, identify the type of restriction (height, weight, or width) and specify the maximum size that can be accommodated. On some projects, it may be necessary to designate a detour route for oversized vehicles. An important safety issue associated with oversized loads is that they can sometimes be unexpected in work zones, even though warning and restriction or prohibition signs may be in place. Some oversized loads can overhang the temporary barrier or channelization devices and endanger workers. Consider the potential risk to those within the work zone. Routes with high volumes of oversized loads or routes that are already strategic oversized load routes may not be able to rely only on warning or prohibition signs. Protective features or active early warning devices may be needed. If the risk is so great that one oversized load could potentially cause significant damage or injury to workers, failsafe protection measures may be needed to protect structures and workers. The structure design, staging, and falsework openings may need to be reconsidered to safely accommodate oversized loads.

1010.09 Temporary Traffic Control Devices

FHWA regulations require that all roadside appurtenances such as portable sign stands, barricades, traffic barriers, barrier terminals, crash cushions, and work zone hardware be compliant with the National Cooperative Highway Research Program (NCHRP) 350 crash test requirements. For additional information on the NCHRP 350 requirements and for additional descriptions of devices, refer to the MUTCD. For additional information and use guidelines for the following work zone devices, refer to [Work Zone Traffic Control Guidelines](#).

(1) Channelizing Devices

Channelizing devices are used to alert and guide road users through the work zone. They are a supplement to signing, pavement markings, and other work zone devices. Typical channelizing devices include the following:

(a) Cones

Traffic safety cones are the most commonly used devices for traffic control and are very effective in providing delineation to the work zone. Cones are orange in color and are constructed of a material that will not cause injury to the occupants of a vehicle when impacted. For daytime operations on lower-speed (40 mph or lower) roadways, 18-inch-high cones can be used. For nighttime operations and high-speed roadways, reflectorized 28-inch-high cones are necessary. Traffic cones are used to channelize traffic, divide opposing traffic lanes, and delineate short-duration work zones.

(b) Traffic Safety Drums

Drums are fluorescent orange in color, constructed of lightweight, flexible materials, and are a minimum of 3 feet in height and 18 inches in diameter. They are highly visible and appear to be formidable obstacles. They are also less likely to be displaced by the wind generated by moving traffic. For these reasons, drums are preferred on high-speed roadways. Type-C steady-burn warning lights may be installed atop drums to improve visibility.

(c) Tall Channelizing Devices

Tall channelizing devices are 42 inches tall, fluorescent orange in color, and are constructed of lightweight, flexible material that may be less likely to cause injury in an impact. Tall channelizing devices are used to channelize traffic, divide opposing traffic lanes, and delineate short-duration work zones. These devices provide a larger target value in terms of retroreflectivity than cones, but less than that of drums. They do have a smaller footprint than drums, so they are a good alternative in narrow shoulder conditions.

(d) Tubular Markers

Tubular markers are not a recommended device unless they are being used to separate traffic on low-volume low-speed roadways.

(e) **Barricades**

The barricades used in work zone applications are portable devices. They are used to control traffic by closing, restricting, or delineating all or a portion of the roadway. There are four barricade types:

1. **Type 1 Barricade:** Used on lower-speed roads and streets to mark a specific object.
2. **Type 2 Barricade:** Used on higher-speed roadways; it has more reflective area for nighttime use to mark a specific object.
3. **Type 3 Barricade:** Used for lane and road closures.
4. **Directional Indicator Barricade:** A special-use device not commonly used. The device is used to define the route of travel on low-speed streets or in urban areas where tight turns are required. In lane reductions, the directional arrow on this barrier can be used in the transition taper to indicate the direction of the merge.

(f) **Longitudinal Channelizing Devices**

Longitudinal channelizing devices such as lightweight water-filled barriers are an improvement over the traffic cones and drums used to channelize traffic through a work zone. These types of barriers are **not intended** as a replacement for concrete barrier.

(g) **Barrier Drums**

Barrier drums are low-density polyethylene fabricated devices placed on and along temporary concrete barriers. They are fluorescent orange with retro-reflective bands and are designed to straddle a concrete barrier. They can be used in place of barrier reflectors for barrier delineation.

(2) Portable and Temporary Signing

Portable and temporary signs (Class B Construction Signs) are generally used in short-term work zones. They are set up and removed daily or frequently repositioned as the work moves along the highway. These signs are mounted on crashworthy, collapsible sign supports. They need to be placed such that they do not obstruct pedestrian facilities. Warning signs in place longer than three days at one location must be post-mounted.

(3) Fixed Signing

Fixed signing (Class A Construction Signs) are the signs mounted on conventional sign supports along or over the roadway. This signing is used for long-term stationary work zones. Ground-mounted sign supports are usually timber; details for their design are in [Chapter 1020](#) and the *Standard Plans*. Sign messages, color, configuration, and usage are shown in the MUTCD and the *Sign Fabrication Manual*. Existing signs may need to be covered, removed, or modified during construction.

(4) Warning Lights

Warning lights are either flashing or steady burn (Types A, B, or C) and are mounted on channelizing devices, barriers, and signs. Secure warning lights to the channelizing device or sign so they will not come loose and become a flying object if impacted by a vehicle. (See the [MUTCD](#) for additional information.)

- **Type A:** Low-intensity flashing warning light used to warn road users during nighttime hours that they are approaching a work zone.
- **Type B:** High-intensity flashing warning light used to warn road users during both daytime and nighttime hours.
- **Type C and Type D 360 degree:** Steady-burn warning lights designed to operate 24 hours a day to delineate the edge of the roadway.

(5) Arrow Panel

The arrow panel (Sequential Arrow Sign) displays either an arrow or a chevron pointing in the direction of the intended route of travel. Arrow panel displays are required for lane closures on multilane roadways. When closing more than one lane, use an arrow panel display for each lane reduction. Place the arrow panel at the beginning of the transition taper and out of the traveled way. The caution display (four corner lights) is only used for shoulder work. Arrow panels are not used on two-lane two-way roadways. (See the [MUTCD](#) for additional information.)

(6) Portable Changeable Message Signs (PCMS)

PCMS displays have electronic displays that can be modified and programmed with specific messages, and they are supplemental to other warning signs. These signs are usually mounted on trailers and use solar power and batteries to energize the electronic displays. The maximum number of message panels is two per location. If additional information is necessary, consider using a second sign. Place the PCMS far enough in advance of the roadway condition to allow the approaching driver adequate time to read the sign's message twice. PCMS systems are typically used where:

- Traffic speed is expected to drop substantially.
- Significant queuing and delays are expected.
- There are extreme changes in alignment or surface conditions.
- Advance notice of ramp, lane, or roadway closures is necessary.
- Incident management teams are used.

(7) Transportable Attenuators

A transportable attenuator is a portable impact attenuator attached to the rear of a large truck. Ballast is added to the truck to minimize the roll-ahead distance when impacted by a vehicle. Transportable attenuators are used as a shield to prevent errant vehicles from entering the work zone. They should be used on all high-speed roadways. If a transportable attenuator is not available, the use of a protective or shadow vehicle is still highly recommended.

(8) Portable Temporary Traffic Control Signals

Portable temporary traffic signals are trailer-mounted and used in work zones to control traffic. These versatile portable units allow for alternative power sources such as solar power, generators, and deep-cycle marine batteries, in addition to AC power. (See the [MUTCD](#) for additional information). Portable traffic signals are typically used on two-lane two-way highways where one lane is closed for an extended duration and alternating traffic movements need to be maintained. Contact the region Traffic Office and Signal Superintendent for specific guidance and advice on the use of these systems; a traffic control plan is required.

(9) Portable Highway Advisory Radio (HAR)

A HAR is a roadside radio system that provides traffic and travel-related information (typically affecting the roadway being traveled) via AM radio. 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 the region Traffic Office for specific guidance and advice on the use of these systems.

(10) Automated Flagger Assistance Device (AFAD)

The AFAD is an automated flagging machine that is operated remotely by a flagger located off the roadway and away from traffic. The device is a safety enhancement for projects that use alternating traffic control by physically placing the human flagger off the roadway while maintaining control of the traffic movements approaching the work zone. Contact the region Traffic Office for specific guidance and advice on the use of these systems. A traffic control plan is required for use of the AFAD.

1010.10 Other Traffic Control Devices or Features

(1) Barriers (Positive Protection)

Barriers are used in work zones to separate traffic moving in opposing directions and to separate road users from the work area. Temporary concrete barrier is the most common type of positive protection. (See [Chapter 1610](#) for guidance on barriers.)

Providing positive barrier protection may become the key component of the work zone strategy. Barrier use usually requires long-term stationary work zones and pavement marking revisions, and it can increase the traffic control costs. The safety benefit versus the cost of using barrier requires careful consideration, and cost should not be the only or primary factor determining the use of barrier.

Traditional lane closures using channelizing devices may not provide adequate worker and road user protection for some types of construction. Use barriers for the following conditions:

- To separate opposing high-speed traffic normally separated by a median or existing median 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 must 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.
- Where drums, cones, or barricades do not provide adequate protection for the motorist or worker.

(a) **Temporary Concrete Barriers**

These are the safety-shape barriers shown in the *Standard Plans*. Lateral displacement from impacts is usually in the range of 2 to 4 feet. (See chapter 1610 for detailed information on deflection.) When any barrier displacement is unacceptable, these barriers are anchored to the roadway or bridge deck. Anchoring systems are also shown in the *Standard Plans*.

(b) **Movable Barriers**

Movable barriers 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 clear zone or fitted with an impact attenuator. Storage sites at both ends of the barrier will be needed for the barrier-moving machine.

(c) **Portable Steel Barriers**

Portable steel barriers have a lightweight stackable design. They have options for gate-type openings and relocation without heavy equipment. Lateral displacement from impacts is in the range of 6 to 8 feet. Steel barriers can be anchored according to the manufacturer's specifications. Some deflection with anchored systems is still expected.

(2) Impact Attenuators

Within the Design Clear Zone, the approach ends of temporary concrete barriers are fitted with impact attenuators to reduce the potential for occupant injury during a vehicle collision with the barrier. Impact attenuators are addressed in [Chapter 1620](#).

The selection and location of impact attenuators in work zones can present situations that do not exist on a fully operational highway. Consider all work zone and traffic protection needs. The information in [Chapter 1620](#) provides all the needed impact attenuator performance information, but the actual work zone location may require careful consideration by the designer to ensure the correct application is used. Consider the dynamic nature of work operations where work zone ingress and egress, work area protection, worker protection, and traffic protection all factor into the final selection as well as the placement surface available. Redirective and nonredirective devices can both be used as long as the aforementioned issues are resolved and the devices also meet the [Chapter 1620](#) criteria when applied to a given work zone location. Also, impact attenuators used in work zones are much more likely to be impacted, which again requires careful consideration of those devices that are durable and easy to repair. Some common impact attenuator work zone issues are:

- Nonredirective device is improperly located. This is usually associated with an inadequate length of need calculation (see [Chapter 1610](#)) or protection issues not fully considered.
- Narrow temporary medians, narrow work zones, narrow or no shoulders, temporary median openings, and inadequate installation area (width, cross and approach slope, or base material).
- Temporary or short-term protection issues associated with the removal or relocation of existing or temporary barriers and impact attenuators.

Designers need to ensure the approved list of temporary impact attenuators is appropriate for the individual work zone plan locations. The designer may remove from the list those devices that are not appropriate for a given location.

(3) Delineation

Pavement markings provide motorists with clear guidance through the work zone and are necessary in all long-term work zones. Temporary pavement markings can be made using paint, tape, or raised pavement markers. Lateral clearance markers are used at the angle points of barriers where they encroach on or otherwise restrict the adjacent shoulder. Barrier delineation is necessary where the barrier is less than 4 feet from the edge of traveled way. For concrete barrier, delineation can either be barrier reflectors attached to the face of the barrier or barrier drum delineators that sit on the barrier.

Existing contradictory pavement markings must be removed. Other delineation devices are guideposts, concrete barrier delineators, and lateral clearance markers. Show these features on the traffic control plans. These devices have retroreflective properties and are used as a supplement in delineating the traveled way during the nighttime. (See [Chapter 1030](#) for delineation requirements.)

Removal of existing or temporary pavement markings can leave a scar, creating a “ghost stripe” effect on the pavement. Under certain conditions, this scar can appear as a valid marking, which could cause driver confusion. Destructive removal such as intensive grinding can actually leave a groove in the pavement that can hold rainwater and leave the appearance of a stripe, especially at night when headlight reflections intensify the effect.

Consider the types of removal for markings and their potential for ghost stripes and other distracting or conflicting leftover markings. Less destructive types of removal, such as hydroblasting and the use of removable temporary markings, can significantly improve pavement marking performance through the work zone. Continuous positive guidance through high-quality temporary pavement markings, alone or in combination with existing markings, is a substantial benefit to drivers in work zones. Contact the region or HQ Traffic Office for further information on this subject.

Due to the above-referenced ghosting, marking conflicts, and associated degradation of the pavement integrity, an overlay of the roadway may be considered.

(4) Screening

Screening is used to block the motorist’s view of construction activities adjacent to the roadway. Construction activities can be a distraction, and motorist reactions might cause unsafe vehicle operation and undesirable speed reductions. Consider screening the work area when the traffic volume approaches the roadway’s capacity. Screening can either be vertically supported plywood/plastic panels or chain link fencing with vertical slats. These types of screening are positioned behind traffic barriers to prevent impacts by errant vehicles. The screening is 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 and is approved by the Engineer prior to installation.

Glare screening is another type of screening used 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. Contact the HQ Design Office and refer to AASHTO's *Roadside Design Guide* for additional information on screening.

(5) Illumination

Illumination might be justified if construction activities take place on the roadway at night for an extended period of time. Illumination might also be justified for long-term construction projects at the following locations:

- Road closures with detours or diversions.
- Median crossovers on freeways.
- Complex or temporary alignment or channelization.
- Haul road crossings (if operational at night).
- Temporary traffic signals.
- Temporary ramp connections.
- Projects with lane shifts and restricted geometrics.
- Projects with existing illumination that needs to be removed as part of the construction process.

Illumination is required when:

- Traffic flow is split around or near an obstruction.

Flaggers are necessary for nighttime construction activities (supplemental lighting of the flagger stations by use of portable light plants or other approved methods). (See Standard Specification 1-10.3(1)A.) For information on light levels and other electrical design requirements, see [Chapter 1040](#).

(6) 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](#)).

(7) Work Zone Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems apply advanced technologies to optimize the safety and efficiency of the existing transportation network. Many permanent systems already exist throughout Washington State and provide the opportunity to greatly enhance construction projects that fall within the limits of the ITS network. ITS applications in work zones can be used to provide traffic monitoring and management, data collection, and traveler information.

ITS can provide real-time work zone information and associated traffic conditions such as slowed or stopped traffic ahead, or they can advise of alternate routes. This gives motorists more information as they make decisions about travel plans.

Work zone ITS technology is an emerging area that can provide the means to better monitor and manage traffic flow through and around work zones. Equipment used in work zones, such as portable camera systems, highway advisory radios, variable speed

limits, ramp metering systems, and queue detection sensors, helps ensure a more efficient traffic flow with a positive impact on safety, mobility, access, and productivity.

Identify work zone ITS elements early in the strategy development process and include them in the preliminary estimate so they can be designed along with the other traffic control elements. For large mobility projects that have existing freeway cameras already in place, temporary ITS features (such as temporary poles and portable systems) may be necessary to ensure the network can be maintained during construction, especially if existing camera locations are in conflict with construction activities. In locations that do not have existing camera locations, but have significant construction projects planned, work zone ITS may be a good opportunity to bring ITS technology to the route.

Refer to [Chapter 1050](#) and the work zone safety web page for additional ITS information and guidance.

1010.11 Traffic Control Plan Development and PS&E

WSDOT is obligated to provide a proposal in the PS&E for controlling traffic that is consistent with the project construction requirements. Even though there may be more than one workable solution, a thorough analysis of all the variables will help produce a TMP that addresses all impacts and establishes the appropriate levels of safety, mobility, and constructibility.

The preparation of traffic control plans (TCPs) requires the designer to not only have a thorough knowledge of highway construction activities, but also traffic engineering knowledge and an understanding of the unique traffic flow patterns within the specific project. Road users have little or no understanding of the construction occurring in the work zone and require far greater guidance than the contractor or agency personnel who are familiar with the project.

Traffic control plans can generally be broken down into three specific categories: typical, project-specific, and site-specific. The work zone location, ramps, intersections, access, and other site information will determine the level of detail necessary. Consider these categories for each work zone when developing TCPs.

TCPs are designed from the perspective of drivers, pedestrians, and bicyclists to provide the necessary information to assist them in navigating a work zone. Unexpected roadway conditions, changes in alignment, and temporary roadside obstacles relating to the work activity should be defined adequately to eliminate users' uncertainty. Keep in mind the construction workers' exposure to traffic as the traffic control plans are being developed.

It is recommended that multiple work operations be combined under a single traffic control plan to minimize the impacts to traffic and encourage the efficiency of the contractor. The intention is not to direct the contractor in how to pursue or perform the work, but to provide the most efficient approach to protect the work area and to establish the level of safety and traffic control while maintaining traffic mobility. A constructible and biddable set of traffic control plans is the goal. The contractor has the option of adopting the contract plans or proposing an alternative method.

(1) Traffic Control Plan Types

“Typical” traffic control plans are generic in nature and are not intended to satisfy all conditions for all work zones. They are adaptable to many roadway conditions and work operations. Use this type of plan if it can be applied with little or no field

modification. Typical plans may be included in every project. The majority of the time, they will be used to supplement project- or site-specific plans, especially for a complex project. For projects with routine day-to-day operations, such as paving projects on a two-lane roadway, typical plans work well. Even “routine” projects may have some unique work that needs more specific plan development. As a starting point, use the typical plans located at: <http://www.wsdot.wa.gov/design/standards/plansheet/tc.htm>

A “project-specific” traffic control plan can be a typical plan that has been modified to include project-specific details such as side roads, business approaches, horizontal curves, and so on. A project-specific plan may also be drawn using existing base data, but may not necessarily be a scaled drawing. Project-specific plans are a good compromise between a typical plan with no specific detail and a scaled base data-developed plan, especially when base data may not be available.

“Site-specific” traffic control plans are drawn using scaled base data with scaled traffic control device placements to provide the highest level of accuracy. They ensure that the proposed work operation will actually fit the location and that a workable method to maintain traffic flow can be achieved. If properly designed, site-specific plans need very little field modification. The use of site-specific plans is the best approach to satisfy the intent of a TMP by addressing impacts clearly and completely with detailed plans. For complex work zones, draw the traffic control plans with site-specific base data.

Do not place typical plan-type details on scaled site-specific plans. An example of this would be to use a scaled site-specific base plan and draw typical plan generic “L” distance to represent the lane closure taper distance, with the distance to come from a data box based on the highway speed. Another example is construction signs at specific locations on the scaled plan with a typical “X” distance dimension representing sign spacing. These examples misrepresent where the tapers begin or end and the actual locations where signs will be placed in the field. Inspectors or contractors then have to make field decisions and revisions to the plans that should have been addressed during the design.

The following are types of TCPs and details to consider in addressing TMP strategies in the PS&E.

(a) Temporary Channelization Plans

Temporary channelization plans are site-specific TCPs for long-term work zones or staged traffic control. They show the station limits for the beginning and ending locations of the temporary markings and taper rates when applicable. These plans also show the type of markings (such as lane line or edge line) on the plan with enough detail to assist the field inspector with field layout. When applicable, these plans also include temporary concrete barrier locations, flare rates, beginning and ending stations, and attenuator information (among others).

(b) Temporary Median Crossovers

These are another type of temporary channelization plan. Geometrics for the crossovers need to follow the same guidance as permanent alignments, and they have horizontal curves calculated to fit the location. Paved roadway surfaces and temporary pavement markings are required. Consider temporary illumination to improve the visibility of the operation. Temporary drainage may be necessary under the median fill, when applicable.

(c) **Temporary Roadway Cross Sections**

These plan details can be invaluable in providing additional details not easily visible when looking at the plan view of a TCP, especially when the roadway is in a temporary shift or configuration. This is also an excellent way to identify roadway drop-off conditions and vertical clearance issues.

(d) **Temporary Pavement Marking Details**

Detail sheets can be helpful in providing the specific details necessary to explain marking installation needs to supplement temporary pavement marking special provisions.

(e) **Temporary Portable Signal Plan**

For projects that include temporary portable signal systems, a traffic control plan is required. Example projects would be alternating one-lane traffic operations on a two-way facility (such as two-lane bridge widening), replacement projects, or emergency slide repair. The plan must include the entire advance signing for the system, temporary markings, location in relation to work operation, temporary lighting at stop bars, and so on. Use a portable signal unit only for projects where the length between signal heads is 1,500 feet maximum and no other accesses lie in between the temporary signals. There are specific temporary signal requirements that go into a project; therefore, for assistance, contact the region Traffic Office.

(f) **Detour and Alternate Route Plan**

For projects that anticipate the need for a detour or alternate route, ensure that sign placement will fit the locations shown along the route and that the signs will not conflict with existing signs, driveways, or pedestrian movements. Additionally, placement of construction signing should not obstruct approach or intersection sight distance. Depending on the duration, the detour that will be in place, and the anticipated amount 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). Note: A signed detour agreement with the appropriate local agency is required for detour routes using local roadways and must be completed prior to project advertisement.

(g) **Pedestrian and Bike Detour Route**

When existing pedestrian and signed bike routes are disrupted due to construction activities, address detour routes with a traffic control plan. The plan must show enough detail and be specific enough to address the conflicts and ensure the temporary route is reasonably safe and adequate to meet the needs of the user. Also, consider the impacts to the transit stops for pedestrians: Will the bus stops be able to remain in use during construction or will adjustments be necessary? (See [Chapter 1510](#) for pedestrian work zone design requirements.)

(h) **Advance Warning Sign Plan**

May be combined with the vicinity map or shown on a separate plan. Show Class A Construction Signs that will remain in place for the duration of the project. Locate the signs 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.

(i) **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.

(j) **Quantity Tabulation Sheets**

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

(k) **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.

(2) Plans to Address TMP Strategies

The following are plans that often must be considered when addressing TMP strategies in the PS&E.

(a) **Construction Sequence Plans**

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

(b) **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 to ensure there will be no conflicts with construction operations. Ensure opposing left-turn clearances are maintained as described in [Chapter 1310](#) if channelization has been temporarily revised, or adjust signal timing to accommodate. Some existing systems can be maintained using temporary span wires for signal heads and video, microwave actuation, or timed control.

(c) **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 to ensure there will be no conflicts with construction operations.

(3) 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.

(4) 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. To use the lump sum item to pay for all temporary traffic control, be certain how the contractor's work operations will progress and that the traffic control plans fully define the work zone expectations.

1010.12 Training and Resources

Work zone-related training is an important component in an effective work zone safety and mobility program. Federal regulations require that those involved with work zone design and implementation be trained at a level consistent with their responsibilities. It is valuable to know what training classes are available and how those classes relate to the project design and construction programs.

(1) Training Courses

There are many work zone-related courses available, and the HQ Staff Development Office and HQ Traffic Office's Traffic Training Program Manager can assist with the availability and scheduling of classes. Consider the following training courses to develop an overall proficiency in work zone safety and mobility design:

- **Work Zone Traffic Control Design Course:** This course, taught by the HQ Traffic Office, focuses on work zone safety and mobility through transportation management plan development and WZTC PS&E.
- **QuickZone Course:** This course, taught by McTrans, explores the QuickZone work zone traffic capacity analysis program. QuickZone is a useful tool for determining capacity needs, and it allows comparison of alternative strategies.
- **MUTCD Course:** This course, taught by Transped, focuses on the content and use of the MUTCD, including Part 6, Temporary Traffic Control.
- **Traffic Control Supervisor (TCS) Course:** This course, taught by the Evergreen Safety Council, NW Laborers Union, and ATSSA, is primarily for those students who intend to become a TCS or those who have TCS-related responsibilities. TCS training offers value to designers regarding how implementation issues interact with design issues. Designer attendance may be restricted to "space available" status.
- **Certified Flagger Training Course:** This course is directed at students who will become certified flaggers in Washington State and is not intended for designers. Designers may want to use the *Flagger Handbook* as a resource to learn about flagger-controlled traffic control and flagging techniques and issues. This class may be valuable for increasing the safety of designers anticipating extensive field surveying and data gathering work during the project development phase.

Other courses on work zone safety, mobility, and related subjects may be available on a limited basis. Some of these courses would fall into the categories of traffic analysis and traffic engineering and may be appropriate, depending on individual designer needs and responsibilities.

(2) Resources

The responsibility of the designer to fully address all work zone traffic control impacts is very important because the level of traffic safety and mobility will be directly affected by the effectiveness of the transportation management plan (TMP). The following resources are available to assist the designer with various aspects of the work zone design effort.

(a) Region Work Zone Resources

Each region has individuals and offices with various resources that provide work zone guidance and direction beyond what may be available at the project Design Office level. They include:

- Region Traffic Office
- Region Work Zone Specialist
- Region Construction and Design Offices

(b) Headquarters (HQ) Work Zone Resources

The HQ Traffic Office has a work zone team available to answer questions, provide information, or otherwise assist. The HQ Design and Construction offices may also be able to assist with some work zone issues. They include:

- State Work Zone Safety & Mobility Manager
- State Work Zone Engineer
- State Work Zone Training Specialist
- WSDOT Work Zone Web Page

(c) FHWA Work Zone Resources

The FHWA Washington Division Office and Headquarters (HQ) Office may be able to provide some additional information through the WSDOT HQ Traffic Office. The FHWA also has a work zone web page: www.ops.fhwa.dot.gov/wz/

1010.13 Documentation

For the list of documents required to be preserved in the Design Documentation Package and the Project File, see the Design Documentation Checklist:

www.wsdot.wa.gov/design/projectdev/

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

TMP Component	
1. Introductory Material	
Cover page	
Licensed Engineer stamp page (if necessary)	
Table of contents	
List of figures	
List of tables	
List of abbreviations and symbols	
Terminology	
2. Executive Summary	
3. TMP Roles and Responsibilities	
TMP manager	
Stakeholders/review committee	
Approval contact(s)	
TMP implementation task leaders (public information liaison, incident management coordinator)	
TMP monitors	
Emergency contacts	
4. Project Description	
Project background	
Project type	
Project area/corridor	
Project goals and constraints	
Proposed construction phasing/staging	
General schedule and timeline	
Adjacent projects	
5. Existing and Future Conditions	
Data collection and modeling approach	
Existing roadway characteristics (history, roadway classification, number of lanes, geometrics, urban/suburban/rural)	
Existing and historical traffic data (volumes, speed, capacity, volume-to-capacity ratio, percent trucks, queue length, peak traffic hours)	
Existing traffic operations (signal timing, traffic controls)	
Incident and crash data	
Local community and business concerns/issues	
Traffic growth rates (for future construction dates)	
Traffic predictions during construction (volume, delay, queue)	
6. Work Zone Impacts Assessment Report	
Qualitative summary of anticipated work zone impacts	
Impacts assessment of alternative project design and management strategies (in conjunction with each other)	
<ul style="list-style-type: none"> • Construction approach/phasing/staging strategies • Work zone impacts management strategies 	

Transportation Management Plan Components Checklist
Exhibit 1010-3

Traffic analysis results (if applicable)	
• Traffic analysis strategies	
• Measures of effectiveness	
• Analysis tool selection methodology and justification	
• Analysis results	
Traffic (volume, capacity, delay, queue, noise)	
Safety	
Adequacy of detour routes	
Business/community impact	
Seasonal impacts	
Cost-effectiveness/evaluation of alternatives	
Selected alternative	
• Construction approach/phasing/staging strategy	
• Work zone impacts management strategies	
7. Selected Work Zone Impacts Management Strategies	
Temporary Traffic Control (TTC) strategies	
• Control strategies	
• Traffic control devices	
• Project coordination, contracting, and innovative construction strategies	
Public Information (PI)	
• Public awareness strategies	
• Motorist information strategies	
Transportation Operations (TO)	
• Demand management strategies	
• Corridor/network management strategies	
• Work zone safety management strategies	
• Traffic/incident management and enforcement strategies	
8. TMP Monitoring	
Monitoring requirements	
Evaluation report of successes and failures of TMP	
9. Contingency Plans	
Trigger points	
Decision tree	
Contractor's contingency plan	
Standby equipment or personnel	
10. TMP Implementation Costs	
Itemized costs	
Cost responsibilities/sharing opportunities	
Funding source(s)	
11. Special Considerations (as needed)	
12. Attachments (as needed)	

Transportation Management Plan Components Checklist
Exhibit 1010-3 (continued)

