Chapter 1300  Intersection Control Type

1300.01  General

It is WSDOT practice to analyze potential intersection solutions at all intersection improvement locations in accordance with E 1082 – Business Practices for Moving Washington and E 1090 – Moving Washington Forward: Practical Solutions. The objective is to provide the optimum solution within available resources, with an emphasis on low-cost investments. The analysis can be done for individual intersections, or on a corridor or network basis. This chapter provides guidance on preliminary intersection analysis and selection of control type. Intersection design is completed using Chapter 1310 for the geometrics of intersections, Chapter 1320 for roundabouts, and Chapter 1330 for traffic signals. Use the aforementioned chapters in conjunction with chapters 1106, 1230 series, 1430, 1510, and 1520 to assist with dimensioning design elements.

Consider design users and the balance between modes, safety and mobility performance considerations, context-sensitive/sustainable design, and economics when selecting and evaluating alternatives to meet the needs of the project.

Identification of intersection projects can come from a variety of programs and sources, including those funded by local agencies and developers. The intent of this chapter is that the ICA procedures apply to all types of intersection modifications on the state highway system. Potential safety project locations are identified through the safety priority programming process. Other programs may identify intersection needs through the priority array programming process, but the influence of the type of intersection control with respect to specific performance category needs may not be fully understood until contributing factors analysis is completed (see Chapter 1101).

Complete an Intersection Control Analysis (ICA) as early in the project development process as practicable, taking into account the level of community engagement that may need to occur prior to approval. The ICA (see 1300.05 for procedures) should be initiated no later than the scoping phase. Scale the ICA according to the size and complexity of the project; for example, evaluation of adding a turn lane to an existing intersection control may take less effort than evaluating new intersection control. Consult the region or HQ Traffic offices for assistance with the level of effort required.

It is WSDOT policy to focus on lower cost solutions with the intent to optimize return on investment. Only when all at-grade intersection alternatives are ruled out, including turn restrictions and complete intersection removal, should other more-costly measures be considered, such as grade-separation. Ramp terminal intersections are subject to the analysis requirements of this chapter. See Chapters 1360 and 550 for additional information.
For additional information, see the following chapters:

**Chapter Subject**

- 320 Traffic analysis
- 321 Sustainable Safety Analysis
- 530 Limited access control
- 540 Managed access control
- 550 Interchange Justification Report
- 1100 Practical Design
- 1101 Need Identification
- 1103 Design Controls
- 1106 Design Element Dimensioning
- 1230 Geometric Cross Section Basics; and other 1230 series chapters
- 1310 Intersections
- 1320 Roundabouts
- 1330 Traffic signals
- 1340 Road Approaches
- 1360 Interchanges
- 1510 Pedestrian facilities
- 1515 Shared-use paths
- 1520 Bicycle facilities

**1300.02 Intersection Control Objectives**

Intersections are an important part of highway design. Intersection control choice requires consideration of all potential users of the facility, including drivers of motorcycles, passenger cars, heavy vehicles of different classifications, public transit, and bicyclists and pedestrians.

Design users have varying skills and abilities. Younger and older drivers in particular are subject to a variety of behavioral or human factors that can influence elements of their driving ability. See NCHRP Report 600 – Human Factors Guidelines for Road Systems: Second Edition for additional information (http://www.trb.org/Main/Blurbs/167909.aspx). Bicyclists, from recreational to commuters, also have a variety of skill sets that can influence the effectiveness of bike facilities and intersection operational design (see Chapter 1520 for additional information). Meeting the needs of one user group can directly influence the service that other groups experience. The selection process evaluates these competing needs and results in an optimal balance of tradeoffs for all design users, recognizing the context and priorities of the location.

The intent of an ICA is not to design an intersection, but to evaluate the compatibility of different intersection control types with respect to context, modal priority, intersection design vehicle and the identified balance of performance needs. Four basic intersection design considerations are shown in Exhibit 1300-1 and can affect the intersection control types depending on the situation.

The objectives of the ICA are to:

- Provide a consistent framework to determine the most compatible intersection control type for the location, context, economics, and balance of performance needs.
• Evaluate the operational and safety performance for various appropriate and feasible intersection control types under consideration.

• Evaluate the modal performance considerations between different intersection control types with respect to the identified modal priority and intersection design vehicle (see Chapter 1103). Identify the potential modal treatments that augment the control types.

• Consider the intersection operations and the relationship with adjacent intersections and other access points.

• Evaluate the intersection control types for potential sustainability, cost-effectiveness, and expected maintenance and operations life cycle needs.

• Establish that a roundabout is the preferred intersection control type. When a roundabout is not selected, provide justification to support alternative decisions.

• Consider emerging alternative intersection designs such as displaced left-turn (DLT) and restricted crossing u-turn intersections (RCUT) where appropriate.

• Select the most cost-effective intersection control type for the project based on overall need and context.
Exhibit 1300-1: Intersection Design Considerations

<table>
<thead>
<tr>
<th>Human Factors</th>
<th>Traffic Considerations</th>
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<tbody>
<tr>
<td>• Driving habits</td>
<td>• Conformance to natural paths of movement</td>
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<td>• Driver workload</td>
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<td>• Driver error</td>
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<td>• Driver distractions</td>
<td>• Compatibility with context characteristics</td>
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<td>• Perception-reaction time</td>
<td>• Demand for alternative mode choices</td>
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<td>• Conformance to natural paths of movement</td>
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<td>• Demand for alternative mode choices</td>
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<tr>
<th>Physical Elements</th>
<th>Economic Factors</th>
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<td>• Cost of improvements, annual maintenance, operations and life cycle costs, and salvage value</td>
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<td>• Vertical alignments at the intersection</td>
<td>• Effects of controlling access and right of way on abutting properties where channelization restricts or prohibits vehicular movements</td>
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<td>• Sight distance</td>
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<td>• Angle of the intersection</td>
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<td>• Conflict areas</td>
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<td>• Speed-change lanes</td>
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<td>• Managed lanes (HOV, HOT, shoulder)</td>
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<td>• Accessible facilities</td>
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<td>• Parking zones</td>
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<td>• Geometric design features</td>
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<td>• Traffic control devices</td>
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<td>• Roadside design features</td>
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<td>• Driveways</td>
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<td>• Adjacent at-grade rail crossing</td>
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<td>• Access management treatments including turn restrictions</td>
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1300.03 Common Types of Intersection Control

1300.03(1) Uncontrolled Intersections
- Uncontrolled intersections do not have signing, and the normal right of way rule (RCW 46.61.180) applies.
- This intersection type is typically found on local roads and streets where the volumes of the intersecting roadways are low and roughly equal, speeds are low, and there is little to no crash history.
- Uncontrolled intersections are not recommended for state routes.

1300.03(2) Yield Control
- Intersections with yield control assign right of way without requiring a stop.
- Mostly used at rural low-volume ramps and wye (Y) intersections.
- Yield control is generally not recommended in urban locations or where pedestrians are expected.

1300.03(3) Two-Way Stop Control
- Intersections with two-way stop control are a common, lower cost control, which require the traffic on the minor roadway to stop and yield to mainline traffic before entering the major roadway.
- Along certain corridors, especially where u-turn opportunities exist, consider limiting access at two-way stops to “right-in, right-out only.”

1300.03(4) Multi-Way Stop Control
- Multi-way stop control normally requires all traffic to stop before entering the intersection.
- Fewer fatal and injury crashes than two-way stop control.
- Multi-way stop control is suited for lower speed facilities with approximately equal volumes on all legs and total entering volumes not exceeding 1,400 vehicles during the peak hour.
- Increased traffic delays, fuel consumption, and air pollution.
- Multi-way stop control is not recommended on multilane state routes or at intersections with unbalanced directional traffic flows because of the delays and queues introduced on the major-volume legs of the intersection.
1300.03(5)  **Roundabouts**

Roundabouts are often circular (or near-circular) at-grade intersections, where traffic on the approaches yield to traffic within the circulating roadway. Roundabouts are an effective intersection type that may offer the following:

- Reduced fatal and injury crashes compared with other at-grade intersection types.
- Fewer conflict points.
- Lower potential for wrong-way driving.
- Reduced traffic delays.
- Traffic-calming and lower speeds.
- More capacity than a two-way or multi-way stop.
- Quickly serves pedestrians needing to cross the intersection and shortens crossing distance for pedestrians by allowing for crossing in stages where needed. Reduces vehicular approach speeds that in turn reduces injury risk to pedestrians.
- Ability to serve high turning volumes with minimal number of approach lanes.
- Improved operations where space for queuing is limited.
- At ramp terminals where left-turn volumes are high, improved capacity without affecting the structure.
- Facilitation of u-turn movements and can be appropriate when combined with access management along a corridor.
- Aesthetic treatments and gateways to communities.
- Roundabouts are scalable and site-specific solutions, with flexibility to fit funding and a variety of site constraints. See Chapter 1320 for more information on roundabout types and design.

1300.03(6)  **Traffic Control Signals**

- Signalized intersections may offer the following:
  - Increased capacity of the intersection.
  - Allow for improved progression within a coordinated system along a corridor or a grid.
  - Can be used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to complete their movement or enter the intersection.
  - Can be preempted to provide priority service to railroad, emergency responders, transit and approaches where advance queue loops are used.

However, signalized intersections:

- Require continual maintenance and engineering for optimal operations.
• Cannot adequately balance large traffic flows with pedestrian demands.
• Can be susceptible to power outages and detection failures.

Indiscriminate use of traffic signals can adversely affect the safety performance and operational efficiency of vehicle, bicycle, and pedestrian traffic. Therefore, and as required by the MUTCD, a traffic signal should be considered for installation only after it is determined to meet specific “warrants” and an engineering study shows that the installation would improve safety and/or operations. Satisfying a signal warrant does not mandate the installation of a traffic signal nor by itself meet the requirements of 1300.05; but failing to satisfy at least one warrant shall remove the signal from consideration.

Not all crashes are correctable with the installation of a traffic signal. Traffic signals may decrease the potential for crashes of one type and increase the potential for another type. For instance, rear-end crashes more frequently occur with signals because of stopping and starting of vehicles. At operating speeds above 40 mph, the severity of these rear-end crashes tend to be higher. This requires careful consideration of the location characteristics, traffic flow, and crash history.

State statutes (RCW 46.61.085) require WSDOT approval for the design and location of all conventional traffic signals and for some types of beacons located on city streets forming parts of state highways. The Traffic Signal Permit (DOT Form 242-014 EF) is the formal record of the department’s approval of the installation and type of signal. For traffic signal permit guidance, see Chapter 1330.

1300.03(7) Alternative Intersections

Alternative intersections work mainly by rerouting U and left turns, and/or separating movements. Alternative intersections may have different terminology in different areas, but the most common types include:

- Median u-turn (MUT)
- Jug handle
- Bowtie
- Restricted crossing u-turn (RCUT)
- Displaced left-turn intersection (DLT)
- Continuous green tee
- Split intersection
- Quadrant roadway intersection
- Single quadrant interchange
- Echelon
- Center turn overpass

As alternative intersections may be relatively new to Washington State and its users, more education and community engagement will be necessary to ensure project success. However, extensive experience shows that many of these intersection types can provide better operational and safety performance, often at much less cost than traditional strategies.

Three types of alternative intersections are highlighted in the subsections below: median u-turn (MUT), restricted crossing u-turn (RCUT), and displaced left-turn (DLT) intersections. For more information about these and other intersection design solutions, see the Federal Highway Administration (FHWA) Alternative Intersection Design web page:

http://safety.fhwa.dot.gov/intersection/alter_design/
1300.03(7)(a) Median U-Turn

The median u-turn (MUT) intersection treatment relocates left turn movements downstream from the intersection resulting in lower delays, higher throughput, and reduction in the number and severity of crashes. Left-turning drivers proceed straight through the at-grade intersection, and then execute a u-turn at some distance downstream at a new or existing median opening. The main intersection is typically signalized and can be highly efficient needing only two signal phases. By removing the left turns at the main intersection, the MUT design results in a significant reduction in rear-end, angle, and sideswipe crashes; while reducing the number of conflict points from 32 to 16 when compared to a conventional signalized intersection. The MUT can also have advantages for pedestrians with fewer conflict points and a lower delay. However, the intersection design may reduce bicyclist mobility as they are expected to use the pedestrian crossings in order to perform left turns at the intersection. The MUT intersection design is more likely to be suitable for consideration in situations where:

- The intersection is over capacity.
- There are heavy through volumes and low to moderate left turn volumes.
- The intersection is within a higher-speed, median-divided corridor.
- There are safety concerns at an existing signalized intersection or corridor.

Refer to FHWA’s *Median U-Turn Intersection Informational Guide* for geometric design considerations and recommendations. (See Chapter 1310 for geometrics when designing the u-turn movement for the MUT intersection.)

Exhibit 1300-2 Median U-Turn Intersection Example
1300.03(7)(b) Restricted Crossing U-Turn Intersection

Restricted crossing u-turn (RCUT) intersections, also known as superstreets or J-turns, have similarities with the MUT in that the minor road through and left-turning movements are redirected (see Exhibit 1300-2). This intersection type results in lower delays, improved progression, and a potential reduction in the total number of crashes and fatal and injury crashes.

Drivers on the minor road approaches must turn right onto the major road and then perform a u-turn maneuver at a median opening downstream. However, the major road left turn movements are still allowed at the main intersection. RCUT intersections may or may not warrant signalization due to traffic volumes, and those with signalization require fewer signal phases and shorter cycle lengths than a traditional signalized intersection. The RCUT intersection is more likely suitable for consideration in situations where:

- The intersection is over capacity.
- There is a need to improve travel time and progression for the major road.
- There are crashes at the intersection related to turning movements that can reduced by a RCUT.
- The intersection is within a higher-speed, multilane corridor.
- There are low through and left turn volumes on the minor road.
- Pedestrian volumes are low.
- The major roadway contains sufficient median width, or total right of way width, to support the u-turn movements.

Exhibit 1300-3 Restricted Crossing U-Turn Intersection Example with Stop-control

Example of RCUT Intersection with stop-control from FHWA’s Restricted Crossing U-Turn Intersection Informational Guide
The RCUT intersection may be a potential alternative compared to a grade-separated interchange, at locations meeting grade-separated considerations identified in 530.04(3). Refer to FHWA’s *Restricted Crossing U-Turn Intersection Informational Guide* for geometric design considerations and recommendations. (See Chapter 1310 for geometrics when designing the u-turn movement for the RCUT.)

1300.03(7)(c) Displaced Left-Turn Intersection

The displaced left-turn (DLT) intersection, also known as a continuous flow intersection, works mainly by relocating one or more left turn movements to the other side of the opposing traffic via an interconnected signalized crossover. This essentially causes the traffic signal system to be more efficient by eliminating the left turn phase at the main intersection allowing for more green time to be allocated to other movements. The DLT can reduce delays by up to 40%, but often can be delivered for just slightly more cost than a typical signalized intersection. Compared with a conventional intersection, the DLT can be more challenging for pedestrians due to longer crossing distances and counter-intuitive left turn vehicular movements. However, the DLT typically has shorter cycle lengths and potentially shorter delays. The DLT intersection design is best applied in situations where:

- There are high left-turn and through volumes.
- Intersection is over capacity.
- There are excessive delays and queuing, especially when left turn queues extend past the available storage bays.
- Pedestrian volumes are low.
- Sufficient right-of-way exists on the leg(s) that need to be widened to accommodate the new lanes.
- Context is urban/suburban.

*Exhibit 1300-4  Displaced Left Turn Intersection Example*

*Example of DLT Intersection from FHWA’s Displaced Left Turn Intersection Informational Guide*
1300.04 Modal Considerations

When designing a multimodal intersection, consideration needs to be given to all design users at the intersection, the intersection design vehicle and selected modal priority (see Chapter 1103).

It is not appropriate to design for specific modal treatments on the outset of evaluating intersection control types. However, modally oriented intersection treatments may be necessary to enhance specific modal baseline or contextual performance needs (see Chapter 1101), and may influence the control type selection. Include a discussion of the potential modally oriented treatments relevant to the control types being analyzed and modal performance needs. Evaluate the potential effect of modal specific treatments on all design users relevant for the control types evaluated in the ICA.

1300.04(1) Pedestrian Considerations

Consider the intersection type and how it accommodates pedestrians. With each intersection type, there may be specific elements and/or treatments applicable for pedestrians (see, for example chapters 1231 and 1510) to meet modal performance needs identified (see Chapter 1101).

For example, a signalized intersection with a long cycle length, high speeds, or frequent permitted turning movements is generally not appropriate for areas with moderate to high pedestrian demand. However, a responsive signal in an urban downtown core with low speeds is typically well respected with high compliance and short delays.

Often, single-lane roundabouts can be accommodating to pedestrians with high compliance rates, short delays, and minimal disruption to vehicular traffic flow due to short crossing distances and two-stage crossings.

Additional information on emerging practices to address pedestrian performance needs for different intersection control types can be found at the Pedestrian and Bicycle Information Center (http://www.pedbikeinfo.org/)

For signalized intersections, sidewalk and ramp designs have additional requirements to accommodate the pedestrian features of the traffic signal system (see Chapter 1330).

1300.04(2) Bicycle Considerations

For consideration of bicycle needs at intersections and treatments that may have an operational effect on other design users, see chapters 1515 and 1520. Additional emerging practice information to address bicycle performance needs for different intersection control types can be found at the Pedestrian and Bicycle Information Center (http://www.pedbikeinfo.org/) and the NACTO Urban Bikeway Design Guide (https://nacto.org/publication/urban-bikeway-design-guide/).

1300.04(3) Transit Considerations

When transit vehicles are identified as a modal priority, consider treatments to meet the performance needs of the specific transit vehicle types and their effect on the performance of other design users (see Chapter 1103). Transit oriented treatments can vary significantly depending on the proximity of stop locations with respect to the intersection location and origin of the transit movement (see Chapter 1430 for bus stop placement guidelines), and the type of
transit vehicle (such as a fixed guideway vehicle). Discuss treatment options and any operating restrictions the transit provider may have regarding different intersection control types.

**1300.04(4) Operational Considerations**

Traditional delay analysis focuses on determining the peak-hour letter-graded Level of Service (LOS) of an individual intersection. However, as this approach often does not account for multimodal users and as roughly 80% of the daily traffic volumes occur outside of the peak hours, a more encompassing review of the intersection is needed to provide sufficient multimodal capacity and safety performance at all hours of the day.

Intersection control can have an influence on road user behavior and modal operations, not just at the intersection itself, but also along the corridor or surrounding network, even when the intersection has an acceptable LOS. Delay affects route and mode choice and sometimes whether a user will decide to complete the trip. A user’s willingness to accept delay depends on many factors including the user’s knowledge of the transportation network, anticipated traffic conditions, and alternative options. The increasing presence of in-vehicle guidance systems and real-time traffic apps further aids the user in selecting the route with shortest travel times. Also, some alternatives that may improve mobility for one mode, such as the addition of turn lanes, may result in a performance degradation or even discourage trips for pedestrians or other modes. Thus, it is important to consider the effects of intersection control on the surrounding network and for all potential users. The following are some factors when selecting and evaluating alternatives:

- Access management strategies can be effective in promoting efficient travel patterns and rerouting traffic to other existing intersections. Check with the WSDOT region Planning Office for future land use plans or comprehensive plans to provide for future growth accommodation.

- Consider the volume to capacity (V/C) ratio, the delay, and the queue length of each approach. Some scenarios may require additional sensitivity analysis to determine the impacts of small changes in volumes.

- Examine the effects of existing conditions. Consider progression through nearby intersections (corridor and network analysis) and known risky or illegal driving maneuvers.

- Consider the possibility that traffic from other intersections with lower LOS will divert to the new/revised intersection.

**1300.05 Procedures**

For new intersections, determine and document intersection control according to the applicable procedures in this chapter.

For intersection improvement projects involving pavement construction and/or reconstruction, or preservation projects such as signal replacement/rehabilitation, evaluate intersection control in accordance with this chapter unless there is documentation that this analysis has already been completed and is referenced in the Project Summary.

Control for existing intersections that are unaffected by the project (per the contributing factors analysis) or are receiving minor revisions such as signal timing changes or rechannelization of existing pavement are not subject to further evaluation.
1300.05(1) Intersection Control Analysis (ICA)

The Intersection Control Analysis is a 5-step process meant to screen and evaluate alternatives to determine the best possible intersection type and design. Due to the safety and operational performance record, a roundabout is the preferred intersection control type and is required to be evaluated in Step 1. If a roundabout is selected and no other feasible alternatives remain after Step 2, contact the Region Traffic Engineer to determine if further analysis is required.

For each alternative, provide a brief description of the assumed layout. Include the number of lanes on major and minor approaches and any measures necessary to accommodate multi-modal users. For a roundabout, document the assumed inscribed circle diameter. For a signal, document the assumed cycle length and phasing strategy used for the analysis.

Step 1: Background and Project Needs – Describe the existing conditions. Include physical characteristics of the site, posted speed, AADT, channelization and control features, multimodal facilities, context, and modal priority.

Document the project needs and which performance measures will be used for analysis and comparison of project alternatives in Step 3. Identify all project alternatives under consideration. For each alternative, determine if it is expected to meet the basic needs of the project. If an alternative does not pass this initial screening, remove it from consideration. All remaining alternatives are to proceed to Step 2.

Step 2: Feasibility – Develop the alternatives at a sketch level to determine the footprint required to achieve performance measures. Consider right-of-way, environmental, cost, context-sensitive/sustainable design, and geometrics/physical constraints for each remaining alternative. If an alternative is not practicable from any of these perspectives, remove it from consideration. All remaining alternatives are to proceed to Step 3. If a roundabout is the only remaining viable alternative at this stage, contact the Region Traffic Engineer to determine if further analysis in Steps 3 and 4 is required.

- Determine the right of way requirements and feasibility. Discuss the right of way requirements and the feasibility of acquiring that right of way in the analysis. Include sketches or plan sheets with sufficient detail to identify topography, existing utilities, environmental constraints, drainage, buildings, and other fixed objects. An economic evaluation will be useful if additional right of way is needed. Include the right of way costs in the benefit/cost analysis (Step 4).

- Identify known environmental concerns that could influence control type selection. At this stage, are there any red flags or obvious concerns between potential control types? Are there any known environmental risks that may substantially increase the cost of the project or available information that could help in alternatives comparison? Consult with region Environmental staff for support.

- Consider Context Sensitive/Sustainable Design. Context sensitive design is a model for transportation project development. A proposed transportation project is to be planned not only for its physical aspects as a facility serving specific transportation objectives, but also for its effects on the aesthetic, social, economic, and environmental values, needs, constraints, and opportunities in a larger community setting. Projects designed using this model:
  - Optimize safety of the facility for both the user and the community.
  - Promote multimodal solutions.
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- Are in harmony with the community, and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area.
- Are designed and built with minimal disruption to the community.
- Involve efficient and effective use of the resources (time, budget, community) of all involved parties.

Step 3: Analysis – Perform and report the results of applicable analyses for all remaining alternatives and the no-build condition for performance measures identified in Step 1. The analysis is scalable, but typically should include the measures below. The level of effort should be based on project complexity, cost of proposed alternatives, context, and impact to the network and other modes. Contact the region Traffic Office early in the process to determine the network area of influence and scope of analysis. Include the following:

- Traffic Analysis – Use the opening year and selected design year for analysis (see Chapter 1103). In some cases, it may also be appropriate to analyze the horizon year as well. Identify and justify any growth rates used and provide turning movements for all scenarios. There are several deterministic and microsimulation tools for analyzing delay and intersection performance. Traffic volumes and the proximity to other access points will dictate the modeling effort required. Contact the region Traffic Office to determine the appropriate approved tool. For more information and guidance on traffic analysis, refer to Chapter 320 and the Traffic Analysis webpage (http://www.wsdot.wa.gov/Design/Traffic/Analysis/).
  - Peak hour(s) – Report the delay for each alternative.
  - Off-Peak – Report the delay for an additional time period representative of off-peak travel. Depending on location, up to 80% of total delay can occur in off-peak hours.
  - If a traffic signal is under consideration, perform and report the findings of the signal warrant analysis.

- Report the expected average crash frequency (total and fatal/all injury) of each alternative. When a safety need has been identified in Step 1, perform a crash analysis and summarize the findings. See Chapter 321 for more information.

- Multimodal safety and operations – Briefly discuss how the design for each alternative is expected to affect multimodal users, when applicable. Potential items to consider include pedestrian delay, number of lanes to cross, protected vs permitted turning movements, motorist approach speed, etc. When applicable, evaluate multimodal treatments that may be necessary for each alternative to meet the performance needs.

Step 4: Benefit/Cost Analysis – When applicable, report the Benefit/Cost (B/C) for mobility (due to change in travel time) and/or the B/C for safety (due to change in crash frequency/severity). Include the following in the analysis:

- Project costs related to design, right of way, and construction.
- Annual maintenance and operations cost. For signals, this should include the cost of signal engineers and technicians to review and implement signal timings and respond to malfunctions and emerging issues. This value can be obtained from the region Traffic Office.
• Travel time savings based on the reduction in delay over the life cycle during identified peak hours and/or off-peak hours.

• Societal cost savings (considered as the Benefit in the analysis) of reduced crash frequency and/or severity using a predictive method as described in Chapter 321. Use the following for WSDOT Societal Costs for crashes:
  o Fatal crash: $2,900,000
  o Serious injury crash: $2,900,000
  o Evident injury crash: $155,000
  o Possible injury crash: $60,000
  o Property damage only crash: $10,000

• Salvage value of right of way, grading and drainage, and structures.

**Step 5: Selection** – Based on performance tradeoffs and documented project needs, select the recommended alternative.

1300.05(1)(a) Additional Information

Discuss the following in the ICA as needed to further support the selection (is it an item that will have a significant effect on the decision?):

• Review the corridor sketch plans and database with the regional planning office.

• Information from a corridor or planning study.

• Current and future land use and whether or not the intersection control will reasonably accommodate future land use traffic changes.

• Community engagement and local agency coordination and comments.

• Effect on future local agency projects.

• Other elements considered in the selection of the intersection control.

1300.05(2) Community Engagement

Community engagement is a necessary element of project development. Technical, public, and political aspects must be considered. There is often concern from communities regarding control types that may be under consideration, especially the types of intersections that may seem unfamiliar or that break from the traditional approach. Education and outreach efforts, if necessary, are collaborative and are most useful during the analysis and early scoping stages. It is critical that community engagement efforts occur with preparation and well-organized content regarding the performance data associated with different control types to inform communities of the distinct differences between control types with respect to the context, modes, safety and operations desired. Use contextual performance needs (see Chapter 1101) identified by the community to help support the options being considered at a given location.

Follow the guidelines of WSDOT’s Community Engagement Plan (www.wsdot.wa.gov/planning/), and document the effort as indicated in Chapter 1100.
1300.05(3) Approval

The ICA shall be prepared by or under the direct supervision of a licensed Professional Engineer. Approval of the ICA (see Chapter 300 for more information) requires the following:

- Region Traffic Engineer Approval
- HQ Traffic Approval

1300.05(4) Local Agency or Developer-Initiated Intersections

Chapter 320 provides guidance for preparation of a Traffic Impact Analysis (TIA). Early in the design process, local agencies and developers should coordinate with the region office to identify specific intersections for further analysis. The project initiator provides an Intersection Control Analysis (ICA) for approaches and intersections with state routes per 1300.05, or references this information in the TIA. The project initiator documents the design considerations and submits the ICA and all documentation to the region for approval (per 1300.05). After the ICA is approved, finalize the intersection design and obtain approval per Chapters 300 (for documentation), 1310 (for intersections), 1320 (for roundabouts), and 1330 (for traffic signals).

1300.06 Documentation

Refer to Chapter 300 for additional design documentation requirements.

1300.07 References

1300.07(1) Federal/State Laws, Codes, and Policies

Revised Code of Washington (RCW) 46.61, Rules of the road

Washington Administrative Code (WAC) 468-52, Highway access management – access control classification system and standards

Secretary’s Executive Order: E 1082, Business Practices for Moving Washington, August 2012, WSDOT

1300.07(2) Design Guidance

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

Highway Capacity Manual (HCM), latest edition, Transportation Research Board, National Research Council

Local Agency Guidelines (LAG), M 36-63, WSDOT

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)

Standard Plans for Road, Bridge, and Municipal Construction (Standard Plans), M 21-01, WSDOT
1300.07(3) Supporting Information

Highway Safety Manual (HSM), AASHTO

Roundabouts: An Informational Guide, FHWA-RD-00-067, USDOT, FHWA


A Comparison of a Roundabout to Two-way Stop Controlled Intersections with Low and High Traffic Volumes, Luttrell, Greg, Eugene R. Russell, and Margaret Rys, Kansas State University


U-turn Based Intersections, FHWA [https://safety.fhwa.dot.gov/intersection/innovative/uturn/]

Crossover-Based Intersections, FHWA [https://safety.fhwa.dot.gov/intersection/innovative/crossover/]

Synthesis of the Median U-Turn Intersection Treatment, Safety, and Operational Benefits, FHWA-HRT-07-033, USDOT, FHWA

Alternative Intersections/Interchanges: Informational Report (AIIR), FHWA-HRT-09-060, Hughes et al., USDOT, FHWA, 2010

Field Evaluation of a Restricted Crossing U-Turn Intersection, FHWA-HRT-12-037, USDOT, FHWA

Roundabouts and Sustainable Design, Ariniello et al., Green Streets and Highways – ASCE, 2011

Pedestrian and Bicycle Information Center [www.pedbikeinfo.org/]

Community Engagement Plan, WSDOT [http://www.wsdot.wa.gov/planning/default.htm]