

Transmittal Number PT 16-051	Date July 2016
Publication Distribution To: <i>Design Manual</i> Holders	
Publication Title <i>Design Manual – July 2016</i>	Publication Number M 22-01.13
Originating Organization WSDOT Development Division, Design Office – Design Policy, Standards, and Safety Research Section	

Remarks and Instructions

What's changed in the Design Manual for July 2016?

For a summary of the 2016 substantial revisions, technical errata, and minor revisions, see pages 3 and 4.

How do you stay connected to current design policy?

It's the designer's responsibility to apply current design policy when developing transportation projects at WSDOT. The best way to know what's current is to reference the manual online.

Access the current electronic WSDOT *Design Manual*, the latest revision package, and individual chapters at: www.wsdot.wa.gov/publications/manuals/m22-01.htm

We're ready to help. If you have comments or questions about the Design Manual, please don't hesitate to contact us.

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Remove/Insert instructions for those who maintain a printed manual

NOTE: Also replace the Title Page

CHAPTER/SECTION	REMOVE PAGES	INSERT PAGES
Contents/Exhibits	Entire Contents	Entire Contents
Technical Errata	TE-1&2	TE-1&2
300 Design Documentation, Approval, and Process Review	Entire chapter	Entire chapter
310 Value Engineering	Entire chapter	Entire chapter
320 Traffic Analysis	320-9&10	320-9&10
321 Sustainable Safety	Entire chapter	Entire chapter
520 Access Control	520-3&4	520-3&4
530 Limited Access Control	Entire chapter	Entire chapter
540 Managed Access Control	Entire chapter	Entire chapter
550 Interchange Justification Report	Entire chapter	Entire chapter
610 Investigation of Soils, Rock, and Surfacing Materials	610-5&6	610-5&6
630 Geosynthetics	630-1&2, 9–12	630-1&2, 9–12
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730 Retaining Walls and Steep Reinforced Slopes	730-3&4	730-3&4
740 Noise Barriers	Entire chapter	Entire chapter
1100 Practical Design	Entire chapter	Entire chapter
1103 Design Control Selection	1103-5&6	1103-5&6
1104 Alternatives Analysis	Entire chapter	Entire chapter
1105 Design Element Selection	Entire chapter	Entire chapter
1106 Design Element Dimensions	Entire chapter	Entire chapter
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1230 Geometric Cross Section	1230-1&2, 21&22	1230-1&2, 21&22
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Glossary	G-1&2, 7&8, 15&16, 33&34	G-1&2, 7&8, 15&16, 33&34

About revision marks and footer dates:

- A new date appears in the footer of each page that has changes or new/different pagination. In some cases just a page of a chapter is updated.
- Many chapters in this revision package have all pages with new July 2016 dates, but revision marks indicate actual changes made. This is commonly used on shorter chapters or where most pages have some changes.
- When a chapter is new or substantially rewritten, no revision marks are applied; new dates are assigned.

Summary of *Design Manual Changes* – July 2016 (Revisions merit careful study beyond this summary)

Highlights of the More Substantial Revisions

Chapter 300 Design Documentation, Approval, and Process Review

- Section 300.02 is retitled WSDOT Project Delivery; new content and reference link added to instruct on selecting WSDOT project delivery method.
- Section 300.06(4) is revised with clarifications pertaining to Design Analyses.
- Exhibit 300-1 Approval Authorities is revised with new column for Basis of Design approval.
- Exhibits 300-2 and 4, minor clarifications

Chapter 321 Sustainable Safety

- Section 321.05, Sustainable Safety for I-1 and I-3 Projects, is revised to align with WSDOT performance refinement revisions in other chapters.

Chapter 530 Limited Access Control

- Section 530.10 “Changes to Existing Limited Access Rights of Way (including Access, Occupancy, and Use)” is revised to specify rules for changes to access, use, and occupancy of limited access highways.
- The term deviation is replaced with design analysis in multiple sections.
- Other minor clarifications are made within the chapter.
- The drawings exhibits 530-2a and 530-3b are revised to relabel “county road” as “cross road” to better cover all possible applications of local road ownership.

Chapter 540 Managed Access Control

- Section 540.07(4) “Corner Clearance Design Analysis” is revised to bring back flexibility for siting a single-family residence access connection within the minimum corner clearance distances specified in the chapter. This exception may be allowed only for a single-family residence; other uses, including multiple-family residences, require a design analysis (previously design deviation.)

Chapter 1100 Practical Design

- Section 1100.10(1) Basis of Design emphasizes starting a BOD at the earliest stages possible; consistency between planning strategies and solutions developed in scoping and design; BOD approvals are needed.
- Section 1100.10(1)(a) Basis of Design Exemptions is new content and discusses procedures and exemptions to Basis of Design for All projects, Preservation projects, and Safety projects.
- Section 1100.10(5) Performance Target Refinement Form is removed. This change was coordinated with revisions to Chapters 300 and 1106.

Chapter 1104 Alternatives Analysis

- 1104.03(2) Performance Trade-off Decisions is revised: Added reference to 1106.04(1) for guidance on refining performance targets and added reference to 321.05 for refining safety targets.

Chapter 1105 Design Element Selection

- 1105.04 Documentation is revised: Revision refers to Section 5 of the Basis of Design for documenting design elements that are changed or employed; Added reference to 1100.10(1) for design elements exempted from Basis of Design.

Chapter 1106 Design Element Dimensions

- Performance target refinement procedure is revised in Sections 1106.04(1)&(2). The Performance Target Refinement Form is discontinued and instruction provided to enter refined performance targets on the Basis of Design form.

Chapter 1120 Preservation Projects

- Updated guardrail height criteria to Federal guidelines.
- Updated policy on Breakaway Cable Terminal.
- Clarified reference to WSDOT scoping instructions available at the WSDOT Planning and Programming Scoping website.
- Reference added to see Chapter 1020 for overhead sign assembly.

Chapter 1610 Traffic Barriers

- Multiple sections: Updated guardrail height criteria to meet FHWA guidance
- Aesthetic barrier treatment guidance is evolving in 1610.05(7).
- Updates to non-flared guardrail terminal systems in 1610.06(4).
See also revised Exhibit 1610-12a for examples of non-flared terminals.
- Other minor clarifications
- Standard Plans are revised to coincide with updated guardrail height criteria and are due to be published in August 2016.

Highlights of Other Chapter Revisions

Chapter 310 – Value Engineering

- Removed previous section about practical design workshops.
- Minor clarifications, and moved References to back of chapter.

Chapter 320 Traffic Analysis

- Replaced term design deviation with design analysis.

Chapter 520 Access Control

- Changed term access deviation to access design analysis.

Chapter 610 Investigation of Soils, Rock, and Surfacing Materials

- Changed reference from Design Manual to Roadside Manual for Soil Bioengineering information.

Chapter 630 Geosynthetics

- Updated references to TЕСSM on pages 630-1, 9, and 11.

Chapter 720 Bridges

- Replaced term deviation with design analysis in 720.03(5)(c)(1) and Exhibit 720-3, Note [4].

Chapter 730 Retaining Walls and Steep Reinforced Slopes

- Term design deviation replaced with design analysis in 730.04(1).

Chapter 740 Noise Barriers

- The term design deviation is replaced with design analysis in 740.02(2).
- Current style applied to entire chapter; references moved to back of chapter causing sections 740.02 through 740.05 renumbered.

Chapter 1260 Sight Distance

- The term deviation is replaced with design analysis in 1260.03(1).

Chapter 1600 Roadside Safety

- The term deviation is replaced with design analysis in 1600.03(1) and 1600.04(1)(a).

Technical Errata July 2016

- This is updated, specifying that the Design Manual does still contain the term deviation in a small group of chapters. The Errata instructs that deviation means design analysis and refers to Chapters 300 and 1106 for more information.



Design Manual

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July 2016

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Engineering and Regional Operations

Development Division, Design Office

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Technical Errata

Technical Errata July 2016

This Technical Errata is provided with the July 2016 *Design Manual* publication.

Errata Purpose

To continue to institute new terminology, documentation, and procedures related to design deviations.

Errata Description and Instruction

WSDOT is changing terminology and documentation format for what has been known as *design deviations*.

The new terminology that replaces *design deviation* is **Design Analysis**.

The term *design deviation* is being removed from the *Design Manual*. This began with the November 2015 Design Manual update, and continues with this July 2016 update.

However, not all chapters have been revised for this purpose yet. Chapters 1310, 1360, and 1410 will all likely be revised in the 2017 manual update.

Where still encountered in the *Design Manual*, replace the term *deviation* or *design deviation* with *Design Analysis*.

Refer to instruction in Chapter 300 and Chapter 1106 for further information about *Design Analysis*.

- Both chapters contain a link to the *Design Analysis* documentation tool.
- Chapter 300 contains instruction on *Design Analysis* approval authorities.

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300.02	WSDOT Project Delivery
300.03	Design Documentation and Records Retention Policy
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300.06	Project Documents and Approvals
300.07	Process Review
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300.01 General

This chapter provides the WSDOT design procedures, documentation and approvals necessary to deliver successful projects on the transportation network in Washington, including projects involving the Federal Highways Administration.

This chapter presents critical information for design teams, including:

- WSDOT’s Project Development process.
- Design documentation tools, procedures, and records retention policy.
- Major Project approvals including Design Approval, Project Development Approval, Basis of Design, Design Analysis, and other specific project documents for design-bid-build and for design-build delivery methods.
- FHWA oversight and approvals on Projects of Division Interest (PoDI).
- WSDOT and FHWA approvals for non-PoDI projects including Interstate new and reconstruction and other specific documents as shown in the approvals exhibits.
- Information about conducting project process reviews.
- Additional references and resources.

For operational changes and local agency and developer projects on state highways, design documentation is also needed. It is retained by the region office responsible for the project oversight, in accordance with the WSDOT records retention policy. All participants in the design process are to provide the appropriate documentation for their decisions. For more information about these types of projects, see the *Local Agency Guidelines* and *Development Services Manual* available at the Publications Services Index website:

www.wsdot.wa.gov/Publications/Manuals/index.htm

For emergency projects, also refer to the *Emergency Relief Procedures Manual*. It provides the legal and procedural guidelines for WSDOT employees to prepare all necessary documentation to respond to, and recover from, emergencies and disasters that affect the operations of the department.

300.02 WSDOT Project Delivery

A project, and its delivery method, is developed in accordance with all applicable procedures, Executive Orders, Directives, Instructional Letters, Supplements, and manuals; the Washington State Highway System Plan; approved corridor sketches and planning studies; the FHWA/WSDOT Stewardship and Oversight Agreement; scoping phase documentation, and the Basis of Design.

The delivery method is determined using the WSDOT Project Delivery Method Selection Guidance Memorandum found here:

🔗 www.wsdot.wa.gov/Projects/delivery/designbuild/PDMSG.htm

See the implementation memorandum for procedural policy and guidance in the selection of probable and final project delivery method, timing for these determinations, and approval and endorsement levels.

The region develops and maintains documentation for each project using this chapter and the Project File / Design Documentation Package checklists (see [300.03\(3\)](#))

Refer to the *Plans Preparation Manual* for PS&E documentation. [Exhibit 300-4](#) is an example checklist of recommended items to be turned over to the construction office at the time of project transition. An expanded version is available here:

🔗 www.wsdot.wa.gov/design/projectdev/

300.02(1) *Environmental Requirements*

All projects involving a federal action require National Environmental Policy Act (NEPA) documentation. WSDOT uses the Environmental Review Summary (ERS) portion of Project Summary for FHWA concurrence on the environmental class of action (EIS/EA/CE). The environmental approval levels are shown in [Exhibit 300-2](#).

Upon receipt of the ERS approval for projects requiring an EA or EIS under NEPA, the region proceeds with environmental documentation, including public involvement, appropriate for the magnitude and type of the project (see [Chapter 210](#) and *WSDOT Community Engagement Plan*).

300.02(2) *Real Estate Acquisition*

Design Approval and approval of right of way plans are required prior to acquiring property. Federal law ([23 USC 108](#)) allows for acquisition of right of way using federal funds prior to completion of NEPA. (See the [April 2, 2013, memorandum on early acquisition policy](#) and the *Right of Way Manual* for more information.)

300.03 Design Documentation and Records Retention Policy

300.03(1) *Purpose*

Design documentation records the evaluations and decisions by the various disciplines that result in design recommendations. Design assumptions and decisions made prior to and during the scoping phase are included. Changes that occur throughout project development are documented. Required justifications and approvals are also included.

300.03(2) Certification of Documents by Licensed Professionals

All original technical documents must bear the certification of the responsible licensee as listed in [Executive Order E 1010](#).

300.03(3) Project File and Design Documentation Package

The Project File and Design Documentation Package include documentation of project work, including planning; scoping; community engagement; environmental action; the Basis of Design; right of way acquisition; Plans, Specifications, and Estimates (PS&E) development; project advertisement; and construction.

The **Project File (PF)** contains the documentation for planning, scoping, programming, design, approvals, contract assembly, utility relocation, needed right of way, advertisement, award, construction, and maintenance review comments for a project. A Project File is completed for all projects and is retained by the region office responsible for the project. Responsibility for the project may pass from one office to another during the life of a project, and the Project File follows the project as it moves from office to office. With the exception of the DDP, the Project File may be purged when retention of the construction records is no longer necessary.

See the Project File checklist for documents to be preserved in the Project File:

www.wsdot.wa.gov/Design/Support.htm

The **Design Documentation Package (DDP)** is a part of the Project File and preserves the decision documents generated during the design process. In each package, a summary (list) of the documents included is recommended. The DDP documents and explains design decisions, design criteria, and the design process that was followed. The DDP is retained in a permanent retrievable file for a period of 75 years, in accordance with the Washington State Department of Transportation (WSDOT) records retention policy.

The Basis of Design, Design Parameters, Alternatives Comparison Table, and Design Analyses are tools developed to document WSDOT practical design and decisions. Retain these in the DDP.

Refer to the remainder of this chapter and DDP checklist for documents to be preserved in the DDP. See Design Documentation Package Checklist here:

www.wsdot.wa.gov/Design/Support.htm

300.04 Project Design Approvals

This section describes WSDOT's project design milestones known as Design Approval and Project Development Approval. They are required approvals regardless of delivery method chosen by WSDOT. Many of the documents listed under these milestones are described further in 300.06.

Information pertaining to FHWA approvals and oversight is provided in [300.05](#) which describes Projects of Division Interest (PoDI) which are governed by a separate plan that specifies FHWA and State responsibilities for the project. Documents for projects requiring FHWA review, Design Approval, and Project Development Approval are submitted through the HQ Design Office.

300.04(1) Design Approval

When the Project Summary (see [300.06](#)) documents are approved, and the region is confident that the proposed design adequately addresses the purpose and need for the project, a Design


Approval may be pursued and granted at this early stage. Early approval is an option at this point in the design phase and is likely most relevant to larger projects with longer PE phases because it provides early approved documentation that locks in design policy for three years. This is a benefit for longer PE phases in that it avoids design changes due to policy updates during that time and provides consistency when purchasing right of way or producing environmental documentation.

If early Design Approval is not beneficial for a subject project, the typical items (below) that are part of this package become required in the combined Design Approval/Project Development Approval Package. Design Approval may occur prior to NEPA approval. Generally, Design Approval will not be provided prior to an IJR being approved on an Interstate project. Approval levels for design and PS&E documents are presented in Exhibits 300-1 through 300-3.

The following items are typically provided for Design Approval. See 300.06 for additional information.

- Stamped cover sheet (project description)
- A reader-friendly memo that describes the project
- Project Summary documents
- Basis of Design
- Alternatives Comparison Table
- Design Parameters worksheets
- Crash Analysis Report
- Design Analysis
- Design Variance Inventory (for known design analyses at this stage)
- Channelization plans, intersection plans, or interchange plans (if applicable)
- Alignment plans and profiles (if project significantly modifies either the existing vertical or horizontal alignment)
- Current cost estimate with a Basis of Estimate

Design Approval is entered into the Design Documentation Package and remains valid for three years or as approved by the HQ Design Office.

- If the project is over this three-year period and has not advanced to Project Development Approval, evaluate policy changes or revised design criteria that are adopted by the department during this time to determine whether these changes would have a significant impact on the scope or schedule of the project.
- If it is determined that these changes will not be incorporated into the project, document this decision with a memo from the region Project Development Engineer that is included in the DDP.
- For an overview of design policy changes, consult the Detailed Chronology of *Design Manual* revisions:  www.wsdot.wa.gov/design/policy/default.htm

300.04(1)(a) Design-Build Projects

Design Approval applies to design-build projects. Design documentation begins in the project scoping phase and continues through the life of the design-build project. This documentation is thus started by WSDOT and is completed by the design-builder. Since Design Approval is related to project scoping, this milestone shall be accomplished prior to issuing a Design-Build Request for Proposal (see [Exhibit 110-1](#)). However, the design-builder shall refer to the Request for Proposal (RFP) for direction on approval milestones. An approved Basis of Design is required prior to issuing a Design-Build Request for Proposal (RFP).

300.04(2) Project Development Approval

When all project development documents are completed and approved, Project Development Approval is granted by the approval authority designated in [Exhibit 300-1](#). The Project Development Approval becomes part of the DDP.

Refer to this chapter and the DDP checklist for design documents that may lead to Project Development Approval. Exhibits [300-1](#) through [300-3](#) provide approval levels for project design and PS&E documents,.

The following items must be approved prior to Project Development Approval:

- Required environmental documentation
- Design Approval documents (and any supplements)
- Updated Basis of Design
- Updated Design Variance Inventory (all project Design Analyses)
- Cost estimate and Updated Basis of Estimate
- Stamped cover sheet (project description)

Project Development Approval remains valid for three years.

- Evaluate policy changes or revised design criteria that are adopted by the department during this time to determine whether these changes would have a significant impact on the scope or schedule of the project.
- If it is determined that these changes will not be incorporated into the project, document this decision with a memo from the region Project Development Engineer that is included in the DDP.
- For an overview of design policy changes, consult the Detailed Chronology of *Design Manual* revisions: www.wsdot.wa.gov/design/policy/default.htm

300.04(2)(a) Design-Build Projects

For design-build projects, the design-builder shall refer to the project Request for Proposal (RFP) for specification on final and intermediate deliverables and final records for the project. Project Development Approval is required prior to project completion.

It is a prudent practice to start the compilation of design documentation early in a project and to acquire Project Development Approval before the completion of the project. At the start of a

project, it is critical that WSDOT project administration staff recognize the importance of all required documentation and how it will be used in the design-build project delivery process.

300.05 FHWA Oversight and Approvals

The March 2015 Stewardship & Oversight (S&O) [Agreement](#) between WSDOT and FHWA Washington Division created new procedures and terminology associated with FHWA oversight and approvals. One such term, and new relevant procedure, is “Projects of Division Interest” (PoDI) described below.

For all projects, on the National Highway System (NHS), the level of FHWA oversight and approvals can vary for numerous reasons such as type of project, the agency doing the work, PoDI/non-PoDI designation, and funding sources. Oversight and funding do not affect the level of design documentation required for a project.

Documents for projects requiring FHWA review, Design Approval, and Project Development Approval are submitted through the HQ Design Office.

300.05(1) FHWA Projects of Division Interest (PoDI)

Projects of Division Interest (PoDI) are a primary set of projects for which FHWA determines the need to exercise oversight and approval authority. These are projects that have an elevated risk, contain elements of higher risk, or present a meaningful opportunity for FHWA involvement to enhance meeting program or project objectives. Collaborative identification of these projects allows FHWA Washington Division to concentrate resources on project stages or areas of interest. It also allows WSDOT to identify which projects are PoDIs and plan for the expected level of engagement with FHWA.

The Stewardship & Oversight Agreement generally defines Projects of Division Interest as:

- Major Projects (A federal aid project with total cost >\$500M)
- TIGER Discretionary Grant Projects
- NHS Projects that may require FHWA Project or Program Approvals
- Projects Selected by FHWA based on Risk or Opportunity

The S&O Agreement also states: Regardless of retained project approval actions, any Federal-aid Highway Project either on or off the NHS that the Division identifies as having an elevated level of risk can be selected for risk-based stewardship and oversight and would then be identified as a PoDI.

For each project designated as a PoDI, FHWA and WSDOT prepare a Project-Specific PoDI Stewardship & Oversight Agreement which identifies project approvals and related responsibilities specific to the project. This means PoDI projects have their own set of approval requirements and the approvals tables at the end of this chapter apply to non-PoDI projects.

300.05(2) FHWA Approvals on Non-PoDI Projects

On projects that are not identified as PoDI, FHWA approvals are still required for various items as shown in [Exhibit 300-1](#). For example, FHWA approval is still required for any new or revised access point (including interchanges, temporary access breaks, and locked gate access points) on the Interstate System, regardless of funding source or PoDI designation (see [Chapter 550](#)).

The [Exhibit 300-1](#) approval table refers to New/Reconstruction projects on the Interstate. New/Reconstruction projects include the following types of work:

- Capacity changes: add a through lane, convert a general-purpose (GP) lane to a special-purpose lane (such as an HOV or HOT lane), or convert a high-occupancy vehicle (HOV) lane to GP.
- Other lane changes: add or eliminate a collector-distributor or auxiliary lane. (A rural truck climbing lane that, for its entire length, meets the warrants in [Chapter 1270](#) is not considered new/reconstruction.)
- New interchange.
- Changes in interchange type such as diamond to directional or adding a ramp.
- New or replacement bridge (on or over, main line, or interchange ramp).
- New Safety Rest Areas Interstate.

Documents for projects requiring FHWA review, Design Approval, and Project Development Approval are submitted through the HQ Design Office.

300.06 Project Documents and Approvals

This section lists several major design documents generated for a project and they all are retained in the Design Documentation Package. The Basis of Design, Alternatives Comparison Table, Design Parameters, and Design Analyses are tools used to document practical design decisions.

See the Project File and Design Documentation Package checklists described in [300.03\(3\)](#) for complete list of documents.

For approval levels see Exhibits [300-1](#) through [300-3](#) or a project-specific S&O Agreement for PoDI projects.

300.06(1) *Project Summary*

The Project Summary provides information on the results of the scoping phase; links the project to the Washington State Highway System Plan and the Capital Improvement and Preservation Program (CIPP); and documents the design decisions, the environmental classification, and agency coordination. The Project Summary is developed and approved before the project is funded for design and construction, and it consists of the ERS, and PD documents. The Project Summary database contains specific online instructions for completing the documents.

300.06(1)(a) **Project Definition (PD)**

The PD identifies the various disciplines and design elements that are anticipated to be encountered in project development. It also states the purpose and need for the project, the program categories, and the recommendations for project phasing. The PD is initiated early in the scoping phase to provide a basis for full development of the ERS, schedule, estimate, Basis of Estimate, and Basis of Design (where indicated in scoping instructions). If circumstances necessitate a change to an approved PD, process a Project Change Request Form for approval by the appropriate designee.

300.06(1)(b) Environmental Review Summary (ERS)

The ERS lists the potentially required environmental permits and approvals, environmental classifications, and environmental considerations. The ERS is prepared during the scoping phase and is approved by the region. If there is a change in the PD, the information in the ERS must be reviewed and revised to match the rest of the Project Summary. For actions classified as a CE under NEPA, the approved ERS becomes the ECS when the project is funded and moves to design. The region may revise the ECS as appropriate (usually during final design) as the project advances. The ECS serves as the NEPA environmental documentation for CE projects. The region Environmental Manager approves the ECS and may send it to FHWA for their approval. The ERS/ECS database includes fully integrated help screens that provide detailed guidance. Contact your region Environmental Office for access.

300.06(2) Basis of Design (BOD)

The BOD captures important decisions that control the outcome of a project, including identified performance needs, context, design controls and design elements necessary to design the practical alternative. When applicable attach supporting documents, such as the Alternatives Comparison Table and Design Parameters to the BOD. (See [Chapter 1100](#) for further discussion on these documents). The Basis of Design (BOD) is part of the DDP.

300.06(3) Basis of Estimate (BOE)

The BOE contains the assumptions, risks, and information used to develop an estimate. The BOE is reviewed and updated during each phase of a project. The confidence of the estimate, either overall or for particular items, is also identified within the BOE. Generally, the BOE is started during the scoping phase because it is required for Project Summary approval; however, in more complex situations the BOE may have begun during the planning phase. For more information, see the [Cost Estimating Manual for WSDOT Projects](#).

300.06(4) Design Analysis

A Design Analysis is a process and tool used to document important design decisions, summarizing information needed for an approving authority to understand and support the decision.

A Design Analysis is required where a dimension chosen for a design element that will be employed or changed by the project is outside the range of values provided for that element in the *Design Manual*. A Design Analysis is also required where the need for one is specifically referenced in the *Design Manual*.

A region approved design analysis is required if a dimension or design element meets current AASHTO guidance adopted by the Federal Highway Administration (FHWA), such as *A Policy on Geometric Design of Highways and Streets*, but is outside the corresponding *Design Manual* criteria.

See [Exhibit 300-1](#) for Design Analysis approval authorities.

In the case of a shoulder width reduction at an existing bridge pier or abutment, sign structure or luminaire base in a run of median barrier, the Design Parameter Sheet may be used instead of a Design Analysis to document the dimensioning decision for the shoulder at that location.

A template is available to guide the development of the Design Analysis document here:

🔗 www.wsdot.wa.gov/design/support.htm.

Once they are approved, Design Analyses are tracked in the Design Variance Inventory System (DVIS). All projects that have Design Analyses must catalog those in the DVIS. All projects have their own inventory within the DVIS. The DVIS database can be accessed from this website:

🔗 www.wsdot.wa.gov/design/.

300.07 Process Review

The Assistant State Design Engineers work with the regions on project development and conduct process reviews on projects. The process review is done to provide reasonable assurance that projects are prepared in compliance with established policies and procedures and that adequate records exist to show compliance with state and federal requirements. Process reviews are conducted by WSDOT, FHWA, or a combination of both.

The design and PS&E process review is performed in each region at least once each year by the HQ Design Office. The documents used in the review process are the Design Documentation Package Checklist(s), Basis of Design, Basis of Estimate, the PS&E Review Checklist, and the PS&E Review Summary. These are generic forms used for all project reviews. Copies of these working documents are available for reference when assembling project documentation. The HQ Design Office maintains current copies at: 🔗 www.wsdot.wa.gov/design/support.htm.

Each project selected for review is examined completely and systematically beginning with the scoping phase (including planning documents) and continuing through contract plans and, when available, construction records and change orders. Projects are normally selected after contract award. For projects having major traffic design elements, the HQ Traffic Operations Office is involved in the review. The WSDOT process reviews may be held in conjunction with FHWA process reviews.

The HQ Design Office schedules the process review and coordinates it with the region and FHWA.

300.07(1) Process Review Agenda

When conducting joint process review with FHWA, the Process Review Report will outline specific agenda items.

A WSDOT process review follows this general agenda:

1. Review team meets with region personnel to discuss the object of the review.
2. Review team reviews the design and PS&E documents, construction documents, and change orders (if available) using the checklists.
3. Review team meets with region personnel to ask questions and clarify issues of concern.
4. Review team meets with region personnel to discuss findings.
5. Review team submits a draft report to the region for comments and input.
6. If the review of a project shows a serious discrepancy, the region design authority is asked to report the steps that will be taken to correct the deficiency.
7. Process review summary forms are completed.

8. Summary forms and checklists are evaluated by the Director & State Design Engineer, Development Division.
9. Findings and recommendations of the Director & State Design Engineer, Development Division, are forwarded to the region design authority for action and/or information within 30 days of the review.

300.08 References

300.08(1) Federal/State Laws and Codes

[23 Code of Federal Regulations \(CFR\) 635.111](#), Tied bids

[23 CFR 635.411](#), Material or product selection

[Revised Code of Washington \(RCW\) 47.28.030](#), Contracts – State forces – Monetary limits – Small businesses, minority, and women contractors – Rules

[RCW 47.28.035](#), Cost of project, defined

“Washington Federal-Aid Stewardship Agreement,”

www.wsdot.wa.gov/publications/fulltext/design/ASDE/2015_Stewardship.pdf

300.08(2) Design Guidance

WSDOT Directional Documents Index, including the one listed below:

<http://wwwi.wsdot.wa.gov/publications/policies>

- [Executive Order E 1010](#), “Certification of Documents by Licensed Professionals,” WSDOT

WSDOT technical manuals, including those listed below:

www.wsdot.wa.gov/publications/manuals/index.htm

- *Advertisement and Award Manual*, M 27-02, WSDOT
- *Cost Estimating Manual for WSDOT Projects*, M 3034.03, WSDOT
- *Design Manual*, M 22-01, WSDOT
- *Emergency Relief Procedures Manual*, M 3014, WSDOT
- *Environmental Manual*, M 31-11, WSDOT
- *Hydraulics Manual*, M 23-03, WSDOT
- *Highway Runoff Manual*, M 31-16, WSDOT
- *Plans Preparation Manual*, M 22-31, WSDOT
- *Project Control and Reporting Manual*, M 3026, WSDOT
- *Roadside Manual*, M 25-30, WSDOT
- *Roadside Policy Manual*, M 3110, WSDOT
- *Temporary Erosion and Sediment Control Manual*, M 3109, WSDOT

Limited Access and Managed Access Master Plan, WSDOT

www.wsdot.wa.gov/design/accessandhearings/

Washington State Highway System Plan, WSDOT

www.wsdot.wa.gov/planning/

300.08(3) Supporting Information

A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, 2011

Mitigation Strategies for Design Exceptions, FHWA, July 2007. This publication provides detailed information on design exceptions and mitigating the potential adverse impacts to highway safety and traffic operations.

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

Highway Safety Manual (HSM), AASHTO

Exhibit 300-1 Approval Authorities

Project Type	Basis of Design (BOD) Approval [10]	Design Analysis Approval [1] [2] [10] [11]	Design Approval and Project Development Approval [10]
Interstate			
New/Reconstruction Regardless of funding source [3]	FHWA	FHWA	FHWA [4]
Intelligent Transportation Systems (ITS) Improvement project over \$1 million Preservation project	HQ Design HQ Design	HQ Design HQ Design	HQ Design Region
All Other <u>Regardless of funding source</u>	HQ Design	HQ Design	Region
National Highway System (NHS)			
<u>Projects on all limited access highways, or on managed access highways outside of incorporated cities and towns</u>	HQ Design	HQ Design [5]	Region
<u>Projects on managed access highways within incorporated cities and towns</u> Inside curb or EPS [6][7] Outside curb or EPS	HQ Design City/Town	HQ Design HQ LP	Region City/Town
Non-National Highway System (Non-NHS)			
Improvement projects on all limited access highways, or on managed access highways outside of incorporated cities and towns	HQ Design	HQ Design	Region
Improvement projects on managed access highways within incorporated cities and towns [9] Inside curb or EPS [6][7] Outside curb or EPS	HQ Design City/Town	HQ Design HQ LP	Region City/Town
Preservation projects on <u>limited access highway, or on managed access highways outside of incorporated cities and towns, or within unincorporated cities and towns</u> [8]	Region	Region	Region
Preservation projects on managed access highways within incorporated cities and towns [8] Inside curb or EPS [6][7] Outside curb or EPS	Region City/Town	Region HQ LP	Region City/Town

FHWA = Federal Highway Administration

HQ = WSDOT Headquarters

HQ LP = WSDOT Headquarters Local Programs Office

EPS = Edge of paved shoulder where curbs do not exist

NHS = National Highway System

www.wsdot.wa.gov/mapsdata/travel/hpms/NHSRoutes.htm

For table notes, see the following page.

Exhibit 300-1 Approval Authorities (continued)**Notes:**

- [1] These approval levels also apply to Design Analysis processing for local agency and developer work on a state highway.
- [2] See [300.06\(4\)](#) and the [Technical Errata](#) issued with the November 2015 *Design Manual* Publication.
- [3] For definition of New/Reconstruction, see [300.05\(2\)](#).
- [4] FHWA will provide Design Approval prior to NEPA Approval, but will not provide Project Development Approval until NEPA is complete.
http://www.wsdot.wa.gov/publications/fulltext/design/ASDE/2015_Stewardship.pdf
- [5] For guidance on the need for Design Analyses related to access management, see Chapters [530](#) and [540](#).
- [6] Includes raised medians (see [Chapter 1600](#)).
- [7] Curb ramps are still included (see [Chapter 1510](#)).
- [8] For Bridge Replacement projects in the Preservation program, follow the approval level specified for Improvement projects.
- [9] Refer to [RCW 47.24.020](#) for more specific information about jurisdiction and responsibilities that can affect approvals.
- [10] Approvals for FHWA Projects of Division Interest (PoDI) and Projects of Corporate interest (PoCI) will be as agreed to in the PoDI or PoCI Agreement.
- [11] A region approved design analysis is required if a dimension or design element meets current AASHTO guidance adopted by the Federal Highway Administration (FHWA), such as *A Policy on Geometric Design of Highways and Streets*, but is outside the range of corresponding *Design Manual* criteria.

Exhibit 300-2 Approvals

Item	Approval Authority		
	Region	HQ	FHWA
Program Development			
Work Order Authorization		X	X [1]
Public Hearings			
Corridor Hearing Summary		X [2]	
Design <u>Hearing</u> Summary		X [3]	X[8]
<u>Limited</u> Access Hearing Plan		X [4]	
<u>Limited</u> Access Findings and Order		X [5]	
Environmental Document			
Class I NEPA (EIS)		[7]	X
SEPA (EIS)		X	
Class II NEPA – Categorical Exclusion (CE) Documented in ECS form	X		
SEPA – Categorical Exemption (CE)	X		
Class III NEPA – Environmental Assessment (EA)		[7]	X
SEPA Environmental Checklist & Determination of Non-Significance (DNS)	X		
Design			
Basis of Design (<u>BOD</u>)	[9]	[9]	[9]
Intersection Control Type	X [22]	X [24]	
Experimental Features		X	X
Environmental Review Summary	X		
Final Project Definition		X [10]	
Interstate Interchange Justification Report		[7]	X
Any Break in Interstate Limited Access		[7]	X
Non-Interstate Interchange Justification Report		X	
Break in Partial or Modified Limited Access		X	
Intersection or Channelization Plans	X [11]		
Right of Way Plans	[12]	X	
Monumentation Map	X		
Materials Source Report		X [13]	
Pavement Determination Report		X [13]	
Roundabout Geometric Design (see Chapter 1320 for guidance)	X		
Resurfacing Report		X [13]	
Signal Permits	X [14]		
Geotechnical Report		X [13]	
Tied Bids	X [15]		

Table is continued on the following page, which also contains the notes.

Exhibit 300-2 Approvals (continued)

Item	Approval Authority		
	Region	HQ	FHWA
Bridge Design Plans (Bridge Layout)	X	X	
Preliminary Bridge Plans for Unusual/Complex Bridges on the Interstate		[7]	X
Structures Requiring TS&Ls		X	
Hydraulic Report	X [16]	[16]	
Preliminary Signalization Plans		X [6][20]	
Signalization Plans	X [22]		
Illumination Plans	X [22]		
Intelligent Transportation System (ITS) Plans	X [22]		
ITS Systems Engineering Analysis Worksheet (Exhibit 1050-2)	X [22]		
Rest Area Plans		X	
Roadside Restoration Plans	X [18]	X [19]	
Planting Plans	X [18]	X [19]	
Grading Plans	X		
Continuous Illumination – Main Line		X [20]	
Tunnel Illumination		X [20]	
High Mast Illumination		X [20]	
Project Change Request Form	X [21]	X [21]	
Work Zone Transportation Management Plan/Traffic Control Plan	X [22]		
Public Art Plan – Interstate (see Chapter 950)	X [18]	X [19][23]	X
Public Art Plan – Non-Interstate (see Chapter 950)	X [18]	X [19][23]	
ADA Maximum Extent Feasible Document (see Chapter 1510)	X	X	
Notes:			
[1] Federal-aid projects only.	[11] Include channelization details.		
[2] Approved by Assistant Secretary, Engineering & Regional Operations.	[12] Certified by the responsible professional licensee.		
[3] Approved by Director & State Design Engineer, Development Division.	[13] Submit to HQ Mats Lab for review and approval.		
[4] Approved by Right of Way Plans Manager.	[14] Approved by Regional Administrator or designee.		
[5] Refer to Chapter 210 for approval requirements.	[15] Per 23 CFR 635.111 .		
[6] Final review & concurrence required at the region level prior to submittal to approving authority.	[16] See the Hydraulics Manual for approvals levels.		
[7] Final review & concurrence required at HQ prior to submittal to approving authority.	[18] Applies to regions with a Landscape Architect.		
[8] <u>On Interstate projects, the Director & State Design Engineer, Development Division, (or designee) submits the approved design hearing summary to the FHWA for federal approval. (See Chapter 210.)</u>	[19] Applies to regions without a Landscape Architect.		
[9] See Exhibit 300-1 for BOD Approvals.	[20] Approved by State Traffic Engineer.		
[10] Approved by HQ Capital Program Development and Management (CPDM).	[21] Consult CPDM for clarification on approval authority.		
	[22] Region Traffic Engineer or designee.		
	[23] The State Bridge and Structures Architect reviews and approves the public art plan (see Chapter 950 for further details on approvals).		
	[24] State Traffic Engineer or designee.		

Exhibit 300-3 PS&E Process Approvals NHS (including Interstate) and Non-NHS

Item	Headquarters or Region Approval Authority
DBE/training goals * **	Office of Equal Opportunity
Right of way certification for federal-aid projects***	Region; HQ Real Estate Services Office or HQ Local Programs Right of Way Manager [7]
Right of way certification for state or local funded projects***	Region; HQ Real Estate Services Office or HQ Local Programs Right of Way Manager
Railroad agreements	HQ Design Office
Work performed for public or private entities *	Region [1][2]
State force work *	Region [3][4]
Use of state-furnished materials *	Region [3][4]
Work order authorization	Capital Program Development and Management [5]
Ultimate reclamation plan approval through DNR	Region
Proprietary item use *	[4][6] HQ Design Office
Mandatory material sources and/or waste sites *	Region [4]
Nonstandard bid item use *	Region
Incentive provisions	HQ Construction Office
Nonstandard time for completion liquidated damages *	HQ Construction Office
Interim liquidated damages *	Statewide Travel and Collision Data Office
<p>Notes:</p> <p>FHWA PS&E Approval has been delegated to WSDOT unless otherwise stated differently in a Project Specific PoDI S&O Agreement.</p> <p>[1] This work requires a written agreement.</p> <p>[2] Region approval subject to \$250,000 limitation.</p> <p>[3] Use of state forces is subject to \$60,000 limitation and \$100,000 in an emergency situation, as stipulated in RCWs 47.28.030 and 47.28.035. Region justifies use of state force work and state-furnished materials and determines if the work is maintenance or not. HQ CPDM reviews to ensure process has been followed.</p> <p>[4] Applies only to federal-aid projects; however, document for all projects.</p> <p>[5] Prior FHWA funding approval required for federal-aid projects.</p> <p>[6] The HQ Design Office is required to certify that the proprietary product is either: (a) necessary for synchronization with existing facilities, or (b) a unique product for which there is no equally suitable alternative.</p> <p>[7] For any federal aid project FHWA only approves Right of Way Certification 3s (All R/W Not Acquired), WSDOT approves Right of Way Certification 1s and 2s for all other federal aid projects.</p> <p>References:</p> <p>* <i>Plans Preparation Manual</i></p> <p>** <i>Advertisement and Award Manual</i></p> <p>*** <i>Right of Way Manual</i></p>	

Exhibit 300-4 Design to Construction Transition Project Turnover Checklist Example

This checklist is recommended for use when coordinating project transition from design to construction.

1. Survey

- End areas (cut & fill)
- Staking data
- Horizontal/Vertical control
- Monumentation/Control information

2. Design Backup

- Index for all backup material
- Backup calculations for quantities
- Geotech shrink/swell assumptions
- Basis of Design, Design decisions and constraints
- Approved Design Analyses
- Hydraulics/Drainage information
- Clarify work zone traffic control/workforce estimates
- Geotechnical information (report)
- Package of as-builts used (which were verified) and right of way files
- Detailed assumptions for construction CPM schedule (working days)
- Graphics and design visualization information (aerials)
- Specific work item information for inspectors (details not covered in plans)
- Traffic counts
- Management of utility relocation

3. Concise Electronic Information With Indices

- Detailed survey information (see Survey above)
- Archived InRoads data
- Only one set of electronic information
- “Storybook” on electronic files (what’s what)
- CADD files

4. Agreements, Commitments, and Issues

- Agreements and commitments by WSDOT
- RES commitments
- Summary of environmental permit conditions/commitments
- Other permit conditions/commitments
- Internal contact list
- Construction permits
- Utility status/contact
- Identification of the work elements included in the Turnback Agreement (recommend highlighted plan sheets)

5. Construction Support

- Assign a Design Technical Advisor (Design Lead) for construction support

An expanded version of this checklist is available at: www.wsdot.wa.gov/design/projectdev

310.01	General	310.05	Project Management Accountability
310.02	Statewide VE Program	310.06	Documentation
310.03	VE Procedure	310.07	References
310.04	Value Engineering Combined with Risk Assessment (VERA)		

310.01 General

Value engineering (VE) analysis is a systematic process of reviewing and assessing a project by a multidisciplinary team not directly involved in the planning and development phases of the project. The VE process includes consideration of design; construction; maintenance; contractor; state, local, and federal approval agencies; other stakeholders; and the public.

Value analyses are conducted early in WSDOT project development to identify ideas that might reduce cost; refine scope definition; improve design functionality; improve constructability; improve coordination/schedule; and identify other value improvements, including reduced environmental impacts and congestion.

A VE analysis¹ may be applied as a quick-response study to address a problem or as an integral part of an overall organizational effort to stimulate innovation and improve performance characteristics.

Project managers are accountable for ensuring their projects meet all applicable value engineering requirements. In addition, local programs projects are accountable for ensuring they comply with all requirements put forth in the *Local Agency Guidelines*. In all cases, when a VE study is completed, the project manager is accountable for completing, signing, and submitting the VE Recommendations Approval Form.

310.02 Statewide VE Program

310.02(1) Annual VE Plan

The State VE Manager coordinates annually with the Capital Program Development and Region VE Coordinators to prepare an annual VE Plan, with specific projects scheduled quarterly. The VE Plan is the basis for determining the projected VE program needs, including team members, team leaders, consultants, and training. The Statewide VE Plan is a working document that reflects coordination between Headquarters (HQ) and the regions to keep it updated and projects on schedule.

310.02(2) Selecting Projects for VE Analysis

310.02(2)(a) Requirements

WSDOT projects for VE studies may be selected from any of the categories identified in the Highway Construction Program, including Preservation and Improvement projects, depending on the size and/or complexity of the project. In addition to the cost, other issues adding to the

¹ The terms “value engineering”, “value study” and “value analysis” are used interchangeably.

complexity of the project design or construction are considered in the selection process. These include projects that have critical constraints, difficult technical issues, expensive solutions, external influences, and complicated functional requirements, regardless of the estimated project cost.

WSDOT may conduct VE analyses on any projects the project manager determines will benefit from the exercise. In addition, WSDOT conducts VE analyses for all projects as required by the criteria set forth in Federal Highway Administration (FHWA) Value Engineering Policy Order.

1. WSDOT policy requires a value engineering analysis for:
 - Any project with an estimated cost (which includes project development, design, right of way, and construction costs) of \$25 million or more, regardless of funding;
 - Each bridge project located on or off of the federal-aid system with an estimated total cost of \$20 million or more (WSDOT policy is to conduct a VE analysis regardless of funding source); and
 - Any other projects the Secretary or FHWA determines to be appropriate.
2. In addition to the projects described above, WSDOT strongly encourages a VE analysis on other projects where there is a high potential for cost savings or improved project performance or quality. Projects involving complex technical issues, challenging project constraints, unique requirements, and competing community and stakeholder objectives offer opportunities for improved value by conducting VE analyses.
3. Any use of Federal-Aid Highway Program (FAHP) funding on a Major Project² requires that a VE analysis be conducted. In some cases, regardless of the amount of FAHP funding, a project team may be required to perform more than one VE analysis for a Major Project.
4. After completing the required VE analysis, if the project is subsequently split into smaller projects in final design or is programmed to be completed by the advertisement of multiple construction contracts, an additional VE analysis is not required. However, splitting a project into smaller projects or multiple construction contracts is not an accepted method to avoid the requirements to conduct a VE analysis.
5. WSDOT may require a VE analysis to be conducted if a region or public authority encounters instances when the design of a project has been completed but the project does not immediately proceed to construction.
 - a. If a project meeting the above criteria encounters a three-year or longer delay prior to advertisement for construction, and a substantial change to the project's scope or design is identified, WSDOT may require a new VE analysis or an update to the previous VE analysis; or
 - b. If a project's estimated cost was below the criteria identified above but the project advances to construction advertisement, and a substantial change occurs to the project's scope or design, causing an increase in the project cost so that it meets the

² Based on the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)*, signed into law on August 10, 2005, a Major Project is defined as "a project with a total estimated cost of \$500 million or more that is receiving financial assistance." FHWA also has the discretion to designate a project with a total cost of less than \$500 million as a Major Project. FHWA may choose to do so in situations where the projects require a substantial portion of the State Transportation Agency's (STA's) program resources; have a high level of public or congressional interest; are unusually complex; have extraordinary implications for the national transportation system; or are likely to exceed \$500 million in total cost.

criteria identified above and results in a **required re-evaluation of the environmental document**, WSDOT requires that a VE analysis be conducted.

6. When the design of a project has been completed but the project does not immediately proceed to construction, the requirement to conduct a VE analysis is considered to be satisfied, or not necessary, if:
 - a. A project met the criteria identified above and had a VE analysis conducted, and the project advances to advertisement for construction without any substantial changes in its scope or its design; or
 - b. A project's estimated cost initially fell below the criteria identified above, but when advancing to advertisement for construction, falls above the criteria due to inflation, standard escalation of costs, or minor modifications to the project's design or contract.

Other projects that should be considered for value engineering have a total estimated cost exceeding \$5 million and include one or more of the following:

- Alternative solutions that vary the scope and cost
- New alignment or bypass sections
- Capacity improvements that widen the existing highway
- Major structures
- Interchanges
- Extensive or expensive environmental or geotechnical requirements
- Materials that are difficult to acquire or that require special efforts
- Inferior materials sources
- New/Reconstruction projects
- Major traffic control requirements or multiple construction stages

310.02(3) VE Analysis Timing

310.02(3)(a) When to Conduct the VE Analysis

Timing is very important to the success of the VE analysis. A VE analysis should be conducted as early as practicable in the planning or development of a project, preferably before the completion of preliminary design. At a minimum, the VE analysis is to be conducted prior to completing the final design.

The VE analysis should be closely coordinated with other project development activities to minimize the impact approved recommendations might have on: previous agency, community, or environmental commitments; the project's scope; and the use of innovative technologies, materials, methods, plans, or construction provisions. In addition, VE analyses should be coordinated with risk assessment workshops such as Cost Risk Assessment (CRA) or Cost Estimate Validation Process (CEVP) (see www.wsdot.wa.gov/design/saeo/).

Benefits can potentially be realized by performing a VE analysis at any time during project development; however, the WSDOT VE program identifies the following three windows of opportunity for performing a VE analysis.

1. Scoping Phase

Early in preliminary engineering, once the project need has been defined (the project summary has been completed) and the project scope and preliminary costs are available, is a good time for value analysis consideration. This is a good time to consider the alternatives or design solutions with a high potential for the VE team's recommendations to be implemented. At the conclusion of the VE study, the project scope, preliminary costs, and major design decisions can be informed by the recommendations.

When conducting value engineering during the scoping phase of a project, the VE analysis focuses on issues affecting project drivers. This stage often provides an opportunity for community engagement and building consent with stakeholders.

2. Start of Design

At the start of design, the project scope and preliminary costs have already been established and the major design decisions have been made. Some Plans, Specifications, and Estimates (PS&E) activities may have begun, and coordination has been initiated with the various support groups and subject matter experts that will be involved with the design. At this stage, the established project scope, preliminary costs, and schedule will define the limits of the VE analysis, and there is still opportunity to focus on the technical issues of the specific design elements.

3. Design Approval

After the project receives Design Approval, most of the important project decisions have been made and the opportunity to affect the project design is limited. Provided that the Design Approval is early enough to incorporate the adopted VE recommendations, the VE analysis should focus on constructability, construction sequencing, staging, traffic control, and any significant design issues identified during design development.

An additional VE analysis may be beneficial late in the development stage when the estimated cost of the project exceeds the project budget. The value engineering process can be applied to the project to lower the cost while maintaining the value and quality of the design.

310.02(4) VE Program Roles and Responsibilities

310.02(4)(a) Region VE Coordinator

- Identifies region projects for VE analyses (from Project Summaries and available planning documents).
- Makes recommendations for timing of the VE analysis for each project.
- Presents a list of the identified projects to region management to prioritize into a regional annual VE Plan.
- Identifies potential team facilitators and members for participation statewide.

310.02(4)(b) State VE Manager

- Reviews regional VE Plans regarding content and schedule.

310.02(4)(c) State VE Coordinator

- Incorporates the regional annual VE Plans and the Headquarters Plan to create the Statewide VE Plan.
- Prepares annual VE Report.
- Maintains policy documents for the department.
- Coordinates studies.
- Arranges training for future VE team leaders and members.

310.02(4)(d) VE Team Leader

The quality of the VE analysis largely depends on the skills of the VE team leader. This individual guides the team's efforts and is responsible for its actions during the analysis. The VE team leader should be knowledgeable and proficient in transportation design and construction and in the VE analysis process for transportation projects.

The VE team leader's responsibilities include the following:

- Plans, leads, and facilitates the VE study.
- Ensures proper application of a value methodology.
- Follows the Job Plan.
- Guides the team through the activities needed to complete the pre-study, the VE study, and the post-study stages of a VE study.
- Schedules a preworkshop meeting with the project team and prepares the agenda for the VE study.

Team leaders from within WSDOT are encouraged, but not required, to be certified by the Society of American Value Engineers (SAVE) as an Associate Value Specialist, Certified Value Specialist (CVS) or as a Value Methodology Practitioner (VMP). Team leadership can be supplied from within the region, from another region, or from Headquarters. A statewide pool of qualified team leaders is maintained by the State VE Coordinator, who works with the Region VE Coordinator to select the team leader.

When using consultant team leaders, SAVE certification is required.

310.02(4)(e) VE Team Members

The VE team is typically composed of five to ten people with diverse expertise relevant to the specific project under study. The team members may be selected from the regions; Headquarters; other local, state, or federal agencies; or the private sector.

Team members are not directly involved in the planning and development phases of the project. They are selected based on the identified expertise needed to address the major functional areas and critical high-cost issues of the study. All team members must be

committed to the time required for the study. It is desirable for team members to have attended Value Engineering Module 1 training before participating in a VE study.

310.03 VE Procedure

The WSDOT VE analysis uses the Seven-Phase Job Plan shown in [Exhibit 310-1](#). A detailed discussion of how each phase is supposed to be conducted can be found in the document, *Value Methodology Standard and Body of Knowledge*, developed by SAVE International, The Value Society. This document can be downloaded at the SAVE website: www.value-eng.org/

310.03(1) Pre-Study Preparation

To initiate a VE study, the project manager submits a Request for Value Engineering Study form to the Region VE Coordinator at least two months before the proposed study date. The form is located on the WSDOT value engineering website:

www.wsdot.wa.gov/design/valueengineering/tools/

The Region VE Coordinator then works with the State VE Coordinator to determine the team leader and team members for the VE study. Contacts are listed on the WSDOT value engineering website: www.wsdot.wa.gov/design/valueengineering

The design team prepares a study package of project information for each of the team members. (A list of potential items is shown in [Exhibit 310-2](#)). Work with the State VE Coordinator for the best/most concise list of materials to send to the team members. If the package is provided via a network drive or FTP site, make sure the materials are well titled and sorted in a well-titled file structure. The VE team members should receive this information or a link to this information at least one week prior to the study so they have time to review the material.

The region provides a facility and the equipment for the study (see [Exhibit 310-2](#)).

310.03(2) VE Analysis Requirements

The time required to conduct a VE analysis varies with the complexity and size of the project, but typically ranges from three to five days. The VE team leader working with the project manager will determine the best length of time for the study.

The VE analysis Final Report includes an executive summary; a narrative description of project information; the background, history, constraints, and controlling decisions; the VE team's focus areas; a discussion of the team's speculation and evaluation processes; and the team's final recommendations. All of the team's evaluation documentation, including sketches, calculations, analyses, and rationale for recommendations, is included in the Final Report. A copy of the Final Report is to be included in the Project File. The project manager will specify the number of copies to be provided to the project team. The State VE Manager also provides a copy of the report to the FHWA for projects on the National Highway System or federal-aid system.

Post-VE analysis activities include:

- The Project Manager and Project team are responsible for:
 - o Implementation and evaluation of the approved recommendations.
 - o Documentation of the reasons approved recommendations were not implemented.

310.03(3) Resolution Phase (Phase 7 of the VE Study)

As soon as possible, preferably no more than two weeks following the VE analysis, the project manager reviews and evaluates the VE team's recommendation(s). The project manager completes the VE Recommendation Approval form included in the Final Report and returns it to the Statewide VE Manager.

For each recommendation that is not approved or is modified by the project manager, the project manager provides justification in the form of a VE Decision Document. The VE Decision Document includes a specific response for each of the disapproved or modified recommendations. Responses include a summary statement containing the project manager's decision not to use the recommendations in the project.

The project manager sends the completed VE Recommendation Approval form and, if necessary, the VE Decision Document to the State VE Manager within three months following receipt of the Final Report or by September 1 of each year, whichever comes first, so the results can be included in WSDOT's annual VE Report to FHWA.

A VE Decision Document must be submitted and forwarded to the Director & State Design Engineer, Development Division, for review. The only time a VE Decision Document is not submitted is if all of the recommendations were adopted and implemented (in other words, no recommendations were rejected or modified).

Exhibit 310-1 Seven-Phase Job Plan for VE Studies

VE Study Phase	Job Plan
1. Information Phase	Gather project information, including project commitments and constraints. <ul style="list-style-type: none"> • <i>Investigate technical reports and field data</i> • <i>Develop team focus and objectives</i>
2. Function Analysis Phase	Analyze the project to understand the required functions. <ul style="list-style-type: none"> • <i>Define project functions using active verb/measurable noun context</i> • <i>Review and analyze these functions to determine which need improvement, elimination, or creation to meet project goals</i>
3. Creative Phase	Generate ideas on ways to accomplish the required functions that improve project performance, enhance quality, and lower project costs. <ul style="list-style-type: none"> • <i>Be creative</i> • <i>Brainstorm alternative proposals and solutions to lower project costs, improve project performance, and enhance quality</i>
4. Evaluation Phase	Evaluate and select feasible ideas for development. <ul style="list-style-type: none"> • <i>Analyze design alternatives, technical processes, and life cycle costs</i>
5. Development Phase	Develop the selected alternatives into fully supported recommendations. <ul style="list-style-type: none"> • <i>Develop technical and economic supporting data to prove the benefits and feasibility of the desirable concepts</i> • <i>Develop team recommendations (long-term as well as interim solutions)</i>
6. Presentation Phase	Present the VE recommendation to the project stakeholders. <ul style="list-style-type: none"> • <i>Present the VE recommendation to the project team and region management in an oral presentation</i> • <i>Provide a written report</i>
7. Resolution Phase	<u>The Project Manager evaluates, resolves, and implements all approved recommendations. The decision to implement or not implement recommendations is documented in the signed VE Recommendation Approval form.</u>
<p>Note: Phases 1–6 are performed during the study; see <i>Value Standard and Body of Knowledge</i> for procedures during these steps.</p>	

Exhibit 310-2 VE Analysis Team Tools

Project-Related Input* and Design Resources (Study Package)
<u>Project Management Plan</u>
Vicinity map
Aerial photos
Large-scale aerial photographs
Pertinent maps - Land use, contours, quadrant, etc.
Crash data with collision analysis
Existing as-built plans
Design file
Cross sections and profiles
Environmental documents Environmental constraints, and commitments
Estimates <u>(and associated Basis Of Estimate)</u>
Geotechnical reports
Hydraulic Report
Plan sheets
Quantities
Right of way plans
<i>Bridge List</i> /Bridge condition report
<i>Design Manual</i>
<i>Field Formulas</i> and <i>Field Tables</i>
<i>Standard Plans</i>
<i>Standard Specifications</i>
<i>State Highway Log</i>
Other manuals as needed

Study-Related Facilities and Equipment
AASHTO <i>Green Book</i>
Calculators
Computer <u>(with network if available)</u> / projector
Easel(s) and easel paper pads
Marking pens
Masking and clear tape
Power strip(s) and extension cords
Room with a large table and adequate space for the team
Scales, straight edges, and curves
Telephone
Vehicle or vehicles with adequate seating to transport the VE team for a site visit**

*Not all information listed may be available to the team, depending on the project stage. Work with your Region VE Coordinator or the State VE Coordinator to verify that all needed information is available.

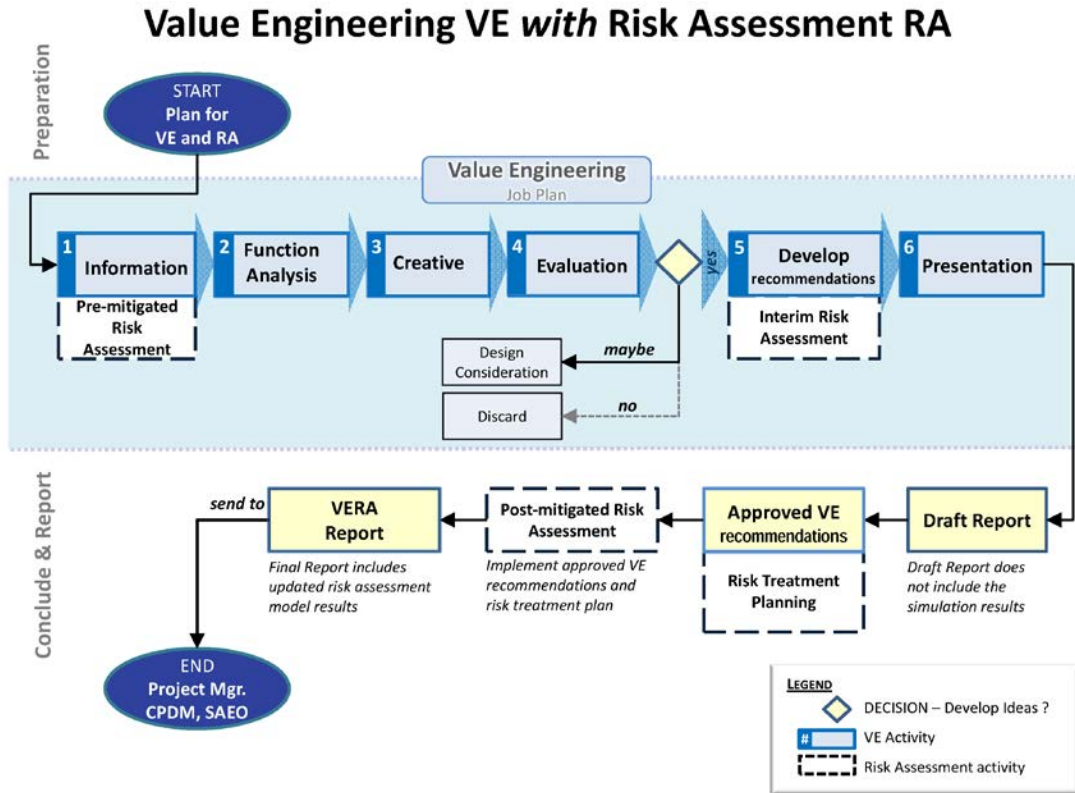
**If a site visit is not possible, perform a “virtual” tour of the project.

310.04 Value Engineering Combined with Risk Assessment (VERA)

Project managers are encouraged to explore the possibility of combining their Value Engineering Study with a Cost Risk Assessment. This offers the possibility of efficiently and effectively accomplishing both processes in a timely manner. Exhibit 310-3 depicts the process for combining VE and risk assessment. An interactive version of this exhibit is available here:

www.wsdot.wa.gov/publications/fulltext/CEVP/VERA.pdf

Exhibit 310-3 VERA Process



310.05 Project Management Accountability

WSDOT is required to make a determination about every VE recommendation generated. To that end, project managers, in consultation with their project teams, support staff, other management support, and subject matter experts, make a determination within two months regarding the action that will be taken about each recommendation.

Project management organization for value engineering (as well as cost risk assessment) is found in the Master Deliverables List (MDL) (see Exhibits 310-4 and 310-5).

Exhibit 310-4 Master Deliverables List of Value Engineering Project Elements

MDL Code	MDL Name	Description
PE.PD.10	Value Engineering	A systematic process designed to focus on the major issues of a complex project or process.
PE.PD.10.01	VE Study	A systematic process designed to focus on the major issues of a complex project or process. It uses a multidisciplinary team to develop recommendations for value improvement. (See Design Manual Chapter 310 for details.) All projects (such as construction, right of way, preliminary engineering, utilities) with a total estimated cost over \$25 million and any bridge project over \$20 million will need to have a VE study.
PE.PD.10.02	VE Final Report	The VE study Final Report and Workbook should include a narrative description of project; background and history; constraints and drivers, identified needs; VE team focus areas; and a discussion of the team speculation, evaluation, and recommendations. All other evaluation documentation, including sketches, calculations, analysis, and rationale for recommendations, must be included in the Workbook as part of the Final Report.
PE.PD.10.03	VE Recommendations Response	The project team's responses to the VE team recommendations should be provided to the Regional Managers for use in developing the VE Decision Document. The VE Recommendations Response is documented on the Value Engineering Recommendation Approval Form. The project team completes it and send it to HQ VE Coordinator after they have evaluated and quantified the actual savings or cost added.

Exhibit 310-5 Master Deliverables List of Cost Risk Assessment Project Elements

MDL Code	MDL Name	Description
PE.PD.04	Cost Risk Estimate & Management	Cost Risk Estimate and Management (CREM) is an integral phase of project risk management. The CREM starts with a risk assessment that is documented on a Cost Risk Analysis Report that may be delivered via: Cost Estimating and Validation Process (CEVP®), Cost Risk Analysis (CRA), or Combined Value Engineering and Risk Analysis (VERA). For more information, see the Cost Risk Estimate & Management website at: www.wsdot.wa.gov/projects/projectmgmt/riskassessment/
PE.PD.04.01	CEVP®	A Cost Estimate Validation Process (CEVP®) is required for any project with an estimated cost of \$100 million or more. Refer to the Cost Risk Estimate & Management website above.
PE.PD.04.02	CRA Workshop	A Cost Risk Assessment (CRA) is required for all projects with an estimated cost of \$25 million or more. Refer to the Cost Risk Estimate & Management website above.
PE.PD.04.03	Informal Cost Risk Analysis	An informal Cost Risk Analysis is required for all projects of \$10 million to \$25 million. Refer to the Cost Risk Estimate & Management website above.
PE.PD.04.04	Qualitative Risk Assessment	A qualitative risk assessment is required for all projects. Refer to the Cost Risk Estimate & Management website above.
PE.PD.04.05	Combined Value Engineering and Risk Analysis and (VERA)	When it is appropriate the efforts of cost risk analysis and values engineering may be combined. Refer to the Cost Risk Estimate & Management website above.
PE.PD.04.06	Risk Management Plan	A document prepared by Regional Managers that includes specific responses for each of the risk identified. Refer to the Cost Risk Estimate & Management website above.

310.06 Documentation

Refer to [Chapter 300](#) for design documentation requirements.

The following value engineering documentation is required:

- **Project File** – Value Engineering Final Report
- **Design Approval** – Design Documentation Package for Approval – the Value Engineering Recommendation Approval Form
- **Project File** – Value Engineering Recommendation Approval Form

310.07 References

310.07(1) Federal Laws and Codes

[Title 23 U.S.C. Section 106\(e\)](#) – Value Engineering Analysis

[Title 23 CFR Part 627](#) – Value Engineering

MAP-21 (Moving Ahead for Progress in the 21st Century), Section 1503

Circular A-131, Office of Management and Budget (OMB)

http://www.whitehouse.gov/omb/circulars_a131

FHWA Value Engineering Policy

<http://www.fhwa.dot.gov/legsregs/directives/orders/13111b.cfm>

310.07(2) Design Guidance

Value Engineering for Highways, Study Workbook, U.S. Department of Transportation, FHWA
Value Standard and Body of Knowledge, SAVE International, The Value Society:

www.value-eng.org/

WSDOT Value Engineering website:

www.wsdot.wa.gov/design/valueengineering/

Mitigation measures may take the following forms:

- Channelization such as turn lanes or raised islands
- Installation of a roundabout or, if necessary, a traffic signal (signal warrant analysis per [MUTCD](#) is required)
- Frontage improvements
- Donation of right of way
- Addressing any design or operational deficiencies created by the proposal
- Possible restrictions of turning movements
- Sight distance enhancements
- Traffic mitigation payment (pro rata share contribution) to a programmed WSDOT project (see Chapter 4 of the [Development Services Manual](#))
- Satisfaction of local agency guidelines and interlocal agreements

320.10 TIA Report

320.10(1) TIA Minimum Contents

The minimum contents of a TIA report are listed in the [Traffic Analysis Procedures Manual](#) and [Development Services Manual](#). Listed below is a summary; however, the depth and detail of content under each element varies in relation to the scale and complexity of the project.

(a) Executive Summary

(b) Table of Contents

1. List of Exhibits (Maps)
2. List of Tables

(c) Introduction

1. Description of the proposed project with purpose and need.
2. Traffic Impact Analysis Methods and Assumptions summary.
3. Map of project location.
4. Site plan, including all access to state highways (site plan, map).
5. Circulation network, including all access to state highways (vicinity map).
6. Land use and zoning.
7. Phasing plan, including proposed dates of project (phase) completion.
8. Project sponsor and contact person(s).
9. References to other traffic impact studies.
10. Other mitigation measures considered.

(d) Traffic Analysis

1. TIA M&A (see the [Traffic Analysis Procedures Manual](#) for a template or the [Development Services Manual](#)).
2. Existing and projected conditions of the site: posted speed; traffic counts (to include turning movements); sight distance; channelization; design analyses; pedestrian and bicycle facilities; design vehicle; and traffic controls, including signal phasing and multi-signal progression where appropriate (exhibit(s)).
3. DHV and ADT; project trip generation and distribution map, including references and a detailed description of the process involved in forecasting the projected trips, including tables.
4. Project-related transportation mode split, with a detailed description of the process involved in determining transportation mode split.
5. Project-generated trip distribution and assignment with a detailed description of the process involved in distributing and assigning the generated traffic, including exhibit(s).
6. If intersection control additions are employed and traffic signals are assumed, include functionality and warrant analyses. With roundabouts or signals, include existing conditions, cumulative conditions, and full-build of plan conditions with and without project.
7. Safety performance analysis (see [Chapter 321](#) and the [Traffic Analysis Procedures Manual](#)).

(e) Conclusions and Recommendations

1. Quantified or qualified LOS, QOS, and other appropriate MOEs of impacted facilities with and without mitigation measures.
2. Predicted safety performance with and without mitigation measures.
3. Mitigation phasing plan with dates of proposed mitigation measures.
4. Defined responsibilities for implementing mitigation measures.
5. Cost estimates for mitigation measures and financing plan.

(f) Appendices

1. Description of traffic data and how data was collected and manipulated.
2. Description of methodologies and assumptions used in analyses.
3. Worksheets used in analyses; for example, signal warrants, LOS, QOS, and traffic count information.
4. If microsimulation is used, provide a copy of the Confidence and Calibration Report.

- 321.01 General
- 321.02 General Sustainable Safety Process
- 321.03 Sustainable Safety for I-2 Projects
- 321.04 Sustainable Safety for P3 – Major Signal and Illumination Projects
- 321.05 Sustainable Safety for I-1 and I-3 Projects
- 321.06 Stand-Alone Sustainable Safety Applications
- 321.07 Safety Analysis Resources and Tools
- 321.08 Reports and Documentation
- 321.09 References

321.01 General

The Washington State Strategic Highway Safety Plan, “Target Zero” has a vision to reduce traffic fatalities and serious injuries to zero by 2030. WSDOT is pursuing this goal along with partners such as Washington State Patrol (WSP) and Washington Traffic Safety Commission (WTSC). WSDOT recognizes that risk exists in all modes of transportation. The universal objective is to reduce the number and severity of crashes within the limits of available resources, science, technology, and legislatively mandated priorities.

The [Secretary’s Executive Order E1085, Sustainable Highway Safety Program](#), sets the policy for the Washington State Department of Transportation (WSDOT) to embark on a targeted and scientifically-based Engineering approach for identifying and addressing crash risks that is multimodal and coordinated with the other three “E”s, Education, Enforcement, and Emergency Services. Sustainable Safety employs a “5th E”, Evaluation, the analysis and diagnosis of crashes and to target their contributing factors in addressing highway safety performance. Evaluation relies on quantifying safety performance using scientific tools and assessment techniques to determine appropriate safety countermeasures.

Sustainable Safety is the approach to transportation safety at WSDOT through the use of “...tools and procedures based on accepted science, data, and proven practice” in accordance with [Secretary’s Executive Order E 1096, Agency Emphasis and Expectations](#), to target safety needs, and “deliver the right solutions at the right time and at the right location.”

Practical Solutions is an approach to making project decisions that focus on resolving the project need for the least cost without adversely impacting safety performance. Sustainable Safety is the approach for resolving safety performance within WSDOT’s Practical Solutions as directed in both E 1096 and [Secretary’s Executive Order E 1090, Moving Washington Forward: Practical Solutions](#).

[E 1085](#) directs engineers to base project-level decisions on safety analysis of specific locations and corridors and focus on proven lower-cost targeted countermeasures at specific locations that optimize the return on investment of safety dollars. These lower-cost investments allow for additional identified locations to be addressed. Sustainable Safety is therefore an essential part of successful Practical Design implementation. It provides the process and methods to incorporate safety performance assessment and peer-review into Performance-Based Practical Design. Sustainable Safety allows the planner, engineer, and decision maker, to identify and quantify the safety performance of alternatives during project development.

Implementing Sustainable Safety improves WSDOT's effectiveness in reducing the risk of fatal and serious injury crashes statewide. It focuses on the contributing factors and types of crashes through the use of state-of-the-art principles and analytical methods to diagnose, quantify, and predict safety performance. The Sustainable Highway Safety Policy directs WSDOT to use effective and efficient resources, like the *AASHTO Highway Safety Manual (HSM)* to achieve the goals of the Washington State Strategic Highway Safety Plan: Target Zero. This approach:

1. Optimizes the reduction in the risk of fatal and serious injury crashes on Washington's highways.
2. Provides reliable and accurate assessment of crash risk.
3. Identifies locations of risk that have a higher potential for crash reduction.
4. Provides reliable and accurate assessment of potential crash reduction benefits.
5. Identifies and deploys solutions with optimal benefit/cost within the WSDOT priority array or through low cost operational improvements.
6. Reduces waste by removing design elements that provide marginal or no reduction in crash risk.
7. Addresses the higher crash risk reduction locations for a given investment level.
8. Provides an accurate assessment of project and program performance.
9. Provides scientific and engineering tools to continually improve and refine safety analyses.

Sustainable Safety is a critical, integral part of Practical Solutions that supports Washington in reaching its Target Zero goal.

321.02 General Sustainable Safety Process

The sustainable safety analysis process is intended to be scalable. The HQ Safety Technical Group is responsible for assisting project teams with setting the scale and scope of analysis on planning studies and projects with oversight by the Director of Quality Assurance and Transportation System Safety. The programs of predetermined interest when determining scope and scale of crash risk analysis are:

- Planning Studies
- I-2 (Safety subprogram)
- P-3 (Major Signal and Illuminations portion of subprogram only)
- I-1 (Mobility subprogram)
- I-3 (Economic initiatives subprogram)

While these sub-programs are known to have specific interest regarding a determination for understanding the scale and scope of analysis, all projects outside the P-1 program will consult with the HQ Safety Technical Group to determine the scope and scale of analysis. P-1 subprogram projects will use [Chapter 1120](#) for determining potential safety components to be included or excluded within a project, and do not require crash risk analysis or consultation with the HQ Safety Technical Group. The remaining sections of this chapter will cover projects within specific subprograms of interest listed above.

321.03 Sustainable Safety for I-2 Projects

The Multimodal Safety Executive Committee (MSEC) formally adopted the *AASHTO Highway Safety Manual* (HSM) for statewide implementation in 2011. The HSM and associated tools provide a science-based technical approach to identify sites with the most potential for reducing crash severity or frequency, and potential countermeasures for addressing factors contributing to those crashes. For a brief introduction of the Highway Safety Manual, see:

🔗 <https://bookstore.transportation.org/>

As part of the endorsement of the HSM, WSDOT uses AASTHOWare Safety Analyst (SA) as the tool for screening and initial ranking of sites within the state system and the development of the WSDOT priority array. SA is used to analyze the entire roadway network and identify sites with potential for safety improvements. Sites with the highest potential for reducing the number and/or severity of fatal and serious injury crashes are prioritized for further analysis. The formal process for evaluating and scoping safety projects is illustrated in the [Safety Scoping Process flowchart](#). The Sustainable Safety approach relies on peer review of projects presented to region and Headquarters (HQ) experts to critically review and offer potential options to project scope and approaches.

321.03(1) I-2 Program Safety Management Process

The safety management process is a methodology used to reduce crashes on existing roadway networks statewide. These steps are a set of tools available for use in conjunction with sound engineering judgment. The groups typically responsible are mentioned below; however, depending on how a region is organized, the responsible groups may vary. The seven steps are:

1. **Network Screening** is initiated by HQ Capital Program Development & Management (CPDM), approved by MSEC. In this step, the whole or a subset of the transportation network is screened to identify and rank sites from most likely to least likely to realize reductions in crash frequency and/or severity by implementing countermeasures.
2. **Diagnosis** is usually done through preparation of a Crash Analysis Report (see [321.08\(1\)](#)) by the region Program Management or Traffic Office. This step provides an understanding of the site's safety performance using observed crash history and physical characteristics to determine contributing factors, and uses HSM methodologies to determine whether the site has higher-than-normal safety opportunities compared to similar types of facilities.
3. **Selecting Countermeasures** is usually done by the region Program Management or Traffic Office with region Design Office input. In this step, sites with higher-than-expected crash experience are further evaluated to identify factors that may be contributing to observed crashes. Countermeasures are then selected to address the factors. Tools available for use in selecting recommended countermeasures include the HSM, SafetyAnalyst, Road Safety Assessments (RSAs), HSM prediction models, and the Crash Modification Factor Clearinghouse. New and other tools will be assessed for use as they become available. WSDOT's "Short List" of approved crash modification factors (CMFs) for countermeasures can be found here:
🔗 <http://wwwi.wsdot.wa.gov/riskmanagement/shs/safetycountermeasures.htm>
4. **Economic Appraisals** are usually done by the region Program Management Office in coordination with the region Design and Traffic Offices. In this step, an economic appraisal is performed to compare the benefits of potential crash countermeasures (calculated using crash modification factors) to countermeasure costs and the effect on overall project costs.

5. **Prioritize Projects** is usually done in coordination with the region Program Management office, region Traffic Office and CPDM. In this step, potential safety projects are reviewed and prioritized based on their benefit/cost analysis and other programming considerations.
6. **Design decision documentation** is responsibility of the region office preparing the design. This step involves using safety analyses to make design decisions and documenting those decisions. Specific uses include:
 - Safety analysis based project design decisions
 - Comparing design alternatives based on safety performance
 - Comparing options of a design decision based on safety performance
 - Analyzing work zone design options based on safety performance
7. **Safety Effectiveness Evaluation** is a post-project step, usually performed by HQ CPDM, HQ Design Office, HQ Traffic Office or the region. It analyzes countermeasures used in past projects for their effectiveness in reducing the number and/or severity of crashes in order to determine if predicted crash reductions were realized. Safety effectiveness evaluations play an important role in assessing how well funds have been invested in safety improvements. These evaluations are used in future decision-making activities related to allocation of funds and revisions to highway agency policies.

321.04 Sustainable Safety for P3 – Major Signal and Illumination Projects

On P-3 – Major Signal and Illumination projects, the analysis shall include development of a Crash Analysis Report and the report shall include the evaluation of a roundabout as an alternative. However, a formal Intersection Control Type Analysis (ICA) described in [Chapter 1300](#) is not required.

321.05 Sustainable Safety for I-1 and I-3 Projects

I-1 and I-3 projects are typically larger in size and more complex. Consult with the HQ Safety Technical Group for assistance in determining the appropriate scale and scope of analysis prior to initiating sustainable safety analysis for the project.

The “number of fatal and serious crashes” is a required baseline metric on all I-1 and I-3 program projects if there is a record of these crashes in the analysis period. The initial target for this metric is a 100% reduction in fatal and serious crashes. However, it’s recognized that not all fatal and serious injury crashes can be eliminated by engineering means. Provide documentation on the Basis of Design form for any refinements made to this target based on the results of a crash analysis.

321.06 Stand-Alone Sustainable Safety Applications

The HSM and associated analysis tools have been developed to aid decision making and documentation in the project development process. It helps quantify safety performance implications of decisions in project development and provides a basis for predicting and documenting the potential safety performance of those decisions. Safety analysis tools may be appropriate for the following activities:

- Design Decisions
 - o To analyze and document the safety performance of design alternatives and design element dimensioning decisions, including cross-section design element dimensioning and other countermeasures treatment options.
- Interchange Justification Reports (IJRs) and IJR Feasibility Studies (See [Chapter 550](#))
 - o Identify and document the existing safety performance of the freeway section and the adjacent affected local surface system.
 - o Predict the safety performance from traffic flow and geometric conditions imposed by the access point revision alternatives.
 - o The scope of a crash analysis in an IJR is decided by the IJR support team and the approving authority(ies), the Assistant State Design Engineer for the region, and the Federal Highway Administration (FHWA) Safety/Design Engineer.

321.07 Safety Analysis Resources and Tools

Various tools are available to support a safety analysis. All of the safety performance tools mentioned below can be found through the Sustainable Highway Safety website:

<http://wwwi.wsdot.wa.gov/riskmanagement/shs/>

- **SafetyAnalyst:** This application is used by and CPDM for network screening. It is also used during scoping and design for gathering crash data for analysis. SafetyAnalyst has crash data broken down into highway segments and intersections that can be displayed in tables, graphs, and charts. The crash data in SafetyAnalyst is updated once per year when the roadway, traffic, and crash databases are complete
- **The Collision Data Mart:** This database application is another way to obtain crash data. Access to this application is granted by your supervisor and the Transportation Data & GIS Office. The data is updated as it comes in.
- **Crash Analysis Report:** This template is the basis for all crash analyses for all types of design documentation that need crash analyses (see [321.08\(1\)](#)).
- **Interchange Safety Analysis Tool enhanced (ISATe):** This tool analyzes the safety performance of freeway segments, speed change lanes, interchange ramps, ramp terminal intersections, and collector-distributor (CD) lanes.
- **Highway Safety Manual Spreadsheets:** There are different spreadsheet options for Highway Safety Manual safety performance predictions. Each of these spreadsheet tools can predict the safety performance of highway segments and intersections for three types of highways: Rural Two-lane Two-way, Rural Multilane, and Urban-Suburban Arterial.

Following are the spreadsheet options, with their benefits and limitations:

1. **AASHTO Highway Spreadsheets:** These spreadsheets are the simplest of the three, but they can only handle a maximum of two segments and two intersections of the same type of highway at a time.
2. **Extended Highway Spreadsheets:** These spreadsheets are a little more complicated, but they can handle an unlimited number of highway segments and intersections of the same highway type. In other words, you can analyze an unlimited number of highway segments and intersections as long as you don't change highway types.
3. **Crash Analysis Tool (CAT):** This is an application with an accessible spreadsheet behind it. It can handle an unlimited number of segments and intersections for any of the highway

types. In other words, you can analyze an unlimited number of highway segments and intersections and can mix and match highway types. This tool also calculates Benefit Cost ratio of alternatives.

4. **WSDOT Crash Modification Factor (CMF) Short List:** This is a spreadsheet displaying the latest pre-approved CMFs that can be readily used if the context of the listed CMF matches the context of the alternative being analyzed. To back up the CMFs on this spreadsheet, there are detailed investigation reports for each CMF type.
5. **Crash Modification Factor Clearinghouse:** For needed CMFs not yet on the short list, this online AASHTO database holds all of the advertised CMFs. Consult this database when no suitable CMF can be found on the short list:
<http://wwwi.wsdot.wa.gov/riskmanagement/shs/safetycountermeasures.htm>

321.08 Reports and Documentation

The Crash Analysis Report (CAR) and Basis of Design (BOD) are used to document outcomes for sustainable safety analysis. Both are described in the following subsections. For any additional approval requirements, refer to [Chapter 300](#).

321.08(1) Crash Analysis Report (CAR)

The primary tool used to document the results of a safety analysis is the Crash Analysis Report. A report template with instructions is available here:

<http://wwwi.wsdot.wa.gov/riskmanagement/shs/safetytools.htm>

Conduct a crash data analysis to determine the contributing factors to fatal and serious injury crashes reported for the intersection, segment or corridor. Identify the most prevalent or target crash type(s) at the intersection, segment or corridor. Use the contributing factors and target crash type(s) to identify countermeasures that target these types and factors. Countermeasures can include low cost, short range and operational improvement options. Complete a benefit/cost analysis to support evaluation of different alternatives.

321.08(2) Basis of Design

The Basis of Design (BOD) and the Alternative Comparison Table (ACT) are used to reference the outcome of crash risk analysis completed for the no-build and other alternatives considered. Depending on the type of project and the scale and scope of analysis agreed upon, a CAR may exist and forms part of the project design documentation package (See [Chapter 300](#)).

321.09 References

321.09(1) Federal/State Directives, Laws, and Codes

[23 United States Code \(USC\) 148](#) – Federal requirements for the Highway Safety Improvement Program (HSIP)

[Revised Code of Washington \(RCW\) 47.05.010](#) – The statement of purpose for priority programming of transportation projects

[Secretary's Executive Order 1085](#) – Sustainable Highway Safety Program

[Secretary's Executive Order 1090](#) – Moving Washington Forward: Practical Solutions

[Secretary's Executive Order 1096](#) – WSDOT 2015-17: Agency Emphasis and Expectations

321.09(2) Design Guidance

Highway Safety Manual (HSM), AASHTO, 2010

A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, 2011

321.09(3) Supporting Information

Safety Scoping Process for State Routes flowchart Internal Web Page:

☞ <http://wwwi.wsdot.wa.gov/ppsc/pgmmgt/wwwi/planprog/scoping/safetyscopingprocessflowchart.pdf>

Strategic Highway Safety Plan: Target Zero – Washington State's strategic traffic safety plan developed by the Washington Traffic Safety Commission: ☞ <http://www.targetzero.com/>

Sustainable Highway Safety Internal Web Page – Contains all of the procedures and tools to implement highway safety: ☞ <http://wwwi.wsdot.wa.gov/riskmanagement/shs/>

Washington Transportation Plan – Washington State Transportation Commission's recommended strategic transportation plan; includes a highway safety element:

☞ http://www.wstc.wa.gov/wtp/documents/wtp2030_201012.pdf

Access Control Tracking System Limited Access and Managed Access Master Plan A database list, related to highway route numbers and mileposts, that identifies either the level of limited access or the class of managed access: www.wsdot.wa.gov/design/accessandhearings

access connection See *approach and access connection*.

access connection permit A written authorization issued by the permitting authority for a specifically designed access connection to a managed access highway at a specific location; for a specific type and intensity of property use; and for a specific volume of traffic for the access connection based on the final stage of the development of the applicant's property. The actual form used for this authorization is determined by the permitting authority.

access design analysis A design analysis (see [Chapter 300](#)) that authorizes deferring or staging acquisition of limited access control, falling short of a 300-foot requirement, or allowing an existing access point to stay within 130 feet of an intersection on a limited access highway. Approval by the Director & State Design Engineer, Development Division, is required (see [Chapter 530](#)).

access hearing plan A limited access plan prepared for presentation at an access hearing.

access point Any point that allows private or public entrance to or exit from the traveled way of a state highway, including "locked gate" access and maintenance access points.

access point spacing On a managed access highway, the distance between two adjacent access points on one side of the highway, measured along the edge of the traveled way from one access point to the next (see also *corner clearance*).

access report plan A limited access plan prepared for presentation to local governmental officials at preliminary meetings before preparation of the access hearing plan.

access rights Property rights that allow an abutting property owner to enter and leave the public roadway system.

allowed Authorized.

application for an access connection An application provided by the permitting authority to be completed by the applicant for access to a managed access highway.

approach and access connection These terms are listed under the specific access section to which they apply. The first section below is for limited access highways and uses the term *approach*. The second section below is for managed access highways and uses the term *access connection*. Approaches and access connections include any ability to leave or enter a highway right of way other than at an intersection with another road or street.

(a) **limited access highways: approach** An access point, other than a public road/street, that allows access to or from a limited access highway on the state highway system. There are five types of approaches to limited access highways that are allowed:

- **Type A** An off and on approach in a legal manner, not to exceed 30 feet in width, for the sole purpose of serving a single-family residence. It may be reserved by the abutting owner for specified use at a point satisfactory to the state at or between designated highway stations. This approach type is allowed on partial and modified control limited access highways.

- **Type B** An off and on approach in a legal manner, not to exceed 50 feet in width, for use necessary to the normal operation of a farm, but not for retail marketing. It may be reserved by the abutting owner for specified use at a point satisfactory to the state at or between designated highway stations. This approach type is allowed on partial and modified control limited access highways. This approach type may be used for wind farms when use of the approach is limited to those vehicles necessary to construct and maintain the farm for use in harvesting wind energy.
 - **Type C** An off and on approach in a legal manner, for a special purpose and width to be agreed upon. It may be specified at a point satisfactory to the state at or between designated highway stations. This approach type is allowed on partial and modified control limited access highways and on full control limited access highways where no other reasonable means of access exists, as solely determined by the department.
 - **Type D** An off and on approach in a legal manner, not to exceed 50 feet in width, for use necessary to the normal operation of a commercial establishment. It may be specified at a point satisfactory to the state at or between designated highway stations. This approach type is allowed only on modified control limited access highways.
 - **Type E** This type is no longer allowed to be constructed because of the requirements that there be only one access point per parcel on a limited access state highway.
 - **Type F** An off and on approach in a legal manner, not to exceed 30 feet in width, for the sole purpose of serving a wireless communication site. It may be specified at a point satisfactory to the state at or between designated highway stations. This approach type is allowed only on partial control limited access highways. (See [WAC 468-58-080\(vi\)](#) for further restrictions.)
- (b) **managed access highways: access connection** An access point, other than a public road/street, that permits access to or from a managed access highway on the state highway system. There are five types of access connection permits:
- **conforming access connection** A connection to a managed access highway that meets current WAC and WSDOT location, spacing, and design criteria.
 - **grandfathered access connection** Any connection to the state highway system that was in existence and in active use on July 1, 1990, and has not had a significant change in use.
 - **joint-use access connection** A single connection to a managed access highway that serves two or more properties.
 - **nonconforming access connection** A connection to a managed access highway that does not meet current WSDOT location, spacing, or design criteria, pending availability of a future conforming access connection.
 - **variance access connection** A connection to a managed access highway at a location not normally allowed by current WSDOT criteria.

530.01	General	530.08	Turnbacks
530.02	Achieving Limited Access	530.09	Adjacent Railroads
530.03	Full Control (Most Restrictive)	530.10	Changes to <u>Existing Limited Access Rights of Way (including Access, Occupancy, and Use)</u>
530.04	Partial Control		
530.05	Modified Control (Least Restrictive)		
530.06	Access Approaches	530.11	Documentation
530.07	Frontage Roads		

530.01 General

Limited access control is established to preserve the safety and efficiency of specific highways and to preserve the public investment. Limited access control is achieved by acquiring access rights from abutting property owners and by selectively limiting approaches to a highway. (For an overview of access control and the references list and definitions of terminology for this chapter, see [Chapter 520](#), Access Control.)

Requirements for the establishment of limited access highways are set forth in [the Revised Code of Washington \(RCW\) 47.52](#). The type of access control applied to a location is considered a design control (see [Chapter 1103](#)), and is determined during planning, scoping, or the early stages of design in conformance with this chapter.

Highways controlled by acquiring abutting property owners' access rights are termed limited access highways and are further distinguished as having full, partial, or modified control. The number of access points per mile, the spacing of interchanges or intersections, and the location of frontage roads or local road/street approaches are determined by the:

- Functional classification and importance of the highway
- Character of the traffic
- Current and future land use
- Environment and aesthetics
- Highway design and operation
- Economic considerations involved

The Federal Highway Administration (FHWA) has jurisdiction on the Interstate System. The Washington State Department of Transportation (WSDOT) has full jurisdiction on all other limited access highways, whether they are inside or outside incorporated city limits.

WSDOT maintains a record of the status of limited access control, by state route number and milepost, in the Access Control Tracking System Limited Access and Managed Access Master Plan database (Access Master Plan).

Nothing in this chapter is to be construed in any way that would prevent acquisition of short sections of full, partial, or modified control of access.

530.02 Achieving Limited Access

530.02(1) Evaluation

The benefits of maintaining or acquiring full, partial, or modified control is to be evaluated during project development if the route is shown in the Access Control Tracking System Limited Access and Managed Access Master Plan database as either “established” or “planned” for limited access. It is generally known that full limited access control applies to interstates and freeways. However, state highways that do not fall under full access control may have more flexibility in the type of control applied (whether limited or managed control). These highways can benefit by having access control evaluations conducted early in project development.

The cost of acquiring limited access is evaluated to determine whether those costs will be included in the project. The evaluation includes the societal costs of crashes, current and future land use development, and the improved level of service of limited access highways. Use the Basis of Design documentation tool to summarize key results of the evaluation process. (See chapters in the 1100 series for more information on using the Basis of Design tool.)

530.02(2) Process

All Washington State highways are managed access highways (see [Chapter 540](#)), except where limited access rights have been acquired. The right of way and limited access plans for routes show the acquired limited access boundaries. This is further represented in the Access Control Tracking System, a database that identifies the status and type of access control for all state highways. The database lists the specific types of limited access control (full, partial, or modified) and identifies whether the control is planned, established, or acquired for a specific route segment. If limited access has not been acquired, the database reports the type of managed access classification that currently applies.

The existing access classification is periodically updated to reflect changes on a corridor segment. The planned limited access reflects the vision for access on a corridor by resolution from the Washington Transportation Commission in the 1960s and 1970s. Conditions may have changed since the plan for limited access was envisioned. It is important to re-evaluate this plan and determine the access design control most appropriate for the agreed context. (See [Chapters 1102](#) and [1103](#) for context and design control guidance, respectively.) For help determining the status of limited access control for any state highway, consult the Headquarters (HQ) Access and Hearings Section.

The Access Master Plan database is available at:

www.wsdot.wa.gov/design/accessandhearings

530.02(2)(a) Procedure for Limited Access Control

Use the following procedure to achieve limited access control:

1. The Secretary of Transportation (or a designee) first identifies a highway as “Planned for Limited Access.”
2. To establish or revise limited access on a new or existing highway, a limited access hearing is held. (See [Chapter 210](#), Public Involvement and Hearings, regarding hearings, and [Chapter 510](#), Right of Way, for the phases of appraisal and acquisition.)

- a. **Phase 1**

The region develops a limited access report and a limited access report plan for department approval and presentation to local officials. The plan notes the level of limited access proposed to be established.
 - b. **Phase 2**

The region develops a limited access hearing plan for Director & State Design Engineer, Development Division (or designee), approval and for presentation at the hearing.
 - c. **Phase 3**

After the hearing, the region develops the findings and order and revises the limited access hearing plan to become the findings and order plan (see [Chapter 210](#)). The findings and order is processed and sent to the HQ Access and Hearings Section for review and approval. The Assistant Secretary, Engineering & Regional Operations, adopts the findings and order and thus establishes the limits and level of limited access control to be acquired.
 - d. **Phase 4**

The findings and order plan is now revised by the HQ Right of Way Plans Section for approval by the Director & State Design Engineer, Development Division (or designee), as a Phase 4 final right of way and limited access plan.
3. Real Estate Services acquires limited access rights from individual property owners based on final design decisions and updates the right of way and limited access plans and the property deed.
 4. These highways or portions thereof are now limited access highways and no longer fall under the managed access program.

530.02(3) Access Report ([RCW 47.52.131](#))

The Access Report is developed by the region to legally inform local governmental officials of the proposed limited access highway and the principal access features involved, and to secure their approval. This report is not furnished to abutting property owners. Submit the report to the HQ Access and Hearings Section for review and approval prior to submission to local authorities. Including local agencies as stakeholders from the onset of the project helps establish project expectations and positive working relationships, making reviews and approvals run as smoothly as possible.

530.02(3)(a) Access Report Content

The Access Report consists of the following:

1. A description of the existing and proposed highways, including data on the history of the existing highway, which may include references to crashes and locations identified in WSDOT's Priority Array.
2. Traffic analyses pertaining to the proposed highway, including available information about current and potential future traffic volumes on county roads and city streets crossing or severed by the proposed highway and reference sources such as origin-destination surveys.

Traffic data developed for the Design Decision Summary, together with counts of existing traffic available from state or local records, is normally adequate. Special counts of existing traffic are obtained only if circumstances indicate that the available data is inadequate or outdated.

3. A discussion of factors affecting the design of the subject highway, including:
 - Functional classification
 - www.wsdot.wa.gov/mapsdata/travel/hpms/functionalclass.htm
 - Level and limits of limited access control.
 - Roadway section.
 - Interchange, grade separation, and intersection spacing.
 - Pedestrian and bicycle trails or paths.
 - Operational controls with emphasis on proposed fencing, the general concept of illumination, signing, and other traffic control devices.
 - Location of utilities and how they are affected.
 - Proposed plan for landscaping and beautification, including an artist's graphic rendition or design visualization.
4. Governmental responsibility, and comprehensive planning, land use, and community service relative to the new highway.
5. The disposition of frontage roads, city street and county road intersections, and excess right of way.
6. An appendix containing:
 - A glossary of engineering terms.
 - A traffic volume diagram(s).
 - Pages showing diagrammatically or graphically the roadway section(s), operational controls, and rest areas (if rest areas are included in the project covered by the report).
 - A vicinity map.
 - An access report plan and profiles for the project.

The limited access report plan shows the effects of the proposed highway on the street and road system by delineating the points of public access. (See the [Plans Preparation Manual](#) for a list of the minimum details to be shown on the plan and for a sample plan.)

7. Notifications and reviews. Upon receipt of the Phase 1 approval (see [Exhibit 510-1](#)) from the Director & State Design Engineer, Development Division, the region publishes the necessary copies, submits the limited access report to the county or city officials for review and approval, and meets with all involved local governmental agencies to discuss the report. Providing a form letter with a signature block for the local agency to use to indicate its approval of the limited access report can help expedite the review and approval process.

The region reviews any requests for modification and submits recommendations, with copies of any correspondence or related minutes, to the HQ Access and Hearings Section.

530.02(4) Limited Access Hearing Plan

The region prepares a limited access hearing plan to be used as an exhibit at the public hearing (see [Chapter 210](#) for hearings) and forwards it to the HQ Right of Way Plans Section for review.

(See the [Plans Preparation Manual](#) for a list of data to be shown on the access hearing plan in addition to the access report plan data.)

When the plan review is completed by Headquarters, the access hearing plan is placed before the Director & State Design Engineer, Development Division, for approval of Phase 2 authority (see [Exhibit 510-1](#)).

530.02(5) Documentation

Documentation for the establishment of limited access control is in [Chapter 210](#).

530.03 Full Control (Most Restrictive)

530.03(1) Introduction

Full control limited access highways provide almost complete freedom from disruption by allowing access only through interchanges at selected public roads/streets, rest areas, viewpoints, or weigh stations, and by prohibiting at-grade crossings and approaches. Gated approaches are occasionally allowed, with approval of the requirements listed in [Chapter 550](#) and Exhibits [550-1](#) and [2](#).

At times, on state highways (except interstate) where full access control has been established, staged acquisition of limited access may be used, subject to the approval of an access design analysis, with initial acquisition as partial or modified control and with ultimate acquisition of full control planned on the highway. When there is no feasible alternative within a reasonable cost, the decision to defer acquisition of limited access control must be documented and is subject to the approval of an access design analysis.

530.03(2) Application

Terminate full control limited access sections at apparent logical points of design change. The following guidelines are to be used for the application of full control on limited access highways.

530.03(2)(a) Interstate

Full control is required on interstate highways.

530.03(2)(b) Principal Arterial

Documentation assessing the evaluation of full control is required for principal arterial highways requiring four or more through traffic lanes within a 20-year design period unless approved for partial or modified control on existing highways.

530.03(2)(c) Minor Arterial and Collector

Minor arterial and collector highways will not normally be considered for development to full control.

530.03(3) Crossroads at Interchange Ramps

The extension of limited access control beyond an intersection is measured from the centerline of ramps, crossroads, or parallel roads (as shown in Exhibits [530-1a](#), [1b](#), and [1c](#)), from the terminus of transition tapers (see [Exhibit 530-1d](#)), and in the case of ramp terminals at single

point urban interchanges (as shown in [Exhibit 530-1e](#)). For guidance on interchange spacing, see [Chapter 1360](#).

530.03(3)(a) Ramps

At-grade intersections and approaches are prohibited within the full length of any interchange ramp. The ramp is considered to terminate at its intersection with the local road or street.

530.03(3)(b) Frontage Roads

Direct access from the highway to a local service or frontage road is allowed only via the interchange crossroad (see Exhibits [530-1a](#), [1b](#), and [1c](#)).

530.03(3)(c) Interchange Crossroads

In both urban and rural areas, full control limited access must be established and then acquired along the crossroad at an interchange for a minimum distance of 300 feet beyond the centerline of the ramp or the end of the transition taper.

If a frontage road or local road is located at or within 350 feet of a ramp, limited access will be established and then acquired along the crossroad and for an additional minimum distance of 130 feet in all directions from the centerline of the intersection of the crossroad and the frontage or local road (see Exhibits [530-1a](#), [1b](#), and [1c](#)).

For interchanges incorporating partial cloverleaf or buttonhook ramps (see [Exhibit 530-1b](#)), limited access is required for all portions of the crossroad and frontage roads between the ramp terminals and for a distance of 300 feet beyond the ramp terminals. If an at-grade intersection for a local road or street is served directly opposite the ramp terminals, limited access will be extended for a minimum of 300 feet along that leg of the intersection.

When the intersection in question is a roundabout, see [Exhibit 530-1c](#). This shows extension of full control to be 300 feet, measured from the center of the roundabout for an intersection with a ramp terminal. [Exhibit 530-1c](#) also shows that if a frontage road or local road is located at or within 350 feet of a ramp terminal, limited access will be established and then acquired along the crossroad (between the roundabouts) and for an additional minimum distance of 130 feet in all directions along the local frontage roadway, measured from the outside edge of the circulating roadway of the roundabout.

[Exhibit 530-1d](#) shows the terminus of transition taper and that full control limited access is extended a minimum distance of 300 feet beyond the end of the farthest taper.

For a single point urban interchange (SPUI) with a right- or left-turn “ramp branch” separated by islands, limited access control is established and acquired for a minimum distance of 300 feet from the intersection of the centerline of the ramp branch with the centerline of the nearest directional roadway (see [Exhibit 530-1e](#).)

Not all interchange configurations match with the basic illustrations in this chapter. Consult with the HQ Access and Hearings Section for confirmation of limited access boundary requirements for non-traditional interchange configurations.

530.03(3)(d) Levels of Limited Access: Location of Approaches

Provide full control for a minimum of 300 feet from the centerline of the ramp or terminus of a transition taper (see Exhibits [530-1a](#), [1b](#), [1c](#), [1d](#), and [1e](#)). The intent is to ensure approaches are far enough away from a frontage road intersection to provide efficient intersection operation.

If the economic considerations to implement full control for the entire 300 feet are excessive, then provide full control for at least the first 130 feet; partial or modified control may be provided for the remainder, for a total minimum distance of 300 feet of limited access. Full limited access should be extended as far as possible before any partial or modified access is implemented. Contact the HQ Access and Hearings Section when considering this option.

An approved access design analysis is required if the limited access control falls short of 300 feet or for any approach that has been allowed to remain within the first 130 feet.

530.03(4) Location of Utilities, Bus Stops, and Mailboxes

530.03(4)(a) Utilities

Connecting utility lines are allowed along the outer right of way line between intermittent frontage roads. (See the [Utilities Accommodation Policy](#) regarding the location of and access to utilities.)

530.03(4)(b) Bus Stops

Common carrier or school bus stops are not allowed, except at:

- Railroad crossings (see [Chapter 1350](#)).
- Locations provided by the state on the interchanges (such as flyer stops).
- In exceptional cases, along the main roadway where pedestrian separation is available.

530.03(4)(c) Mailboxes

Mailboxes are not allowed on full control limited access highways. Mail delivery will be from frontage roads or other adjacent local roads.

530.03(5) Pedestrian and Bicycle Crossings and Paths

All nonmotorized traffic is limited as follows:

- At-grade pedestrian crossings are allowed only at the at-grade intersections of ramp terminals.
- Pedestrian separations or other facilities are provided specifically for pedestrian use.
- Bicyclists use facilities provided specifically for bicycle use (separated paths).
- Shared-use paths are only for bicyclists, pedestrians, and other forms of nonmotorized transportation.
- Bicyclists use the right-hand shoulders, except where such use has been specifically prohibited. Information pertaining to such prohibition is available from the WSDOT website: [wsdot.wa.gov/bike/closed.htm](https://www.wsdot.wa.gov/bike/closed.htm)

Paths and trails, and access to and from, within a limited access highway are best planned and designed with the local agency's participation. Pedestrians and bicycles are allowed, consistent with "Rules of the Road" ([RCW 46.61](#)), within the limits of full control limited access highways. Where paths are allowed they must be documented on the right of way and limited access plan. The plan shows the location of the path and where the path crosses limited access and provides movement notes (see [530.10\(1\)](#)).

530.04 Partial Control

530.04(1) Introduction

Partial control may be established, when justified, on any highway except interstate. Partial control provides a considerable level of protection from traffic interference and protects the highway from future strip-type development.

Upon acquisition of partial control limited access rights, the number, type, and use of access approaches of abutting property are frozen. The abutting property access rights and type of use are recorded on the property deed. The rights and use may not be altered by the abutting property owner, the local jurisdiction, or the region. This authority resides with the Director & State Design Engineer, Development Division (see [530.10](#)).

530.04(2) Application

Partial control will not normally be used in urban areas or inside corporate limits on existing principal arterial highways where traffic volumes are less than 700 design hourly volume (DHFV).

Terminate limited access sections at apparent logical points of design change.

530.04(2)(a) Principal Arterial

Partial control is required when the estimated traffic volumes exceed 3,000 average daily traffic (ADT) within a 20-year design period on principal arterial highways requiring two through traffic lanes. For multilane principal arterial highways, see [530.03\(2\)\(b\)](#).

530.04(2)(b) Minor Arterial

The minimum route length is: urban, 2 miles; rural, 5 miles; and combination urban and rural, 3 miles.

Partial control is required on:

- Rural minor arterial highways at both new and existing locations.
- Urban minor arterial highways at new locations requiring four or more through traffic lanes within a 20-year design period or requiring only two through traffic lanes where the estimated traffic volumes exceed 3,000 ADT within a 20-year design period.

Other rural minor arterial highways with only two lanes may be considered for partial control if any of the following conditions applies:

- The partial control can be acquired at a reasonable cost.
- The route connects two highways of a higher functional classification.

- The potential land development can result in numerous individual approaches, such as encountered in recreational or rapidly developing areas.
- The highway traverses publicly owned lands where partial control is desirable.

530.04(2)(c) Collector: New Alignment

Partial control is required on collector highways in new locations requiring four or more through traffic lanes in a 20-year design period.

530.04(2)(d) Collector: Existing

Existing collector highways will normally be considered for partial control limited access only when all of the following conditions apply:

- The highway serves an area that is not directly served by a higher functional classification of highway.
- Existing or planned development will result in traffic volumes significantly higher than what is required for partial control on minor arterials.
- Partial control can be established without a major impact on development of abutting properties within the constraints of established zoning at the time the partial control is proposed.

530.04(3) Interchanges and Intersections

530.04(3)(a) Interchanges

Where an interchange occurs on a partial control limited access highway, full control applies at the interchange and interchange ramps. Refer to [530.03\(3\)](#) and see Exhibits [530-1a](#), [1b](#), and [1c](#) for required minimum lengths of access control along the crossroad. For these and other interchange configurations not shown, consult with the HQ Access and Hearings Section for support developing limits of access control. (See [Chapter 1360](#) for guidance on interchange spacing.)

530.04(3)(b) Intersections

At an at-grade intersection on a partial control limited access highway, control will be established and acquired along the crossroad for a minimum distance of 300 feet from the centerline of the highway (see [Exhibit 530-2a](#)).

If another frontage or local road is located at or within 350 feet of the at-grade intersection, limited access will be established and then acquired along the crossroad, between the intersections, and:

- For an additional minimum distance of 130 feet in all directions from the centerline of the intersection of the frontage or local road (see [Exhibit 530-2a](#)).
- In the case of a roundabout, for an additional minimum distance of 300 feet along the crossroad, measured from the center of the roundabout (as shown in [Exhibit 530-2b](#)).

On multilane highways, measurements will be made from the centerline of the nearest directional roadway (see [Exhibit 530-2a](#)).

An approved access design analysis is required if the limited access control falls short of 300 feet or for any access that has been allowed to remain within the first 130 feet.

At-grade intersections with public roads are limited to the number allowed for the functional classification of highway involved, as follows:

530.04(3)(b)(1) Principal Arterial

If the ADT of the crossroad is less than 2,000, 1-mile spacing (minimum), centerline to centerline. If over 2,000 ADT within 20 years, plan for grade separation.

530.04(3)(b)(2) Minor Arterial

If the ADT of the crossroad is less than 2,000, ½-mile spacing (minimum), centerline to centerline. If over 2,000 ADT within 20 years, plan for grade separation.

530.04(3)(b)(3) Collector

Road (or street) plus property approaches, not more than six per side per mile.

With approval from the Director & State Design Engineer, Development Division, shorter intervals may be used where topography or other conditions (such as parcel sizes in some cases) restrict the design. Where intersecting roads are spaced farther apart than one per mile, median crossings may be considered for U-turns, in accordance with [Chapter 1310](#). Keep U-turns to a minimum, consistent with requirements for operation and maintenance of the highway.

To discourage movement in the wrong direction on multilane highways, locate private approaches 300 feet or more from an at-grade intersection. At a tee intersection, a private approach may be located directly opposite the intersection or a minimum of 300 feet away from the intersection. Ensure a private approach directly opposite a tee intersection cannot be mistaken for a continuation or part of the public traveled way.

530.04(4) Access Approach

Partial control is exercised to the level that, in addition to intersections with selected public roads, some crossings and private driveways may be allowed.

530.04(4)(a) Approach Types

Partial control limited access highways allow at-grade intersections with selected public roads and private approaches using Type A, B, C, and F approaches. (See [Chapter 520](#) for the definitions of approach types.)

Type D, commercial approaches, are not allowed direct access to partial control limited access highways. Commercial access is allowed only by way of public roads.

The type of approach provided for each parcel is based on current and potential land use and on an evaluation. (See [530.05\(4\)](#) for a list of evaluation criteria.)

530.04(4)(b) Design Considerations

The following considerations are used to determine the number and location of access approaches on partial control limited access highways.

1. Access approaches must be held to a minimum. The number is limited as follows:
 - Principal arterial: two per side per mile
 - Minor arterial: four per side per mile
 - Collector: six per side per mile, including at-grade intersections
2. Approaches in excess of the number listed above may be allowed as staged construction (until full buildout is complete) if approved by the Director & State Design Engineer, Development Division.
3. Approaches are not allowed for parcels that have reasonable access to other public roads unless a parcel has extensive highway frontage.
4. Relocate or close approaches in areas where sight limitations create undue hazards.
5. Allow only one approach for each parcel, except for very large ownerships, or where terrain features do not allow the property to be served by a single approach. This includes contiguous parcels under a single ownership.
6. Where possible, locate a single approach to serve two or more parcels.
7. The approved design is to provide for future development of frontage roads that will eliminate an excessive number of approaches.

530.04(5) Location of Utilities, Bus Stops, and Mailboxes

530.04(5)(a) Utilities

Connecting utility lines are allowed along the outer right of way line between intermittent frontage roads. (See the [Utilities Accommodation Policy](#) regarding the location of and access to utilities.)

530.04(5)(b) Bus Stops

Bus stops for both common carriers and school buses are not allowed on either two-lane or four-lane highways except:

- At railroad crossings (see [Chapter 1350](#)).
- At locations of intersections with necessary pullouts to be constructed by the state.
- Where shoulder widening has been provided for mail delivery service.
- For a designated school bus loading zone on or adjacent to the traveled lane, that has been approved by WSDOT.

Buses are not allowed to stop in the traveled lanes blocking at-grade intersections or private approaches to load or unload passengers.

School bus loading zones on partial control limited access highways must be posted with school bus loading zone signs, in accordance with the latest edition of the [Manual on Uniform Traffic Control Devices](#) (MUTCD).

530.04(5)(c) Mailboxes

Locate mailboxes on frontage roads or at intersections, with the following exceptions for properties that are served by Type A or B approaches:

- Locate mailboxes on a four-lane highway only on the side of the highway on which the deeded approach is provided.
- Locate mailboxes on a two-lane highway on the side of the highway that is on the right in the direction of the mail delivery.

Wherever mailboxes are allowed on a partial control limited access highway, provide mailbox turnouts to allow mail delivery vehicles to stop clear of the through traffic lanes.

(See [Chapter 1600](#) for additional information concerning mailbox locations and turnouts.)

530.04(6) Pedestrian and Bicycle Crossings and Paths

Pedestrian crossings are allowed on partial control limited access highways when they are grade-separated.

At-grade pedestrian crossings are allowed:

- Only at intersections where an at-grade crossing is provided in accordance with [Chapter 1510](#).
- On two-lane highways at mailbox locations.
- On two-lane highways not less than 100 feet from a school bus loading zone (pullout) adjacent to the traveled lane, if school district and WSDOT personnel determine that stopping in the traveled lane is hazardous.
- On two-lane highways where the school bus is stopped on the traveled lane to load or unload passengers and the required sign and signal lights are displayed.

On partial control limited access highways, pedestrian and bicycle traffic is allowed, consistent with “Rules of the Road” ([RCW 46.61](#)), except where unusual safety conditions support prohibition. Information pertaining to such prohibitions is available from the WSDOT website: [wsdot.wa.gov/bike/closed.htm](https://www.wsdot.wa.gov/bike/closed.htm)

Paths and trails, and access to and from, within a partial control limited access highway are best planned and designed with the local agency’s participation. Where paths are allowed, they must be documented on the right of way and limited access plan. The plan shows the location of the path and where the path crosses limited access, and it provides movement notes (see [530.10\(1\)](#)).

530.05 Modified Control (Least Restrictive)

530.05(1) Introduction

Modified control is intended to prevent further deterioration in the safety and operational characteristics of existing highways by limiting the number and location of access points.

Upon acquisition of modified control limited access, the number, type, and use of access approaches of abutting property are frozen. The abutting property access rights and type of use are recorded on the property deed. The rights and use may not be altered by the abutting

property owner, the local jurisdiction, or the region. This authority resides with the Director & State Design Engineer, Development Division (see [530.10](#)).

530.05(2) Application

In general, modified control is applied where some level of control is desired, but existing and potential commercial development precludes the implementation of full or partial control.

530.05(2)(a) Existing Highways

Modified control may be established and acquired on existing highways other than main line interstate. Priority is given to highway segments where one or more of the following conditions applies:

- Commercial development potential is high, but most of the adjoining property remains undeveloped.
- There is a reasonable expectation that the adjoining property will be redeveloped to a more intensive land use, resulting in greater traffic congestion.
- At interchange areas if full or partial access cannot be provided as described in [530.03\(3\)\(d\)](#).

530.05(2)(b) Modified Control Evaluation

Selection of highways on which modified control may be applied is based on an evaluation that includes the following contextual factors:

- The current form of managed access control
- Traffic volumes
- Level of service, or other selected mobility performance metric
- Selected safety performance
- Functional class
- Route continuity
- Mix of residential and employment densities
- Operational considerations related to achieving the selected target speed
- Local land use planning
- Current and potential land use
- Predicted growth rate
- Economic analysis

530.05(2)(c) Exceptions

Where modified control is to be established, developed commercial areas may be excepted from control when all or most of the abutting property has been developed to the extent that few, if any, additional commercial approaches will be needed with full development of the area. Contact the HQ Access and Hearings Section when considering this option. If this exception is within the limits of access control, an approved access design analysis is required.

530.05(3) Intersections

At an intersection on a modified control limited access highway, access control will be established and acquired along the crossroad for a minimum distance of 130 feet:

- Measured from the centerline of a two-lane highway (see [Exhibit 530-3b](#)).
- Measured from the centerline of the nearest directional roadway of a four-lane highway (see [Exhibit 530-3b](#)).
- Measured from the outside edge of the circulating roadway of a roundabout (see [Exhibit 530-3a](#)).

Approaches are allowed within this area only when there is no reasonable alternative. An approved access [design analysis](#) is required for any access that has been allowed to remain within the first 130 feet.

530.05(4) Access Approach

The number and location of approaches on a highway with modified control must be carefully planned and monitored to provide a safe and efficient highway compatible with present and potential land use.

530.05(4)(a) Approach Types

Modified control limited access highways allow at-grade intersections with selected public roads and with private approaches using Type A, B, C, and D approaches. (See [Chapter 520](#) for definitions of the approach types.)

The type of approach provided for each parcel is based on present and potential land use and an evaluation of the following criteria:

- Local comprehensive plans, zoning, and land use ordinances
- Property covenants and agreements
- City or county ordinances
- The highest and best use of the property
- The highest and best use of adjoining lands
- A change in use by merger of adjoining ownerships
- All other factors bearing upon proper land use of the parcel

530.05(4)(b) Design Considerations

The following items are used to determine the number and location of approaches:

1. Parcels that have access to another public road or street are not normally allowed direct access to the highway.
2. Relocate or close approaches located in areas where sight limitations create undue hazards.

3. Hold the number of access approaches to a minimum. Access approaches are limited to one approach for each parcel of land or where adjoining parcels are under one contiguous ownership.
4. Encourage joint use of access approaches where similar use of land and topography allows.
5. Additional approaches may be allowed for future development consistent with local zoning. Once limited access has been acquired, this will require a value determination process (see [530.10](#)).

Close existing access approaches not meeting the above.

530.05(5) Location of Utilities, Bus Stops, and Mailboxes

530.05(5)(a) Utilities

Connecting utility lines are allowed along the outer right of way line between intermittent frontage roads. (See the [Utilities Accommodation Policy](#) regarding location of and access to utilities.)

530.05(5)(b) Bus Stops and Pedestrian Crossings

Bus stops and pedestrian crossings are allowed as follows:

- In rural areas, bus stops and pedestrian crossings are subject to the same restrictions as in [530.04\(5\)](#) and [\(6\)](#).
- In urban areas, bus stops for both commercial carriers and school buses are allowed. (See [Chapter 1430](#) for requirements.)

530.05(5)(c) Mailboxes

Locate mailboxes adjacent to or opposite all authorized approaches as follows:

- On a four-lane highway only on the side of the highway on which the deeded approach is provided.
- On a two-lane highway on the side of the highway that is on the right in the direction of the mail delivery.

Where mailboxes are allowed, a mailbox turnout is recommended to allow mail delivery vehicles to stop clear of the through traffic lanes. (See [Chapter 1600](#) for additional information concerning mailbox locations and turnouts.)

530.05(6) Pedestrian and Bicycle Traffic and Paths

Pedestrians and bicyclists are allowed, consistent with “Rules of the Road” ([RCW 46.61](#)), on modified control limited access highways except where unusual safety considerations support prohibition. Information pertaining to such prohibitions is available from the WSDOT website: [wsdot.wa.gov/bike/closed.htm](https://www.wsdot.wa.gov/bike/closed.htm)

Paths and trails, and access to and from, within a modified control limited access highway are best planned and designed with the local agency’s participation. Where paths are allowed, they must be documented in the right of way and limited access plan. The plan shows the location of the path and where the path crosses limited access, and it provides movement notes (see [530.10\(1\)](#)).

530.06 Access Approaches

530.06(1) General

Access approaches may be allowed on limited access highways, consistent with the requirements outlined in [530.03](#), [530.04](#), and [530.05](#).

For additional information pertaining to approaches, refer to Chapters [1320](#) (roundabouts), [1340](#) (approach design templates), and [510](#) (right of way), and the *Plans Preparation Manual*.

The widths for the approach types are negotiated, and only the negotiated widths are shown on the right of way and limited access plan. (See [Chapter 520](#) for definitions of the approach types.)

530.07 Frontage Roads

Local agency approval is required for any planned frontage roads, county roads, city streets, or cul-de-sacs. The local agency must also agree in writing to accept and maintain the new section as a county road or city street.

530.07(1) General

Frontage roads are provided in conjunction with limited access highways to:

- Limit access to the main line.
- Provide access to abutting land ownerships.
- Restore the continuity of the local street or roadway system.

Refer to [Chapter 1210](#) for frontage road general policy and [Chapter 300](#) for required documentation.

By agreement under which the state is reimbursed for all costs involved, frontage roads that are not the responsibility of the state may be built by the state upon the request of a local political subdivision, a private agency, or an individual.

530.07(2) County Road and City Street

To connect roads or streets that have been closed off by the highway, short sections of county roads or city streets that are not adjacent to the highway may be constructed if they will serve the same purpose as, and cost less than, a frontage road.

530.07(3) Cul-de-sacs

For a frontage road or local street bearing substantial traffic that is terminated or closed at one end, provide a cul-de-sac or other street or roadway consistent with local policy or practice, that is sufficient to allow vehicles to turn around without encroachment on private property.

530.08 Turnbacks

When WSDOT transfers jurisdiction of operating right of way to a city, town, or county, a turnback agreement is required. (See the *Agreements Manual* for turnback procedures.)

Locate the turnback limits at points of logical termination. This will allow WSDOT to retain an adequate amount of right of way for maintenance of the highway and for other operational functions.

In areas where limited access rights have been acquired from the abutting property owners, the limited access rights will continue to be required for highway purposes; therefore, the limited access rights will not be included as part of a turnback agreement.

When a signalized intersection is in the area of a turnback, locate the turnback limit outside the detector loops if WSDOT is continuing the ownership, operation, and maintenance of the signal system. For a roundabout, locate the turnback limit at the back of the raised approach splitter island if WSDOT is continuing the ownership, operation, and maintenance of the roundabout.

530.09 Adjacent Railroads

530.09(1) General

A limited access highway and a railroad are considered adjacent when they have a common right of way border with no other property separating them. The allowed approaches apply only to adjacent railroad property that is directly used for current railroad operation.

530.09(2) Requirements

It is in the public's interest to provide access to the railroad right of way, from limited access highways, for maintenance of the railroad and the utilities located on the railroad right of way where other access is not feasible. This applies to both new highways and to existing highways where limited access has been acquired.

Direct access is allowed where local roads are infrequent or there are few highway-railroad crossings from which trail-type access for maintenance purposes is feasible, and where unique topography or other unusual conditions lead to its use.

To provide direct approaches for access to railroad right of way, all of the following conditions must be met:

- A maximum of one approach is allowed for every 2 miles of highway.
- The approach must not adversely affect the design, construction, stability, traffic safety, or operation of the highway.
- Except where the railroad is located in the median area, the approach is to be accomplished in a legal manner by right turns only, to and from the roadway nearest the railroad. Median crossing is not allowed.
- The approach is secured by a locked gate under arrangements satisfactory to the department. (See the Definitions section in [Chapter 520](#) for Approach Type C, and [Chapter 550](#).)
- The parking of any vehicles or railroad equipment is prohibited within limited access highway right of way.
- A special emergency maintenance permit must be obtained for periods of intensive railroad maintenance.
- The approach must be closed if the railroad operation ceases.

- Approaches are limited to use by the railroad company unless specific provisions for other use are shown on the right of way and limited access plan and included in the right of way negotiations.

530.09(3) Restrictions

Direct access from the highway is considered unnecessary and is not allowed where:

- There are local roads adjacent to or crossing the railroad.
- A trail-type road can be provided by the railroad between crossroads.
- The limited access highway is paralleled by a frontage road adjacent to the railroad.
- No highway previously existed adjacent to the railroad.

530.10 Changes to Existing Limited Access Rights of Way (including Access, Occupancy, and Use)

This section addresses three topics:

- 530.10(1) applies to all changes to access, occupancy & use of limited access rights of way on full, partial and modified highways.
- 530.10(2) provides specific detail on changes for private approaches.
- 530.10(3) provides specific guidance on changes for public approaches.

530.10(1) General

Changes to limited access control on state highways can only be made by the application of current design requirements and with the approval of the Assistant Secretary, Engineering & Regional Operations (or designee), and FHWA (when appropriate).

This means changes to access, use and occupancy (either temporary or permanent) for all limited access state highways require procedures and approval prior to implementation of those changes. On interstate routes, 23 CFR 710.401 requires prior approval from FHWA before allowing any changes on the interstate system. On non-interstate limited access routes, WSDOT approves changes to access, use and occupancy.

Example changes to limited access control:

- Constructing new fence openings
- Closing existing fence openings
- Adding new roadway connections, like an at-grade intersection
- Adding shared-use paths or trails that cross into and out of the right of way
- Widening existing approaches
- Allowing cranes or other equipment to temporarily encroach into the interstate airspace
- Constructing a new interchange or rebuilding an existing interchange (See Chapter 550)

Any changes proposed on interstate limited access facilities must include environmental documentation in the request, as required by FHWA. Contact the HQ Access and Hearings Section for assistance.

Consider the following factors when evaluating a request for modification of a limited access highway:

- Existing level of control on the highway
- Functional classification and importance of the highway
- Percentage of truck traffic
- Highway operations
- Present or future land use
- Environment or aesthetics
- Economic considerations
- Safety considerations

The Region will work with the requesting party to compile and submit all access, use and occupancy documents to the HQ Access and Hearings Section. The request documents should provide adequate detail, including a specific need statement, for the intended access, occupancy or use. The request packet will become a part of the historical record for the state route.

For permanent access, use or occupancy approvals involving existing property rights, the right of way and limited access plan must be revised and deeds may need to be rewritten. Contact Region and/or HQ Real Estate Services for this effort.

Evaluate all revisions to limited access highways to determine if access hearings are required.

For requirements to be met for selected modifications to full control limited access highways such as the Interstate System and multilane state highways, see [Chapter 550](#), Interchange Justification Report.

530.10(2) Changes for Private Access Approaches (Modified/Partial Control Only)

Private accesses are allowed within modified control and sometimes allowed within partial control ([WAC 468-58-010](#)).

530.10(2)(a) Requirements

Examples of access modifications requested by abutting property owners include additional road approaches, changes in the allowed use, or additional users of existing road approaches.

Plan revisions that provide for additional access to abutting properties after WSDOT has purchased the access rights are discouraged. However, these revisions may be considered if all of the following can be established:

- There are no other reasonable alternatives.
- The efficiency and safety of the highway will not be adversely impacted.
- The existing situation causes extreme hardship on the owner(s).
- The revision is consistent with the limited access highway requirements.

530.10(2)(b) Procedures

The region initiates a preliminary engineering review of the requested modification to or break in limited access. This preliminary review will be conducted with the HQ Access and Hearings

Section to determine whether conceptual approval can be granted for the request. If conceptual approval can be granted, then:

- The region initiates an engineering review of the requested modification.
- The region prepares and submits to the HQ Right of Way Plans Section a preliminary right of way and limited access plan revision, together with a recommendation for Headquarters approval. When federal-aid funds are involved in any phase of the project, the proposed modification will be sent to FHWA for review and approval.
- The recommendation will include an item-by-item analysis of the factors listed in [530.10\(1\)](#) and [530.10\(2\)\(a\)](#).

530.10(2)(c) Valuation Determination

Upon preliminary approval, region Real Estate Services prepares an appraisal for the value of the access change using a before and after appraisal.

- The appraisal follows the requirements set forth in the [Right of Way Manual](#).
- The appraisal package is sent to HQ Real Estate Services for review and approval.
- If federal-aid funds were involved in purchasing access control, HQ Real Estate Services will send a copy of the appraisal package to FHWA for review and approval.

530.10(2)(d) Final Processing

- Region Real Estate Services informs the requester of the approved appraised value for the change.
- If the requester is still interested, the region prepares a “Surplus Disposal Package” for HQ Real Estate Services’ review and approval.
- At the same time, the preliminary right of way and limited access plan revision previously transmitted is processed for approval.
- After the department collects the payment from the requester, the region issues a permit for the construction, if required.
- If an existing approach is being surrendered, region Real Estate Services obtains a conveyance from the property owner.
- HQ Real Estate Services prepares and processes a deed granting the change to the access rights.

530.10(3) Changes for Public At-Grade Intersections (Modified/Partial Control Only)

530.10(3)(a) Requirements

- Public at-grade intersections on partial or modified control limited access highways serve local arterials that form part of the local transportation network.
- Requests for new intersections on limited access highways must be made by or through the local governmental agency to WSDOT. The region will forward this request, including the data referenced in [530.10\(1\)](#) and [530.10\(2\)\(a\)](#) to the [HQ Access and Hearings Section](#).

- WSDOT must comply with the hearing, or waiver, process as outlined in [Chapter 210](#). The access acquisition and conveyance must be completed prior to beginning construction of the new intersection. The new intersection is to meet WSDOT design and spacing requirements.

530.10(3)(b) Procedures

- The region evaluates the request for modification and contacts the HQ Access and Hearings Section for conceptual approval.
- The region submits an intersection plan for approval (see [Chapter 1310](#)) and a right of way and limited access plan revision request (see the [Plans Preparation Manual](#)). This plan includes the limited access design requirements along the proposed public at-grade intersection.
- The Director & State Design Engineer, Development Division, approves the intersection plan.
- The Assistant Secretary, Engineering & Regional Operations (or designee), approves the access revision.
- The region submits the construction agreement to the Director & State Design Engineer, Development Division (see the [Agreements Manual](#)).
- The Assistant Secretary, Engineering & Regional Operations (or designee), approves the construction agreement.

530.10(3)(c) Valuation Determination

- When a requested public at-grade intersection will serve a local arterial that immediately connects to the local transportation network, compensation will not be required.
- When a requested public at-grade intersection will serve only a limited area, does not immediately connect to the local transportation network, or is primarily for the benefit of a limited number of developers, compensation for the access change will be addressed in the plan revision request. In these situations, compensation is appropriate and a value will be determined as outlined in [530.10\(2\)\(c\)](#).

530.11 Documentation

Refer to Chapters [210](#), [300](#), and [550](#) for design documentation requirements.

Exhibit 530-1a Full Access Control Limits: Interchange

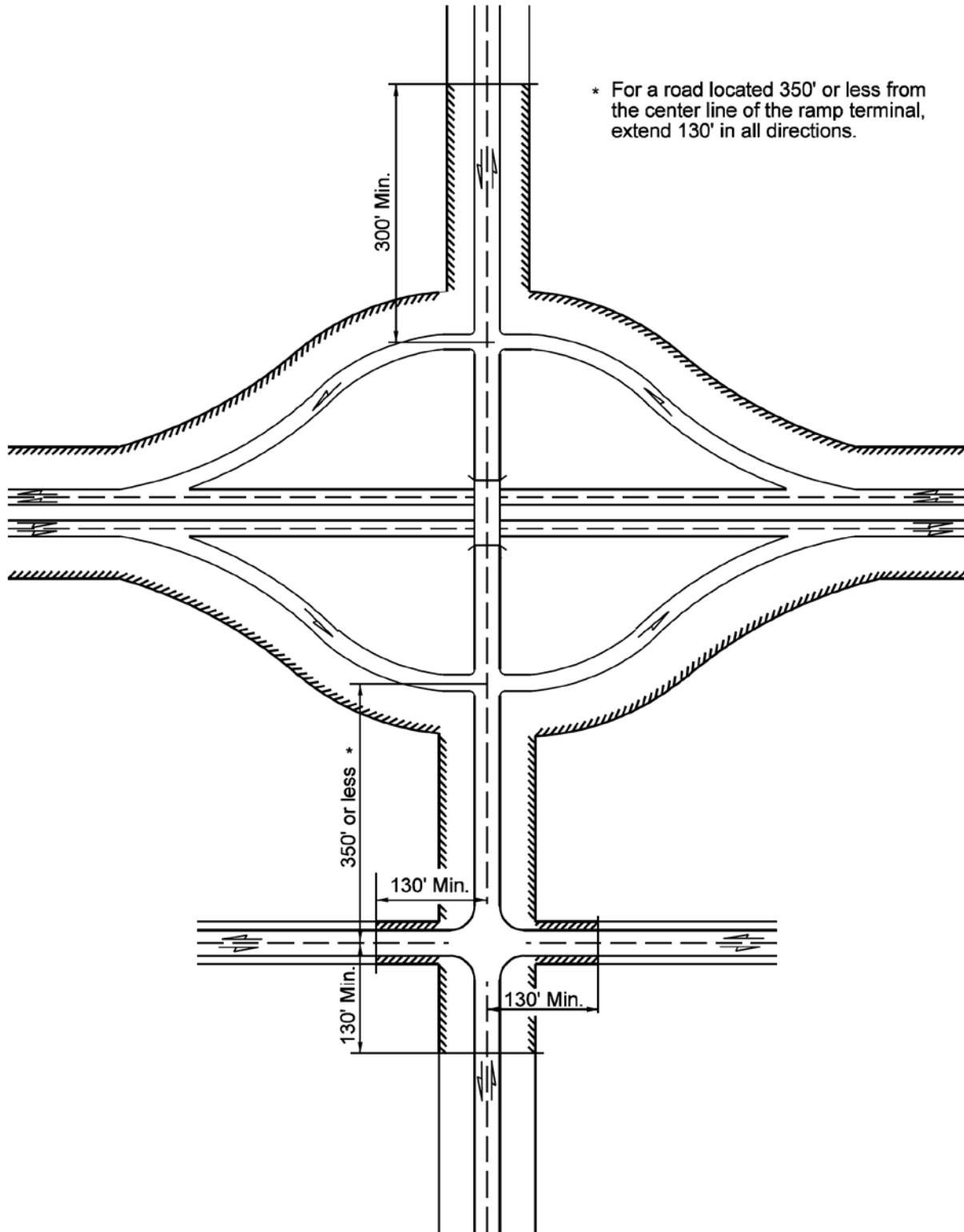


Exhibit 530-1b Full Access Control Limits: Interchange

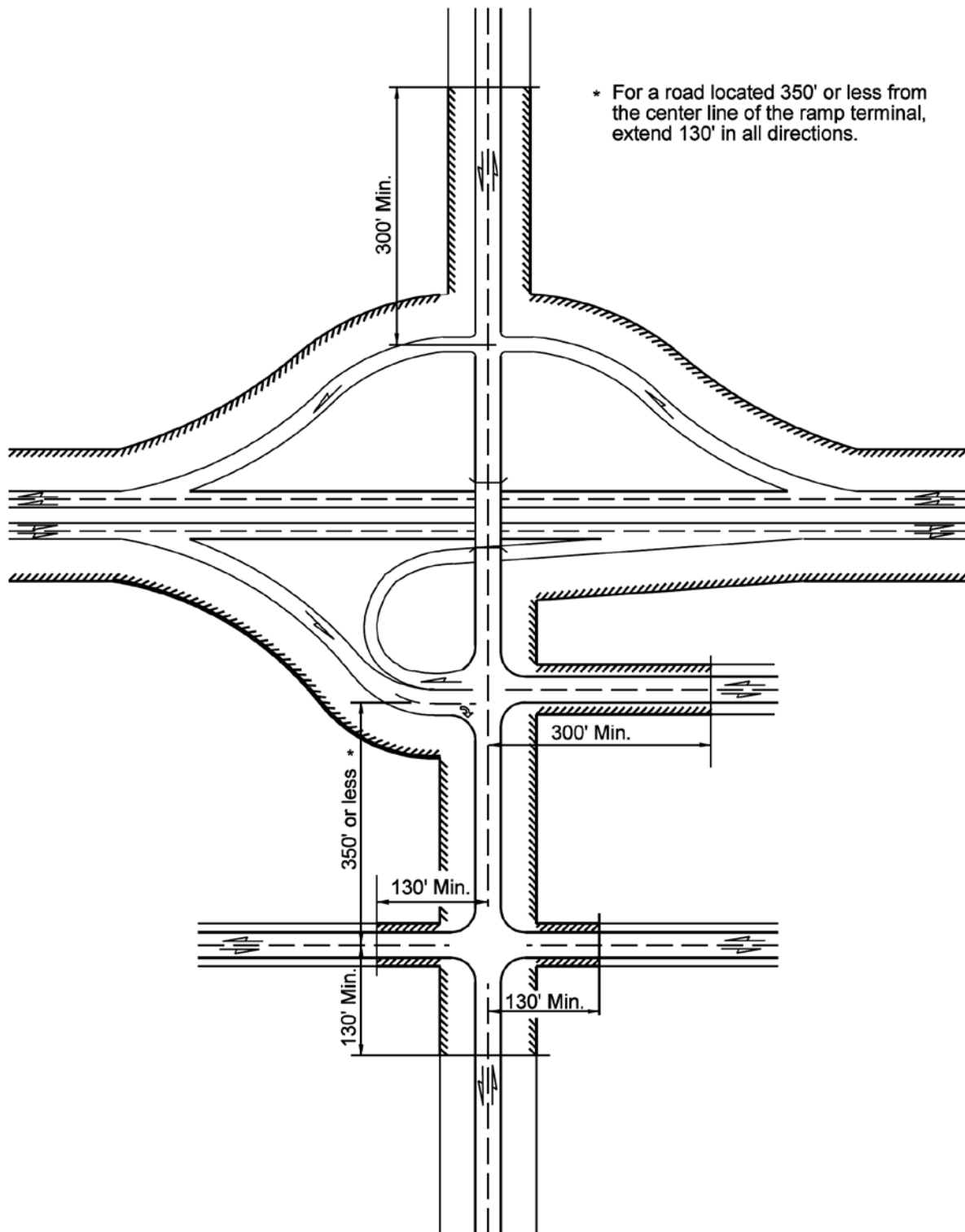


Exhibit 530-1c Full Access Control Limits: Interchange with Roundabouts

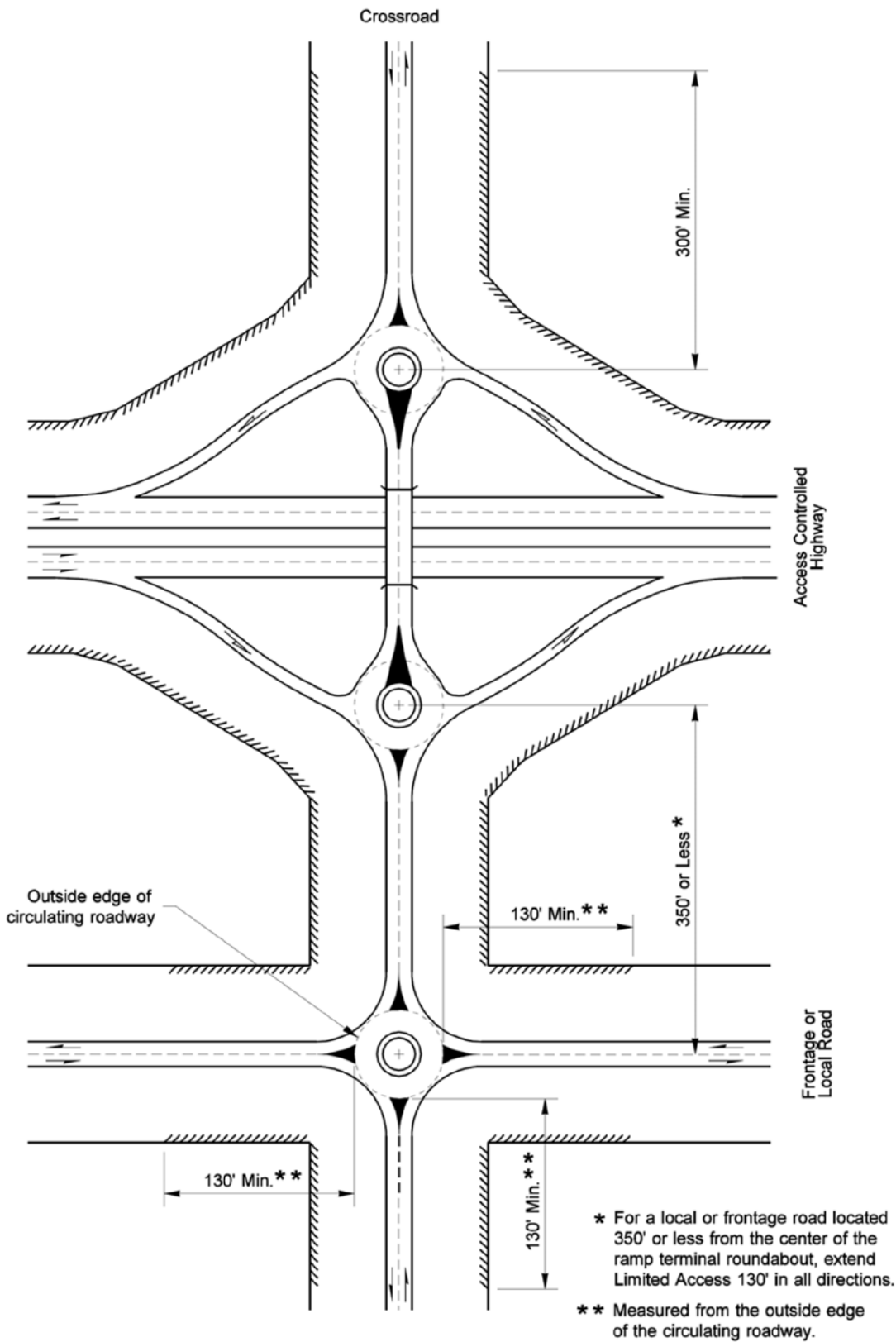


Exhibit 530-1d Full Access Control Limits: Ramp Terminal with Transition Taper

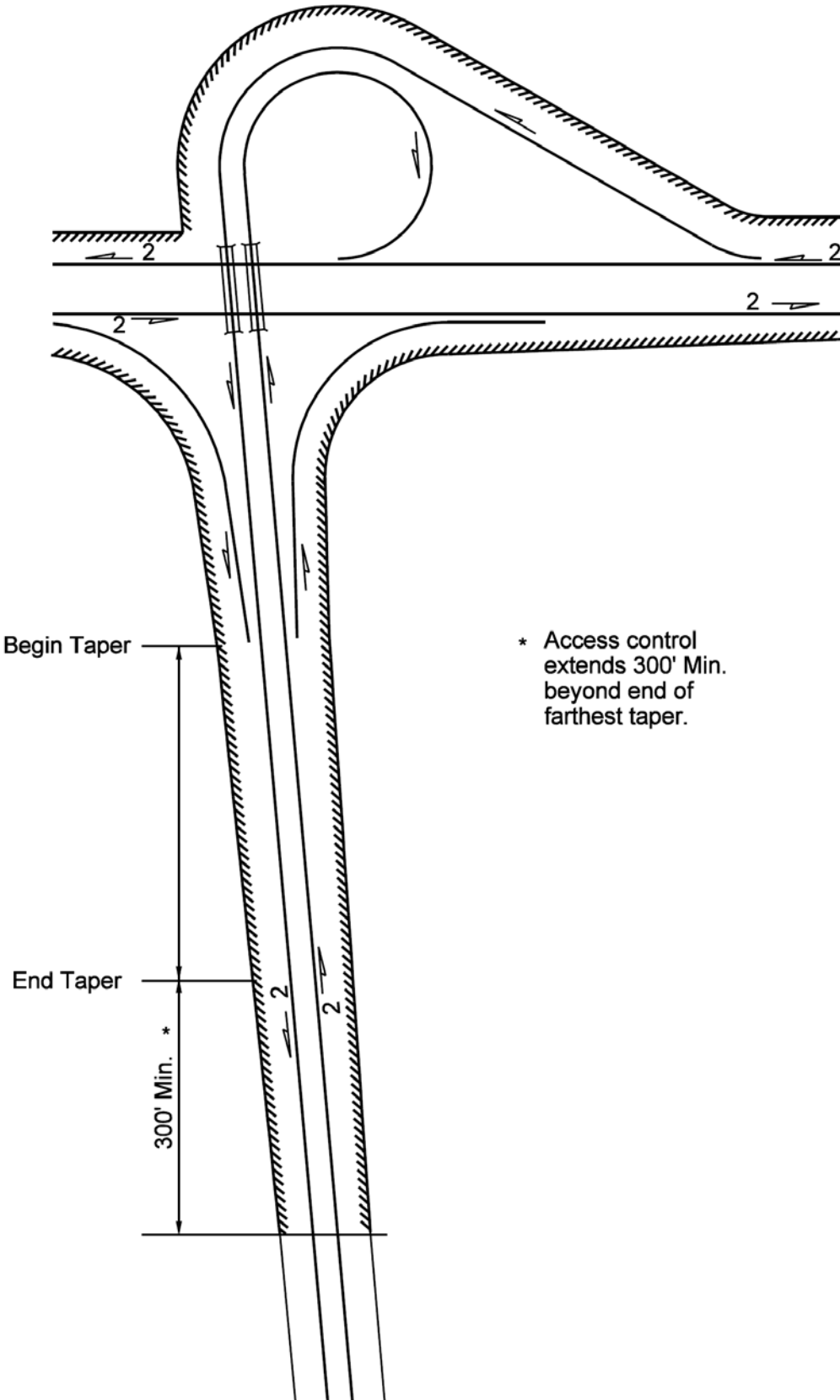


Exhibit 530-1e Full Access Control Limits: Single Point Urban Interchange

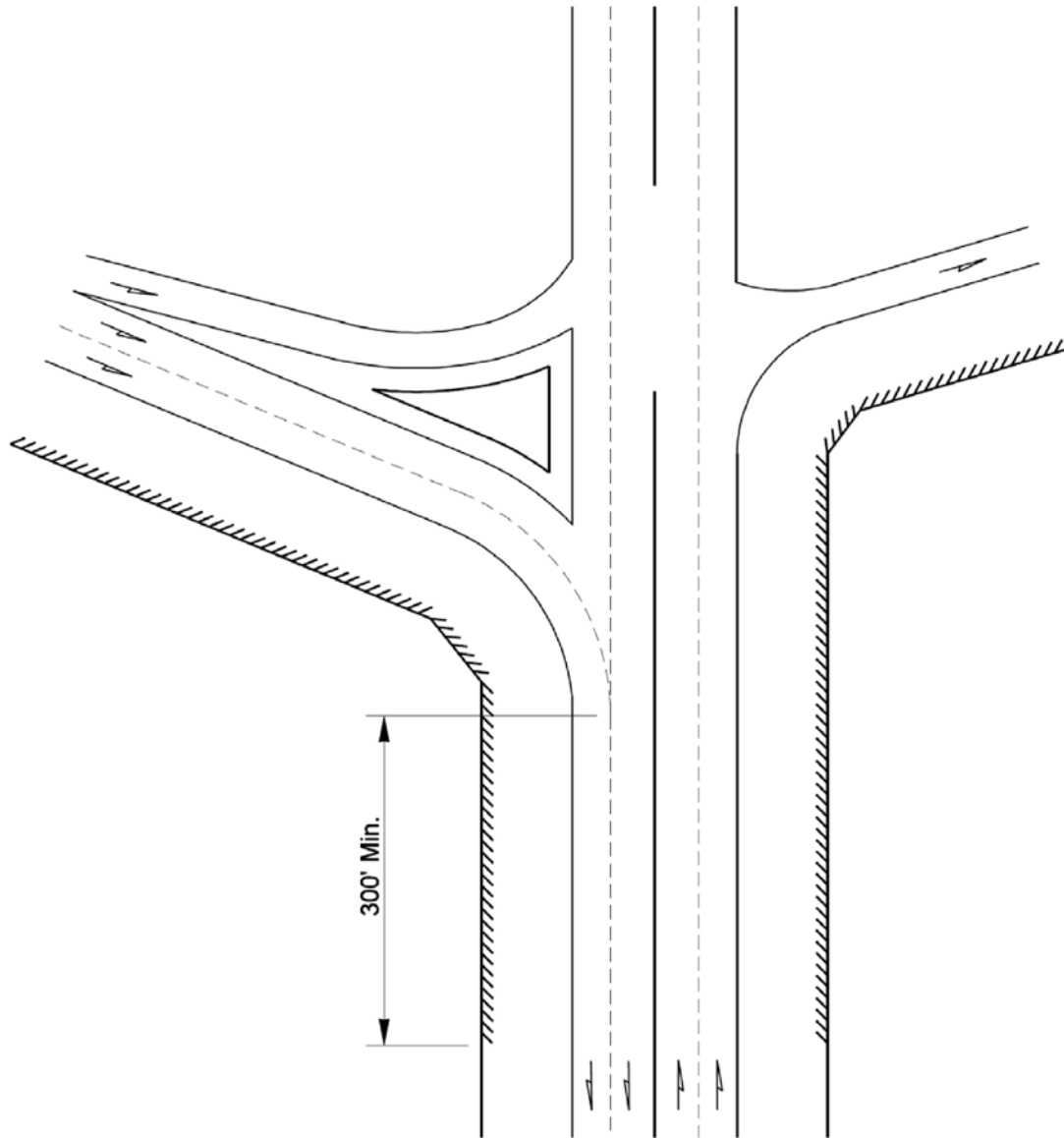


Exhibit 530-2a Partial Access Control Limits: At-Grade Intersections

- * For a road located 350' or less from the center line of the nearest directional roadway, extend access control 130' in all directions.

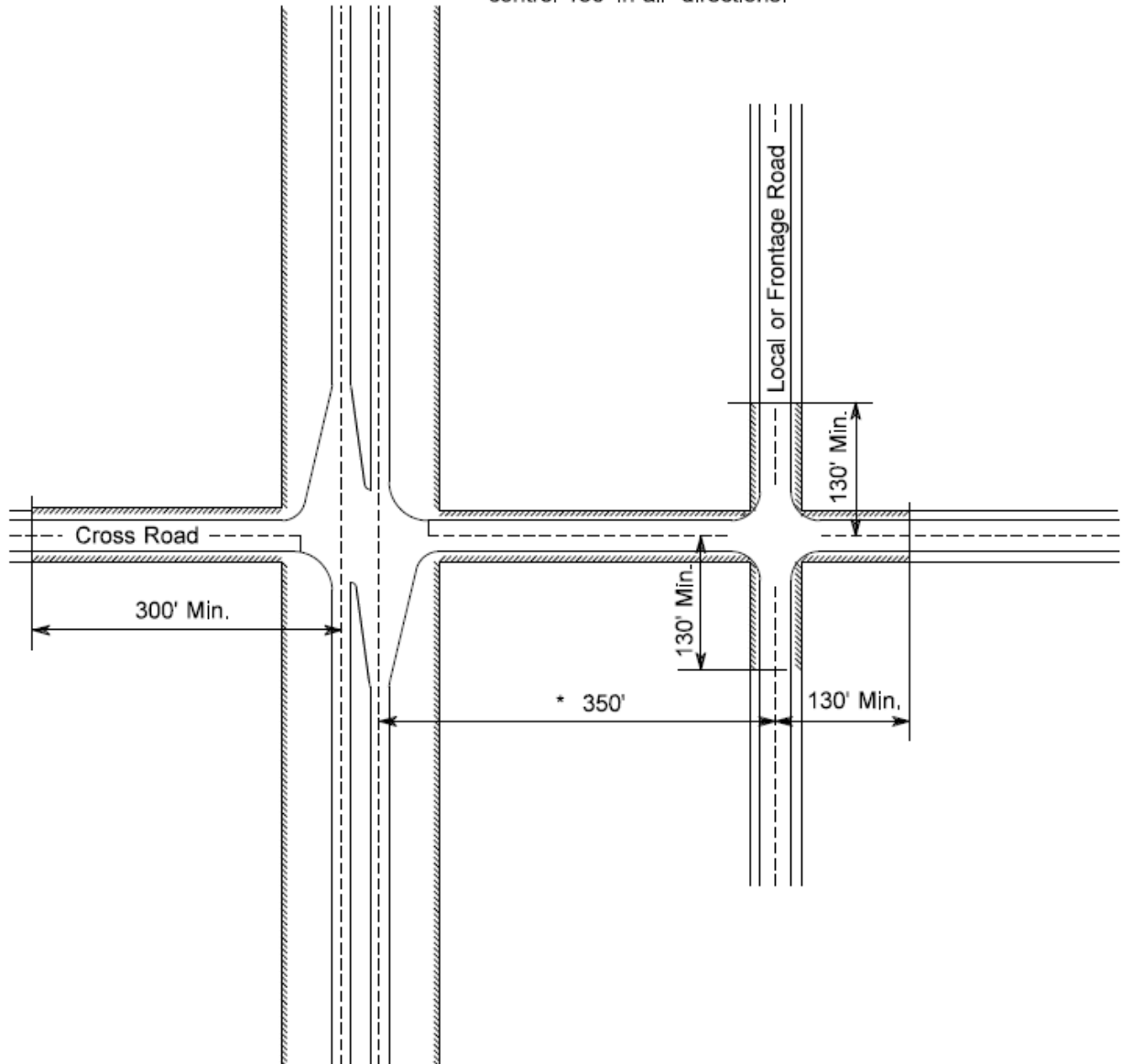
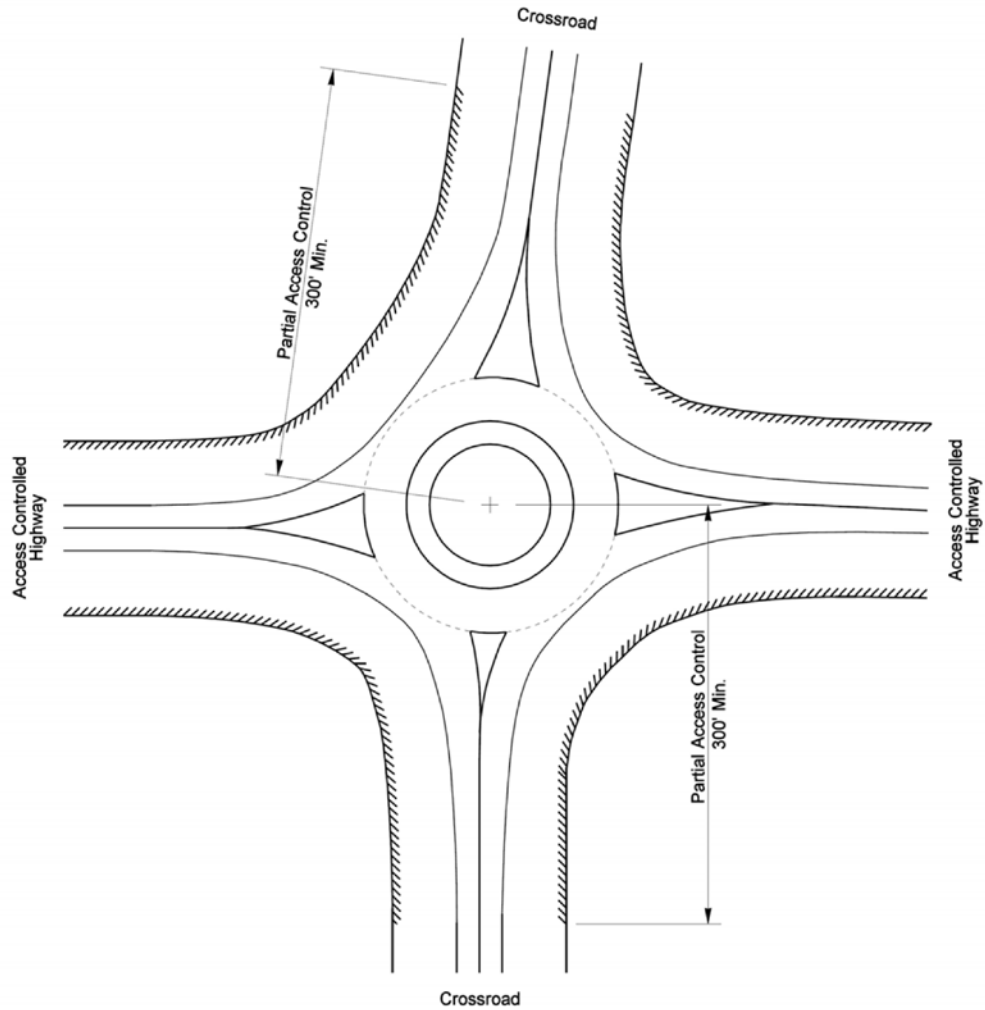


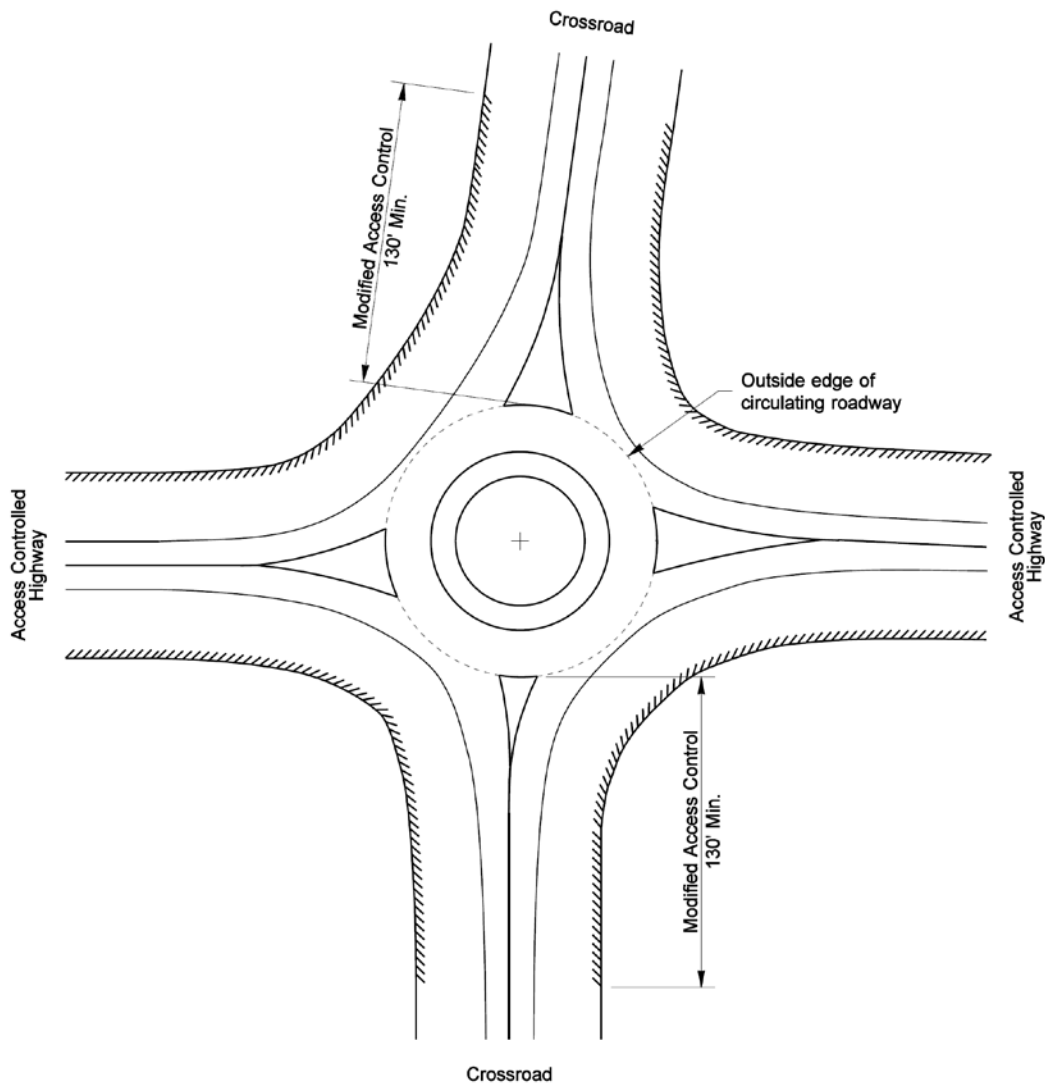
Exhibit 530-2b Partial Access Control Limits: Roundabout Intersections



Note:

Partial access control is measured from the center of the roundabout.

Exhibit 530-3a Modified Access Control Limits: Roundabout Intersections

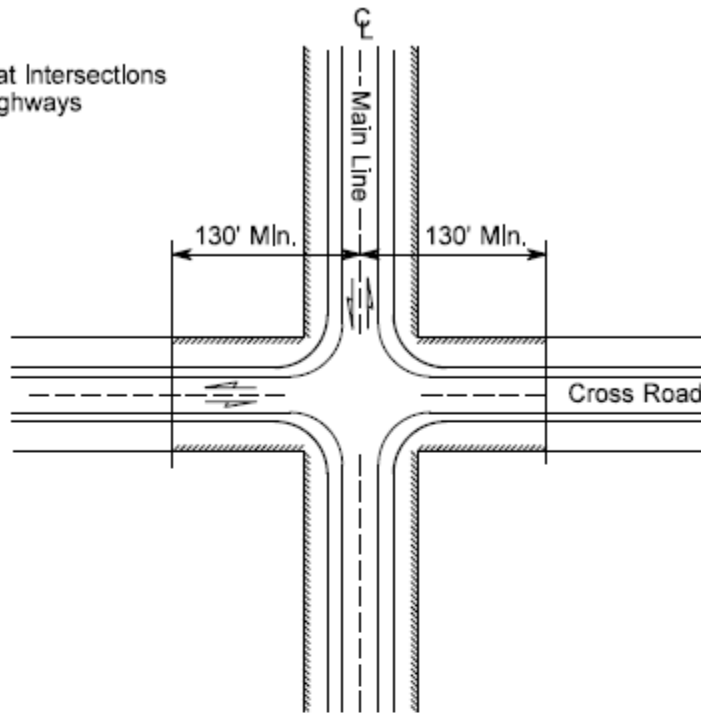


Note:

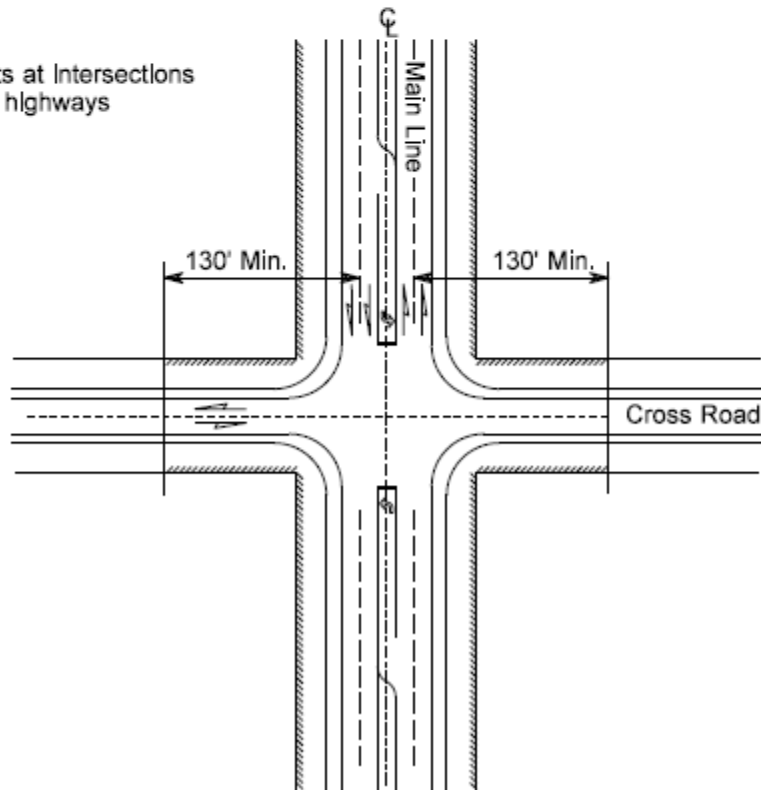
Modified access control is measured from the outside edge of the circulating roadway.

Exhibit 530-3b Modified Access Control Limits: Intersections

Access control limits at Intersections
modified control highways
two-lane



Access control limits at Intersections
modified control highways
multilane



540.01	General	540.07	Permitting and Design Documentation
540.02	Design Considerations	540.08	Other Considerations
540.03	Managed Access Highway Classes	540.09	Preconstruction Conference
540.04	Corner Clearance Criteria	540.10	Adjudicative Proceedings
540.05	Access Connection Categories	540.11	Documentation
540.06	Access Connection Permit	540.12	References

540.01 General

Access management is the systematic regulation of the location, spacing, design, and operation of driveway, city street, and county road connections to state highways. This chapter describes the access management process for granting permission to connect to managed access highways within cities and unincorporated areas. For an overview of access control, references to related state laws and codes, and definitions of terminology for this chapter, see [Chapter 520, Access Control](#).

In Washington State, managed access highways include all state highways that are not limited access highways. State highways that are planned for or established as limited access, are treated as managed access highways until the limited access rights are acquired.

The Access Control Tracking System Limited Access and Managed Access Master Plan (Access Master Plan) identifies not only the limits of limited access control, but also managed access control segments. The current managed access classification is based on access connection densities, distance between access connections, spacing of intersections, and context (see [Washington Administrative Code \(WAC\) 468-52-040](#)). The existing access classification is periodically updated by Headquarters (HQ) with region input to reflect changes on a corridor segment. Conditions may have changed since the Access Master Plan was envisioned or the last managed access classification update. On non-freeways it is important to consider the current classification and any classifications previously planned, and determine the access design control most appropriate for the agreed context (see Chapters [1102](#) and [1103](#) for context and design control guidance, respectively). The Access Master Plan database is available at:

www.wsdot.wa.gov/design/accessandhearings

Access to managed access highways is regulated by the governmental entity with jurisdiction over a highway's roadsides. Access connection permits are issued on managed access highways. The Washington State Department of Transportation (WSDOT) has access connection permitting authority over all state highways outside incorporated towns and cities. Incorporated towns and cities have access connection permitting authority for city streets that are part of state highways, as specified in [Revised Code of Washington \(RCW\) 47.24.020](#). When any project is developed on a state highway outside an incorporated city or town, state law requires that existing access connections be evaluated to determine whether they are consistent with all current department spacing, location, and design standards (see [540.03](#)).

540.02 Design Considerations

Evaluate access connections by using the Access Master Plan database to identify the route classification and determine access connection requirements in conformance with this chapter or [Chapter 530](#) as appropriate. See also [Chapter 1100](#), Practical Design, and chapters in that series for guidance on how access control is used as a design control.

Review all connections and verify whether they are in the Roadway Access Management Permit System (RAMPS) database. Contact the region Development Services Office or the HQ Access and Hearings Section for permission to log on to the link through this page:

www.wsdot.wa.gov/design/accessandhearings

If a nonconforming connection is identified, consider relocating, modifying, or eliminating the connection. It is not the intent of the managed access program that modifications to the connection will change the general functionality of the property.

Where current department standards cannot be met while providing the same general functionality, classify the connection as nonconforming and process the appropriate documentation as discussed below. This documentation is part of the permit process.

540.03 Managed Access Highway Classes

The principal objective of the managed access classification system is to maintain the safety and capacity of existing highways. This is accomplished by establishing access management criteria, which are to be adhered to in the planning and regional approval of access connections to the state highway system.

The classification system for state managed access highways consists of five classes. The classes are arranged from the most restrictive, Class 1, to the least restrictive, Class 5. In general, most state highways outside the incorporated limits of a city or town have been designated as Class 1 or Class 2, with only the most urban and lowest-speed state highways within an incorporated town or city designated as Class 5. [Exhibit 540-1](#) shows the five classes of highways, with a brief description of each class. WSDOT keeps a record of the assigned managed access classifications, by state route and milepost, in the Access Control Tracking System database:

www.wsdot.wa.gov/design/accessandhearings

One of the goals of state law is to restrict or keep access connections to a minimum in order to help preserve the safety, operation, and functional integrity of the state highway. On Class 1 highways, mobility is the primary function, while on Class 5 highways, access needs have priority over mobility needs. Class 2 highways also favor mobility, while Class 3 and Class 4 highways generally achieve a balance between mobility and access.

The most notable distinction between the five highway classes is the minimum spacing requirements of access connections. [Exhibit 540-1](#) shows the minimum distances between access points on the same side of the highway. [Exhibit 540-2](#) applies to the minimum clearance from a public road or street.

In all five highway classes, access connections are to be located and designed to minimize interference with transit facilities and high-occupancy vehicle (HOV) facilities on state highways where such facilities exist or are proposed in state, regional, metropolitan, or local transportation plans. In these cases, if reasonable access is available to the local road/street

system, access is to be provided to the local road/street system rather than directly to the state highway. Following are the functional characteristics and the legal requirements for each class.

540.03(1) Class 1

540.03(1)(a) Functional Characteristics

Class 1 highways provide for high-speed and/or high-volume traffic movements for interstate, interregional, and intercity (and some intracity) travel needs. Service to abutting land is subordinate to providing service to major traffic movements.

Highways in Class 1 are typically distinguished by a highly-controlled, limited number of (public and private) access points, restrictive medians with limited median openings on multilane facilities, and infrequent intersections.

540.03(1)(b) Legal Requirements

1. It is the intent that Class 1 highways be designed to have a posted speed limit of 50 to 65 mph. Intersecting streets, roads, and highways are planned with a minimum spacing of 1 mile. Spacing of ½ mile may be allowed, but only when no reasonable alternative access exists.
2. Private access connections to the state highway are not allowed except where the property has no other reasonable access to the local road/street system. When a private access connection must be provided, the following conditions apply:
 - The access connection continues until such time other reasonable access to a highway with a less restrictive access control class or access to the local road/street system becomes available and is allowed.
 - The minimum distance to another (public or private) access point is 1,320 feet along the same side of the highway. Nonconforming access connection permits may be issued to provide access connections to parcels whose highway frontage, topography, or location otherwise precludes issuance of a conforming access connection permit; however, variance permits are not allowed.
 - No more than one access connection may be provided to an individual parcel or to contiguous parcels under the same ownership.
 - All private access connections are for right turns only on multilane facilities. Where special conditions apply, justify the exception in a traffic analysis in the access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).
 - Additional access connections to the state highway are not allowed for newly created parcels resulting from property divisions. All access for these parcels must be provided by an internal road/street network. Access to the state highway will be at existing permitted locations or revised locations.
3. Restrictive medians are provided on multilane facilities to separate opposing traffic movements and to prevent unauthorized turning movements.

540.03(2) Class 2

540.03(2)(a) Functional Characteristics

Class 2 highways provide for medium-to-high-speed and medium-to-high-volume traffic movements over medium and long distances for interregional, intercity, and intracity travel needs. Direct access service to abutting land is subordinate to providing service to traffic movements.

Highways in Class 2 are typically distinguished by existing or planned restrictive medians on multilane facilities and by large minimum distances between (public and private) access points.

540.03(2)(b) Legal Requirements

1. It is the intent that Class 2 highways be designed to have a posted speed limit of 35 to 50 mph in urbanized areas and 45 to 55 mph in rural areas. Intersecting streets, roads, and highways are planned with a minimum spacing of $\frac{1}{2}$ mile. Intersection spacing of less than $\frac{1}{2}$ -mile may be allowed, but only when no reasonable alternative access exists.

In urban areas and developing areas where higher volumes are present or growth that will require a change to intersection control is expected in the foreseeable future, it is imperative that the location of any public access point be planned carefully to ensure adequate traffic progression. The addition of all new public or private access points that might require signalization or other form of intersection control will require an engineering analysis that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

2. Private access connections to the state highway system are allowed only where the property has no other reasonable access to the local road/street system or where access to the local road/street system will cause unacceptable traffic operational conditions or safety concerns on that system. When a private access connection must be provided, the following conditions apply:
 - The access connection continues until such time other reasonable access to a highway with a less restrictive access control class or acceptable access to the local road/street system becomes available and is allowed.
 - The minimum distance to another (public or private) access point is 660 feet on the same side of the highway. Nonconforming access connection permits may be issued to provide access to parcels whose highway frontage, topography, or location precludes issuance of a conforming access connection permit.
 - Only one access connection is allowed for an individual parcel or to contiguous parcels under the same ownership. This applies unless the highway frontage exceeds 1,320 feet and it can be shown that the additional access connection will not adversely affect the desired function of the state highway in accordance with the assigned managed access Class 2 or the safety or operation of the state highway.
 - Variance permits may be allowed if there are special conditions and the exception can be justified to the satisfaction of the department by a traffic analysis in the

access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

- All private access connections are for right turns only on multilane facilities. This applies unless there are special conditions and the exception can be justified to the satisfaction of the department by a traffic analysis in the access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#) and only if left-turn channelization is provided.
 - Additional access connections to the state highway are not allowed for newly created parcels that result from property divisions. All access for these parcels must be provided by an internal road/street network. Access to the state highway will be at existing permitted locations or at revised locations.
3. On multilane facilities, restrictive medians are provided to separate opposing traffic movements and to prevent unauthorized turning movements. However, a nonrestrictive median or a two-way left-turn lane may be used where special conditions exist and main line volumes are below 20,000 average daily traffic (ADT).

540.03(3) Class 3

540.03(3)(a) Functional Characteristics

Class 3 highways provide for moderate travel speeds depending on context, and moderate traffic volumes for medium and short travel distances for intercity, intracity, and intercommunity travel needs. There is a reasonable balance between access and mobility needs for highways in this class. This class is to be used primarily where the existing level of development of the adjoining land is less intensive than maximum buildout and where the probability of significant land use change and increased traffic demand is high.

Highways in Class 3 are typically distinguished by planned restrictive medians on multilane facilities and by meeting minimum distances between (public and private) access points. Two way left-turn lanes may be used where justified and main line traffic volumes are below 25,000 ADT. Development of properties with internal road/street networks and joint access connections is encouraged.

540.03(3)(b) Legal Requirements

1. It is the intent that Class 3 highways be designed to have a posted speed limit of 30 to 40 mph in urbanized areas and 45 to 55 mph in rural areas. In rural areas, intersecting streets, roads, and highways are planned with a minimum spacing of ½ mile. Intersection spacing of less than ½-mile may be allowed, but only when no reasonable alternative access exists.

In urban areas and developing areas where higher volumes are present or growth that will require a change to intersection control is expected in the foreseeable future, it is imperative that the location of any public access point be planned carefully to ensure adequate traffic progression. Where feasible, major intersecting roadways that might ultimately require signalization or other intersection control type are planned with a minimum of ½-mile spacing. The addition of all new public or private access points that may require signalization or other intersection control type, will require an engineering analysis

that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

2. Private Access Connections

- No more than one access connection may be provided to an individual parcel or to contiguous parcels under the same ownership. This applies unless it can be shown that additional access connections will not adversely affect the desired function of the state highway in accordance with the assigned managed access Class 3 and will not adversely affect the safety or operation of the state highway.
- The minimum distance to another (public or private) access point is 330 feet on the same side of the highway. Nonconforming access connection permits may be issued to provide access to parcels whose highway frontage, topography, or location precludes issuance of a conforming access connection permit.
- Variance permits may be allowed if there are special conditions and the exception can be justified to the satisfaction of the department by a traffic analysis in the access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

540.03(4) Class 4

540.03(4)(a) Functional Characteristics

Class 4 highways provide for moderate travel speeds and moderate traffic volumes for medium and short travel distances for intercity, intracity, and intercommunity travel needs. There is a reasonable balance between direct access and mobility needs for highways in this class. This class is to be used primarily where the existing level of development of the adjoining land is more intensive and where the probability of major land use changes is less than on Class 3 highway segments.

Highways in Class 4 are typically distinguished by existing or planned nonrestrictive medians. Restrictive medians may be used to mitigate unfavorable operational conditions such as turning, weaving, and crossing conflicts. Minimum access connection spacing requirements apply if adjoining properties are redeveloped.

540.03(4)(b) Legal Requirements

1. It is the intent that Class 4 highways be designed to have a posted speed limit of 30 to 35 mph in urbanized areas and 35 to 45 mph in rural areas. In rural areas, intersecting streets, roads, and highways are planned with a minimum spacing of $\frac{1}{2}$ mile. Intersection spacing of less than $\frac{1}{2}$ mile may be allowed, but only when no reasonable alternative access exists.

In urban areas and developing areas where higher volumes are present or growth that will require a change in intersection control is expected in the foreseeable future, it is imperative that the location of any public access point be planned carefully to ensure adequate traffic progression. Where feasible, major intersecting roadways that might ultimately require intersection control changes are planned with a minimum of $\frac{1}{2}$ -mile spacing. The addition of all new public or private access points that may require signalization, or other intersection control type, will require an engineering analysis that is

signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

2. Private Access Connections

- No more than one access connection may be provided to an individual parcel or to contiguous parcels under the same ownership. This applies unless it can be shown that additional access connections will not adversely affect the desired function of the state highway in accordance with the assigned managed access Class 4 and will not adversely affect the safety or operation of the state highway.
- The minimum distance to another (public or private) access point is 250 feet on the same side of the highway. Nonconforming access connection permits may be issued to provide access connections to parcels whose highway frontage, topography, or location precludes issuance of a conforming access connection permit.
- Variance permits may be allowed if there are special conditions and the exception can be justified to the satisfaction of the department by a traffic analysis in the access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

540.03(5) Class 5

540.03(5)(a) Functional Characteristics

Class 5 highways provide for moderate travel speeds and moderate traffic volumes for primarily short travel distances for intracity and intracommunity trips and for access to state highways of a higher class. Access needs generally may be higher than the need for through-traffic mobility without compromising the public's health, welfare, or safety. These highways will normally have nonrestrictive medians.

540.03(5)(b) Legal Requirements

1. It is the intent that Class 5 highways be designed to have a posted speed limit of 25 to 35 mph. In rural areas, intersecting streets, roads, and highways are planned with a minimum spacing of $\frac{1}{4}$ mile. Spacing of less than $\frac{1}{4}$ mile may be allowed where no reasonable alternative exists. In urban areas and developing areas where higher volumes are present or growth that will require changes to intersection control is expected in the foreseeable future, it is imperative that the location of any public access point be planned carefully to ensure adequate traffic progression. Where feasible, major intersecting roadways that might ultimately require changes to intersection control are planned with a minimum of $\frac{1}{4}$ mile spacing. The addition of all new public or private access points that might require signalization, or other control type, will require an engineering analysis that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).
2. Private Access Connections
 - No more than one access connection may be provided to an individual parcel or to contiguous parcels under the same ownership. This applies unless it can be shown that additional access connections will not adversely affect the desired function of

the state highway in accordance with the assigned managed access Class 5 and will not adversely affect the safety or operation of the state highway.

- The minimum distance to another (public or private) access point is 125 feet on the same side of the highway. Nonconforming access connection permits may be issued to provide access to parcels whose highway frontage, topography, or location precludes issuance of a conforming access connection permit.
- Variance permits may be allowed if there are special conditions and the exception can be justified to the satisfaction of the department by a traffic analysis in the access connection permit application that is signed and sealed by a qualified professional engineer who is registered in accordance with [RCW 18.43](#).

Exhibit 540-1 Managed Access Highway Class Description

Class	Non-Conforming ^[1]	Variance ^[2]	Conforming ^[3]	Access Point Spacing**	Limitations ^[4]
Class 1 Mobility is the primary function	Yes*	No	No	1,320 ft	<ul style="list-style-type: none"> One access only to contiguous parcels under same ownership Private access connection is not allowed unless no other reasonable access exists (must use local road/street system if possible)
Class 2 Mobility is favored over access	Yes*	Yes*	No	660 ft	<ul style="list-style-type: none"> One access connection only to contiguous parcels under same ownership unless frontage > 1,320 ft Private access connection not allowed unless no other reasonable access exists; must use local road/street system if possible
Class 3 Balance between mobility and access in areas with less than maximum buildout	Yes	Yes	Yes	330 ft	<ul style="list-style-type: none"> One access connection only to contiguous parcels under same ownership Joint access connection for subdivisions preferred; private connection allowed, with justification
Class 4 Balance between mobility and access in areas with less than maximum buildout	Yes	Yes	Yes	250 ft	One access connection only to contiguous parcels under same ownership, except with justification
Class 5 Access needs may have priority over mobility	Yes	Yes	Yes	125 ft	More than one access connection per ownership, with justification

*The access connection continues only until such time other reasonable access to a highway with a less restrictive class or acceptable access to the local road/street system becomes available and is allowed.

**Minimum, on the same side of the highway.

[1] See 540.07(2).

[2] See 540.07(3).

[3] See 540.07(1).

[4] Unless grandfathered (see 540.06).

540.03(6) Changes in Managed Access Classification

WSDOT, RTPOs, MPOs, or other entities such as cities, towns, or counties may initiate a review of managed access classifications per the process identified by [WAC 468-52](#). In all cases, WSDOT consults with the RTPOs, MPOs, and local agencies and takes into consideration comments received during the review process. For city streets that are designated as state highways, the department will obtain concurrence in the final classification assignment from the city or town.

The modified highway classification list shall be submitted to Headquarters for approval by the Director & State Design Engineer, Development Division, or a designee. WSDOT regions shall notify the RTPOs, MPOs, and local governmental entities in writing of the final determination of the reclassification.

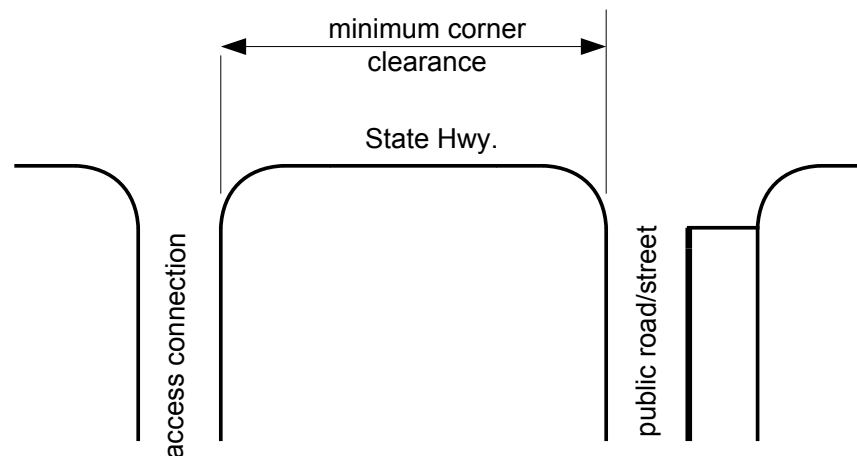
540.04 Corner Clearance Criteria

In addition to the five access control classes, there are also corner clearance criteria that must be used for access connections near intersections (see [Exhibit 540-2](#)).

Corner clearance spacing must meet or exceed the minimum access point spacing requirements of the applicable managed access highway class. A single access connection may be placed closer to the intersection, in compliance with the permit application process specified in WAC 468-51 and in accordance with the following criteria:

- The minimum corner clearance criteria in [Exhibit 540-2](#) may be used where access point spacing cannot be obtained due to property size and where a joint-use access connection cannot be secured or where it is determined by WSDOT not to be feasible because of conflicting land use or conflicting traffic volumes or operational characteristics.
- Some local agencies have adopted corner clearance as a design element in their design standards; these standards are to meet or exceed WSDOT standards. Coordinate with the local agency regarding corner clearance of an access connection on or near an intersecting local road or street.
- When a joint-use access connection or an alternate road/street system access—meeting or exceeding the minimum corner clearance requirements—becomes available, the permit holder must close the permitted access connection unless the permit holder shows to WSDOT's satisfaction that such closure is not feasible.

Exhibit 540-2 Minimum Corner Clearance: Distance From Access Connection to Public Road or Street



With Restrictive Median		
Position	Access Allowed	Minimum (ft)
Approaching Intersection	Right In/Right Out	115
Approaching Intersection	Right In Only	75
Departing Intersection	Right In/Right Out	230*
Departing Intersection	Right Out Only	100
Without Restrictive Median		
Position	Access Allowed	Minimum (ft)
Approaching Intersection	Full Access**	230*
Approaching Intersection	Right In Only	100
Departing Intersection	Full Access**	230*
Departing Intersection	Right Out Only	100
*125 ft may be used for Class 5 facilities with a posted speed of 35 mph or less.		
**Full Access = All four movements (Right in/Right out; Left in/Left out)		

540.05 Access Connection Categories

Whenever an access connection permit is issued on a managed access state highway, the permit must also specify one of four access connection categories: Category I to Category IV. Categories I through III are based on the maximum vehicular usage of the access connection. Category IV specifies temporary use, usually for less than a year. Access connection permits must specify the category and the maximum vehicular usage of the access connection in the permit.

All access connections are determined by WSDOT to be in one of the following categories ([WAC 468-51-040](#)):

540.05(1) Category I

“Category I – minimum connection” provides connection to the state highway system for up to ten single-family residences, a duplex, or a small multifamily complex of up to ten dwelling units that use a common access connection. This category also applies to permanent access connections to agricultural and forestlands, including field entrances; access connections for the operation, maintenance, and repair of utilities; and access connections serving other low-volume traffic generators expected to have average weekday vehicle trip ends (AWDVTE) of 100 or less.

540.05(2) Category II

“Category II – minor connection” provides connection to the state highway system for medium-volume traffic generators expected to have an AWDVTE of 1,500 or less, but not included in Category I.

540.05(3) Category III

“Category III – major connection” provides connection to the state highway system for high-volume traffic generators expected to have an AWDVTE exceeding 1,500.

540.05(4) Category IV

“Category IV – temporary connection” provides a temporary, time-limited connection to the state highway system for a specific property for a specific use with a specific traffic volume. Such uses include, but are not limited to, logging, forestland clearing, temporary agricultural uses, temporary construction, and temporary emergency access. The department reserves the right to remove any temporary access connection at its sole discretion and at the expense of the property owner after the expiration of the permit. Further, a temporary access connection permit does not bind the department, in any way, to the future issuance of a permanent access connection permit at the temporary access connection location.

540.06 Access Connection Permit

[RCW 47.50](#) requires all access connections to be permitted. This can be accomplished by the permitting process (see [540.07](#)) or by the connection being “grandfathered” (in place prior to July 1, 1990).

All new access connections to state highways, as well as alterations and improvements to existing access connections, require an access connection permit. Every owner of property that abuts a managed access state highway has the right to reasonable access, but not a particular means of access. This right may be restricted with respect to the highway if reasonable access can be provided by way of another local road/street.

When a new private road or street is to be constructed, approval by the permitting authority is required for intersection design, spacing, and construction work on the right of way. However, if an access connection permit is issued, it will be rendered null and void if and when the road or street is duly established as a local road or street by the local governmental entity.

It is the responsibility of the applicant or permit holder to obtain all necessary local, state, and federal approvals and permits (which includes all environmental permits and documentation).

The access connection permit only allows the applicant permission to connect to the state highway. It is also the responsibility of the applicant to acquire any and all property rights necessary to provide continuity from the applicant's property to the state highway.

The alteration or closure of any existing access connection caused by changes to the character, intensity of development, or use of the property served by the access connection or the construction of any new access connection must not begin before an approved access connection permit is obtained.

If a property owner or permit holder with a valid access connection permit wishes to change the character, use, or intensity of the property or development served by the access connection, the permitting authority must be contacted to determine whether an upgraded access connection permit will be required.

540.07 Permitting and Design Documentation

An access connection permit is obtained from the department by submitting the appropriate application form, including the fee, plans, traffic data, and access connection information, to the department for review. All access connection and roadway design documents for Category II and III permits must bear the seal and signature of a professional engineer registered in Washington State.

The permitting process begins with the application. Upon submittal of the application with all the attached requirements, it is reviewed and either denied or accepted. If denied, the department must notify the applicant in writing stating the reasons, and the applicant will have thirty (30) days to submit a revised application. Once the application is approved and the permit is issued, the applicant may begin construction.

The Access Manager in each region keeps a record of all access points, including those that are permitted and those that are grandfathered (see [540.08](#)). A permit for a grandfathered access point is not required but may be issued for recordkeeping reasons.

540.07(1) Conforming Access Connection Permit

Conforming access connection permits may be issued for access connections that conform to the functional characteristics and all legal requirements for the designated class of the highway.

540.07(2) Nonconforming Access Connection Permit

Nonconforming access connection permits may be issued:

- For short-term access connections pending the availability of a future joint-use access connection or local road/street system access.
- For location and spacing not meeting requirements.
- For Category I through IV permits.
- After an analysis and determination by the department that a conforming access connection cannot be made at the time of permit application submittal.
- After a finding that the denial of an access connection will leave the property without a reasonable means of access to the local road/street system.

In such instances, the permit is to be noted as being a nonconforming access connection permit and may contain the following specific restrictions and provisions:

- Limits on the maximum vehicular use of the access connection.
- The future availability of alternate means of reasonable access for which a conforming access connection permit can be obtained.
- The removal of the nonconforming access connection at the time the conforming access is available.
- The properties to be served by the access connection.
- Other conditions as necessary to carry out the provisions of [RCW 47.50](#).

540.07(3) Variance Access Connection Permit

Variance access connection is a special nonconforming or additional access connection permit issued for long-term use where future local road/street system access is not foreseeable:

- For location and spacing not meeting requirements or for an access connection that exceeds the number allowed for the class.
- After an engineering study demonstrates, to the satisfaction of the department, that the access connection will not adversely affect the safety, maintenance, or operation of the highway in accordance with its assigned managed access class.

In such instances, the permit is to be noted as being a variance access connection permit and may contain the following specific restrictions and provisions:

- Limits on the maximum vehicular use of the access connection
- The properties to be served by the access connection
- Other conditions as necessary to carry out the provisions of [RCW 47.50](#)

This permit will remain valid until modified or revoked by the permitting authority unless an upgraded permit is required due to changes in property site use (see [540.08\(1\)](#)).

A variance access connection permit must not be issued for an access connection that does not conform to minimum corner clearance requirements (see [540.04](#)).

540.07(4) Corner Clearance Design Analysis

540.07(4)(a) Outside Incorporated City Limits

A design analysis request will be required for nonconforming access connections if corner clearance criteria are not met. The HQ Design Office is to be involved early in the process. Such an access will be outside the corner radius and as close as feasible to the property line farthest away from the intersection.

For WSDOT projects, record the approved design analysis in the Design Variance Inventory System (DVIS) and include it in the Design Documentation Package (see [Chapter 300](#)).

For non-WSDOT projects, the region Development Services Office or Local Programs Office is responsible for entering the design analysis into the DVIS.

An exception to the above may be allowed for a single-family residence, serving a single residence, not meeting the minimum corner clearance criteria and having no feasible connection to the local cross street. One single family home generates a very low volume of traffic and will pose a low conflict potential for traffic on the State Highway System. A single-family access connection exception is to comply with the following criteria:

- Serves a single residence
- Access is to be outside the corner radius
- Access is to be located as close as feasible to the property line farthest away from the intersection
- The denial of an access connection would leave the property without a reasonable means of access.
- The connection is to be relocated to a local road/street system, if one becomes available.

Document the above criteria in the access connection permit.

540.07(4)(b) Within Incorporated Cities

In accordance with [RCW 35.78.030](#) and [RCW 47.50](#), incorporated cities and towns have jurisdiction over access permitting on streets designated as state highways and, therefore, no design analysis by WSDOT will be required. On WSDOT projects, document decisions made on these accesses in the DDP.

540.08 Other Considerations

540.08(1) Changes in Property Site Use With Permitted Access Connection

The access connection permit is issued to the permit holder for a particular type of land use generating specific projected traffic volumes at the final stage of proposed development. Any changes made in the use, intensity of development, type of traffic, or traffic flow require the permit holder, an assignee, or the property owner to contact the department to determine whether further analysis is needed because the change is significant and will require a new permit and modifications to the access connection ([WAC 468-51-110](#)).

A significant change is one that will cause a change in the category of the access connection permit or one that causes an operational, safety, or maintenance problem on the state highway system based on objective engineering criteria or available collision data. Such data will be provided to the property owner and/or permit holder and tenant upon written request ([WAC 468-51-110](#)).

540.08(2) Existing Access Connections

540.08(2)(a) Closure of Grandfathered Access Connections

Any access connections that were in existence and in active use on July 1, 1990, are grandfathered.

The grandfathered access connection may continue unless:

- There are changes from the 1990 AWDVTE.
- There are changes from the 1990 established use.
- The department determines that the access connection does not provide minimum acceptable levels of highway safety and mobility based on collision and/or traffic data or accepted traffic engineering criteria, a copy of which must be provided to the property owner, permit holder, and/or tenant upon written request ([WAC 468-51-130](#)).

540.08(2)(b) Department Construction Projects

540.08(2)(b)(1) Notification

The department must notify affected property owners, permit holders, business owners, and emergency services in writing, when appropriate, whenever the department's work program requires the modification, relocation, or replacement of its access connections. In addition to written notification, the department will facilitate, when appropriate, a process that may include, but is not limited to, public notices, meetings, or hearings, as well as individual meetings.

540.08(2)(b)(2) Modification Considerations

When the number, location, or design of existing access connections to the state highway is being modified by a department construction project, the resulting modified access connections must provide the same general functionality for the existing property use as they did before the modification, taking into consideration the existing site design, normal vehicle types, and traffic circulation requirements. These are evaluated on an individual basis.

It is important to remember that the intent is not to damage the property owner by removing nonconforming access connections, but to eliminate access connections that are both nonconforming and not needed.

The permitting authority evaluates each property individually to make a determination about which category of access connection (see [540.05](#)) and which design template (see [Chapter 1340](#)) will be reasonable. If it is a commercial parcel, determine whether the business can function with one access connection. Each parcel, or contiguous parcels under the same ownership being used for the same purpose, is allowed only one access connection. If the business cannot function properly with only one access connection, a variance permit may be issued for additional access connections. If the property is residential, only one access connection is allowed; however, certain circumstances might require an additional access connection (see [540.07\(4\)\(a\)](#)).

540.08(2)(b)(3) Costs: Replacement of/Modifications to Existing Access Connections

The costs of modifying or replacing the access points are borne by the department if the department construction project caused the replacement or modification. Modification of the connection may require a change to the existing permit.

540.08(3) Work by Permit Holder's Contractor

The department requires that work by the owner's contractor be accomplished at the completion of the department's contract or be scheduled so as not to interfere with the department's contractor. The department may require a surety bond prior to construction of the access connection in accordance with [WAC 468-51-070](#).

540.09 Preconstruction Conference

All new access connections, including alterations and improvements to existing access connections to the highway, require an access connection permit. The permitting authority may require a preconstruction conference prior to any work being performed on the access. The preconstruction conference must be attended by those necessary to ensure compliance with the terms and provisions of the permit. Details regarding the individual access connections will be included in the construction permit. This may include access connection widths, drainage requirements, surfacing requirements, mailbox locations, and other information ([WAC 468-51-090](#)).

540.10 Adjudicative Proceedings

Any person who can challenge any of the following departmental actions may request an adjudicative proceeding (an appeal to an Administrative Law Judge) within thirty (30) days of the department's written decision ([WAC 468-51-150](#)):

- Denial of an access connection permit application pursuant to [WAC 468-51-080](#)
- Permit conditions pursuant to [WAC 468-51-150](#)
- Permit modifications pursuant to [WAC 468-51-120](#)
- Permit revocation pursuant to [WAC 468-51-120](#)
- Closure of permitted access connection pursuant to [WAC 468-51-120](#)
- Closure of grandfathered access connection pursuant to [WAC 468-51-130](#)

An appeal of a decision by the department can be requested only if the administrative fee has been paid. If the fee has not been paid, the permit application is considered incomplete and an adjudicative proceeding cannot be requested.

540.10(1)(a) Adjudicative Proceedings Process

Following is a brief summary of the adjudicative proceeding process. For the purpose of this summary, the responsibilities of the department are separated into those actions required of the region and those actions required of Headquarters. The summary is written as if the appealable condition was a denial of an access connection request.

1. The region receives an access connection permit application, with fee.
2. The region processes the application and makes a determination that the access connection request will be denied.
3. The region sends the applicant a written letter denying the access connection. Included in this letter is notification that the applicant has thirty (30) days to request an adjudicative proceeding if the applicant disagrees with the region's denial decision. The region must

- notify affected property owners, permit holders, business owners, tenants, lessees, and emergency services, as appropriate.
4. The applicant requests, within thirty (30) days, an adjudicative proceeding.
 5. The region reviews its initial denial decision and determines whether there is any additional information presented that justifies reversing the original decision.
 6. If the region determines that the original denial decision will stand, the region then forwards copies of all applicable permit documentation to the HQ Development Services & Access Manager for review and processing.
 7. The HQ Development Services & Access Manager reviews the permit application and sends the permit documentation and appeal request to the Office of the Attorney General (AG).
 8. If the initial findings of the AG agree with the region's denial decision, the AG's Office sends the applicant a written letter, with the AG's signature, informing the applicant that a hearing will be scheduled for the applicant to appeal in person the department's decision to deny access.
 9. The region reserves a location and obtains a court reporter, and Headquarters obtains an Administrative Law Judge (ALJ) to conduct the proceeding. The AG, by written letter, notifies the applicant of the time and place for the hearing. The AG's Office has ninety (90) days from receipt of the applicant's appeal to approve or deny the appeal application, schedule a hearing, or decide not to conduct a hearing. The actual hearing date can be set beyond this ninety-day (90-day) review period.
 10. The AG's Office leads the department's presentation and works with the region regarding who will testify and what displays and other information will be presented to the ALJ. The HQ Development Services & Access Manager will typically not attend these proceedings.
 11. After hearing all the facts, the ALJ issues a decision, usually within a few weeks after the proceedings. However, the ALJ has ninety (90) days in which to serve a written Initial Order stating the decision.
 12. The ALJ's decision is final unless the applicant, or the department through the HQ Development Services & Access Manager, decides to appeal the ALJ's decision to the Director & State Design Engineer, Development Division. This second appeal must occur within twenty (20) days of the ALJ's written decision.
 13. If appealed to the Director & State Design Engineer, Development Division, the Director & State Design Engineer has ninety (90) days to review the Initial Order and all the facts and supporting documentation and issue a Final Order. The review by the Director & State Design Engineer does not require the applicable parties to be present and may involve only a review of the material submitted at the adjudicative proceeding.
 14. The Director & State Design Engineer's decision is final unless appealed within thirty (30) days to the Washington State Superior Court.

The above represents a general timeline if all appeals are pursued. Based on the noted timelines, it can take nearly a year before a Final Order is issued. If appealed to Superior Court, up to an additional 18 months can be added to the process. In any case, contact the region

Development Services Engineer for further guidance and direction if an appeal might be forthcoming.

540.11 Documentation

Refer to [Chapter 300](#) for design documentation requirements.

540.12 References

540.12(1) State Laws and Codes

[Chapter 520](#), Access Control, provides reference to laws and codes

540.12(2) Design Guidance

[Chapter 520](#), Access Control

Chapters in the [1100](#) series for guidance on practical design, context, and design controls

[Chapter 1230](#), Geometric Cross Section

Chapters [1300](#) and [1310](#), for intersection design policy and guidance

[Chapter 1340](#), Driveways

[Chapter 1600](#), Roadside Safety

550.01	General
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550.03	Interchange Justification Report and Supporting Analyses
550.04	Report Organization and Appendices
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550.01 General

The primary function of limited access freeways and highways is to provide safe and reliable travel for people, goods, and services from state to state and region to region within a state. They should not be used for local trips as an extension of the local street network. Adding or revising access can adversely impact the safety and operations of these facilities; therefore, access revisions must be done with caution. For this reason, new and/or modified access must be justified, and this chapter contains the process for seeking access approval.

An Interchange Justification Report (IJR) is the document used to justify a new access point or access point revision on existing limited access freeways and highways in Washington State. This chapter provides policy and guidance on developing the required documentation for an IJR, and the sequence of an IJR presentation, for both Interstate and non-Interstate limited access routes.

Federal law requires Federal Highway Administration (FHWA) approval of all revisions to the Interstate system, including changes to limited access. Both FHWA and Washington State Department of Transportation (WSDOT) policy require the formal submission of a request to either break or revise the existing limited access on Interstate routes. This policy also facilitates decision-making regarding proposed changes in access to the Interstate system in a manner that considers and is consistent with the vision, goals, and long-range transportation plans of a metropolitan area, region, and state. Breaking or revising existing limited access on state routes must be approved in accordance with [Chapter 530](#), Limited Access Control. An IJR is a document that includes all of the necessary supporting information needed for a request. It documents the IJR team's assumptions and the design of the preferred alternative, the planning process, the evaluation of the alternatives considered, and the coordination that supports and justifies the request for an access revision.

FHWA cannot give final approval to the IJR unless environmental analysis/documentation has been approved for the project. Therefore, the IJR process and the environmental analysis should be conducted concurrently. The level of environmental analysis should be consistent with the project context and significance of the potential environmental impacts. The project may qualify as Categorical Excluded (CE). This option should always be examined before proceeding with environmental documentation.

Engineers at the WSDOT Headquarters (HQ) Design Office Access and Hearings Section specialize in providing support for meeting the guidance provided in this chapter. To ensure project success, consult with them before any of the IJR work is started. They can help during

the development of the study, Methods and Assumptions Document, and the Interchange Justification Report.

An IJR support team, including HQ Access and Hearings, agrees upon what an IJR will include. IJR on the Interstate require that all eight policy points contained in the [FHWA Policy on Adding Additional Interchanges](#) be addressed. The scale and complexity of the report varies considerably with the scope of the proposal. [Exhibit 550-1](#) lists typical projects for Interstates and the required policy points to address. The level of effort is set by the support team and documented in the Methods and Assumptions Document. For non-Interstate IJR, [Exhibit 550-2](#) lists project types and required policy points to address. Both Exhibits show what approval levels are required.

When a local agency or developer is proposing an access point revision, WSDOT requires that a support team be formed.

The IJR will contain a signature page that will be stamped by the Engineer of Record responsible for the report's preparation and the Traffic Analysis Engineer responsible for the traffic analysis included in [Policy Point 3](#). (See [Exhibit 550-6](#) for an example.)

550.02 Procedures

An access point revision is a multistep process. It begins with assembling a support team to conduct a feasibility or planning-level study. The purpose of this study is to determine whether there are improvements that can be made to the local roadway network to meet the purpose and need of the proposed access modification. If the study shows that the purpose and need of the proposal cannot be achieved with the local infrastructure only, the next step would normally be to prepare an IJR (see the Interstate IJR: Process Flow Chart, [Exhibit 550-3](#)).

The IJR is typically initiated early in the environmental process. Traffic analyses help define the area of impact and the range of alternatives. Since the traffic data required for the National Environmental Policy Act (NEPA) or the State Environmental Policy Act (SEPA) and the operational/safety analyses of the IJR are the same, these documents need to be coordinated and developed together, using the same data sources and procedures.

Consider implementing Planning and Environmental Linkage (PEL) principles during the feasibility/planning study phase of the IJR to eliminate rework in the environmental review/NEPA stage of the project. Using the PEL approach is most valuable for a project where an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required. If the project is classified as a CE, information from the Corridor Sketch Plan can be useful. Application of PEL principles may require:

- Public and agency involvement effort with increased opportunity for comment and comprehensive documentation of process, meetings held, attendance, comments received and response to those comments;
- Analysis of potentially high-risk environmental areas and multidisciplinary assessment of project impacts; and
- Documentation of the methodology and data sources used to assess environmental resources.

Contact the HQ NEPA Specialist for additional guidance about PEL process and requirements.

The required steps in the IJR process are described in detail in this chapter, and include:

- Assemble the support team to engage subject experts and decision makers.
- Define purpose and need of the proposal (team).
- Determine whether a feasibility study needs to be conducted or already exists (team).
- Prepare Methods and Assumptions Document to lay the groundwork for the IJR, including scope of IJR and team roles and responsibilities (team).
- Endorse Methods and Assumptions Document to prepare the IJR (team).
- Prepare draft IJR (team or consultant).
- Review draft IJR (team).
- Finalize IJR by addressing comments and issues.
- Review and approve IJR (or conceptual approval).

550.02(1) Organize Support Team and Conduct Study

550.02(1)(a) Support Team

Establish a support team before beginning the feasibility study. This same support team is also involved with the IJR process if the study shows that either a revision or a new access point is needed to meet the proposal purpose and need.

The support team normally consists of the following:

- FHWA Area Engineer and FHWA Safety and Geometric Design Engineer (for Interstate projects)
- Region Planning, Design, or Project Development Engineer (or designee), Region Traffic
- HQ Assistant State Design Engineer
- HQ Development Services & Access Manager
- HQ Traffic Office Representative
- Representative from local agencies (city, county, port, or tribal government)
- Recorder (records and prepares meeting minutes for documentation purposes)

The support team enlists specialists, including but not limited to:

- Metropolitan Planning Organization (MPO)
- Regional Transportation Planning Organization (RTPO)
- WSDOT region (planning, design, environmental, maintenance, and traffic)
- WSDOT Headquarters (design, environmental, bridge, traffic, and geotechnical)
- Project proponent specialists (region, local agency, developer)
- Transit agencies
- Other identified stakeholders/partners

The support team's role is to:

- Develop processes for reaching agreement, resolving disputes, and assigning responsibility for final decisions. This is especially important for complex proposals.
- Review regional and state transportation plans to see if the request is consistent with the needs and solutions shown in those plans.
- Develop purpose and need statements for the proposal, consistent with the project environmental document or PEL process.
- Expedite the study steps (and, if needed, the IJR development and review process) through early communication and agreement.
- Establish the agreed-upon study area (including baseline transportation improvements) and future travel demand forecasts for each of the alternatives being considered.
- Develop and endorse the Methods and Assumptions Document.
- Provide guidance and support.
- Evaluate data and identify possible alternatives for the proposal during the study and, if needed, for an IJR.
- Contribute material for the report that documents the discussions and decisions.
- Review results and determine whether an IJR is warranted.
- Ensure the compatibility of data used in adjacent or overlapping studies.
- Ensure integration of the following as required: Project Definition process, value engineering studies, public involvement efforts, environmental analyses, operational analyses, safety analyses, and other analyses for the study. This encourages the use of consistent data. If conducting a feasibility/planning level study, consider implementing PEL process to minimize re-work.
- Address design elements and known design analyses, drawing from the Basis of Design (see Chapter 300), to support Policy Point 4.

The support team works together, from the corridor study through preparation of the assumptions document and completion of the IJR.

550.02(1)(b) Methods and Assumptions Document

This document is developed to record assumptions used in the IJR, the purpose and need, along with analysis methodologies, criteria, and support team decisions. The document presents the proposed traffic analysis tool and approach, safety analysis methodology, study area, peak hour(s) for analysis, traffic data, design year, opening year, travel demand forecasts, baseline conditions, and design year conditions. It also documents the team's decisions on how much detail will be included in each policy point, the required level of environmental documentation (CE, EA, EIS), and the anticipated timing of the work (concurrent with, or subsequent to the IJR). The timing of environmental documentation determines the level of approval for the IJR, see 550.01.

The signed Methods and Assumptions Document represents endorsement by the support team on the IJR approach, tools, data, and criteria used throughout the IJR process. This document is used on both interstate & non-interstate IJR.

The Methods and Assumptions Document is dynamic, and is updated and re-endorsed when changed conditions warrant. The document also serves as a historical record of the processes,

dates, and decisions made by the team. WSDOT and FHWA require the development and acceptance of the document, because early agreement on details results in the highest level of success for the IJR process.

Use the WSDOT Methods and Assumptions Document template here:

www.wsdot.wa.gov/design/accessandhearings

Refer to [Exhibit 550-5](#) for an example form for support team's concurrence to Methods and Assumptions Document.

550.02(1)(c) Feasibility Study

The feasibility study will include practical design procedures described in Division 11 of this Design Manual. The support team identified in [550.02\(1\)\(a\)](#) will assume the role of the Multiagency and Interdisciplinary Stakeholder Advisory team described in [Chapter 1100](#). Prior to commencing the feasibility study it is critical to establish the project performance needs (see [Chapter 1101](#)) with the support team.

Study the transportation network in the area. This study must identify the segments of both the local and regional network that are currently experiencing congestion or safety deficiencies, or where planned land use changes will prompt the need to evaluate the demands on and the capacity of the transportation system. The study area includes the affected existing and proposed interchanges/ intersections upstream and downstream from the proposed access point revision. Extend the study area far enough that the proposal creates no significant impacts to the adjacent interchanges/intersections, then analyze only through the area of influence. When the area of influence extends beyond one interchange/intersection upstream and downstream, extend the analysis to include the extent of the traffic impacts.

Segments of the local and regional network within the study area will be evaluated for system improvements. Part of the study process is to identify local infrastructure needs and develop a proposal. The study must investigate investments in local infrastructure improvements to meet the purpose and need of the proposal. It must be shown that the local infrastructure alone cannot be improved to address the purpose and need. The limited access facility should not be used to solve congestion problems on the local network.

During the feasibility study process and while developing a proposal, it is important to use the data and analysis methods required for an IJR. If the study indicates that an IJR is warranted, the study data can then be utilized in the IJR. The feasibility study and the IJR can also be used to support the transportation analysis requirements in the project's environmental documentation (CE, EA, or EIS).

550.02(1)(d) Analysis and Data to Support Proposal

The proposal analysis tools, data, and study area must be agreed upon by the support team. Use the Methods and Assumptions Document to detail the specific items and record the team's agreement to them. Establishing assumptions upfront ensures the project will have the highest rate of success. For further guidance and examples on assumptions documents, see:

www.wsdot.wa.gov/design/accessandhearings

Show that a preliminary (planning level) analysis, comparing build to no-build data, was conducted for the current year, year of opening, and design year, comparing baseline, no-build condition, and build alternatives. Include the following steps:

1. Define the study area. The study area is a minimum of one interchange upstream and downstream from the proposal. The study area should be expanded as necessary to capture operational impacts of adjacent interchanges in the vicinity that are, or will be, bottlenecks or chokepoints that influence the operations of the study interchange.
2. Establish baseline transportation networks and future land use projections for the study area. The baseline transportation network typically includes local, regional, and state transportation improvement projects that are funded. The land use projection includes population and employment forecasts consistent with the regional (MPO or RTP) and local jurisdiction forecasts.
3. Establish the environmental classification (CE, EA, EIS), level of environmental analysis (feasibility study or NEPA documentation), and timing of environmental work (concurrent with or subsequent to IJR analysis). If a feasibility study is selected, determine if PEL principles will be implemented and if resource agencies will be invited to participate.
4. Collect and analyze current traffic volumes to develop current year, year of opening, and design year (see Chapter 1103) peak hour traffic estimates for the regional and local systems in the area of the proposal. Use regional transportation planning organization-based forecasts, refined by accepted travel demand estimating procedures. Forecasts for specific ramp traffic may require other methods of estimation procedures and must be consistent with the projections of the travel demand models. Modeling must include increased demand caused by anticipated development.
5. Identify the origins and destinations of trips on the local systems, the existing interchange/intersections, and the proposed access using existing information.
6. Develop travel demand forecasts corresponding to proposed alternatives that might be made to the following:
 - The local system: widen, add new surface routes, coordinate the signal system, control access, improve local circulation, or improve parallel roads or streets.
 - The existing interchanges: lengthen or widen ramps, add park & ride lots, or add frontage roads.
 - The freeway lanes: add collector-distributor roads or auxiliary lanes.
 - Transportation system management and travel demand management measures.
7. Describe the current year, year of opening, and design year level of service at all affected locations within the study area, including local systems, existing ramps, and freeway lanes.

550.02(2) Conduct Analysis and Prepare IJR

Prepare a detailed IJR using the guidance in [550.03](#), Interchange Justification Report and Supporting Analyses, and [Exhibit 550-3](#).

550.02(2)(a) IJR Policy Points

The IJR addresses the following eight specific policy points, which are described in detail in [550.04](#):

1. Need for the Access Point Revision
2. Reasonable Alternatives
3. Operational and Crash Analyses

4. Access Connections and Design
5. Land Use and Transportation Plans
6. Future Interchanges
7. Coordination
8. Environmental Processes

550.03 Interchange Justification Report and Supporting Analyses

The eight policy points are presented below. Factors that affect the scope include location (rural or urban), access points (new or revised), ramps (new or existing), ramp terminals (freeway or local road), complexity of the environmental context, and potential for significant environmental impacts or controversy on environmental grounds.

550.03(1) Policy Point 1: Need for the Access Point Revision

What are the current and projected needs? Why are the existing access points and the existing or improved local system unable to meet the proposal needs? Is the anticipated demand short or long trip?

Describe the need for the access point revision and why the existing access points and the existing or improved local system cannot address the need. How does the proposal meet the design year travel demand? Provide the analysis and data to support the need for the access request.

550.03(1)(a) Project Description

Describe the needs being addressed, and define the current problem or deficiency that the project is looking to address or overcome. Using specific performance measures can be helpful; for example, state the average speed or throughput during the A.M. or P.M. peak. The need for improvement should be established using factors such as existing conditions and the conditions anticipated to occur in the analysis years under the “no-build” alternative, or other factors such as the need for system linkage.

Demonstrate that improvements to the local transportation system and the existing interchanges cannot be improved to satisfactorily accommodate the design year travel demands. Describe traffic mitigation measures considered at locations where the level of service (LOS) is (or will be) below agreed-upon service standards in the design year. (See the State Highway System Plan for further information on LOS standards.) Additional measures of effectiveness (such as density, speed changes, delay, and travel times) should be discussed and documented in the Methods and Assumptions Document.

The access point revision should meet regional, not local, travel demands. Describe the local and regional traffic (trip link and/or route choice) benefiting from the proposal.

550.03(2) Policy Point 2: Reasonable Alternatives

Describe the reasonable alternatives that have been evaluated.

Describe all reasonable alternatives that have been considered. These include the design options, locations, project phasing, and transportation system management-type improvements such as ramp metering, public transportation, and HOV facilities that have been assessed and that meet the proposal's design year needs. The alternatives analysis must be the same as that used in the environmental documentation.

After describing each of the alternatives that were proposed, explain why reasonable alternatives were omitted or dismissed from further consideration. Where operational and safety concerns are some of the reasons that alternatives are rejected, the support group may need operational and/or safety analyses for those alternatives (see [Policy Point 3](#) below).

Future projects must be coordinated as described in [Policy Point 7](#), Coordination.

Environmental concerns may preclude consideration of some alternatives. Detailed analysis of sensitive resources and possible concurrence by resource agencies may be required (see [Policy Point 8](#) below).

550.03(3) Policy Point 3: Operational and Crash Analyses

How will the proposal affect safety and traffic operations at year of opening and design year?

Policy Point 3 documents the operational and safety effects of the proposal(s) and the results that support the final proposal, including any mitigation measures that compensate for operational and/or safety tradeoffs. Information from the Basis of Design and Alternatives Comparison Table (see Division 11) can be used to support the analysis in Policy Point 3. Include a conceptual plan of the type and location of the signs proposed to support the design alternative.

The preferred operational alternative is selected, in part, by showing that it will meet the access needs without causing a significant adverse impact on the operation and safety of the freeway and the affected local network, or that the proposal impacts will be mitigated.

Document the results of the following analyses in the report:

- Operational Analysis – “No-Build” Alternative: An operational analysis of the current year, year of opening, and design year for the existing limited access freeway and the affected local roadway system. This is the baseline plus state transportation plan and comprehensive plan improvements expected to exist at the year of opening or design year. All of the alternatives will be compared to the no-build condition. The report should document the calibration process and results that show the current year operations closely match actual field conditions.
- Operational Analysis – “Build” Alternative: An operational analysis of the year of opening and design year for the proposed future freeway and the affected local roadway system.
- Crash Analysis – “Observed crash history”: Document the observed crash history, for the most current data years, of the existing limited access freeway and the affected local roadway system. The support team will determine the number of years as well as the scope and detail of this section.

- Crash Analysis – “Proposal(s)”: A crash analysis should be performed for the year of opening and design year of the existing limited access freeway and the affected local roadway system for the “no-build,” “build,” and possibly other scenarios as determined by the support team. The support team will also determine the year of opening and design year as well as the scope and detail of this section.

The data used for the operational and safety analyses must be the same as the data used in the environmental documentation (see [Policy Point 8](#) below). If not, describe and justify the discrepancies in the Methods and Assumptions Document as well as in this section of the IJR. The transportation section of the environmental document should include a similar discussion, and the Methods and Assumption Document should be included in the appendix of the environmental document.

550.03(3)(a) Operational Analyses

Demonstrate that the proposal does not have a significant adverse impact on the operation of the freeway and the affected local roadway system. If there are proposal impacts, explain how the impacts will be mitigated.

To understand the proposal’s positive and negative impacts to main line, crossroad, and local system operations, the selection of the appropriate analysis tool(s) is critical. This is a major piece of the assumptions process. Record the support team’s tool selection agreement in the Methods and Assumptions Document. FHWA’s [Traffic Analysis Toolbox](#) provides an overview and details for making the best tool category selection.

Document the selected operational analysis procedures. For complex urban projects, a refined model might be necessary. WSDOT supports the traffic analysis and traffic simulation software listed on the HQ Traffic Operations website: www.wsdot.wa.gov/design/traffic/analysis/

All operational analyses shall be of sufficient detail, and include sufficient data and procedure documentation, to allow independent analysis during FHWA and Headquarters evaluation of the proposal. For Interstate proposals, Headquarters must provide concurrence before it transmits the proposal to FHWA with its recommendation.

Prepare a layout displaying adjacent interchanges/intersections and the data noted below, based on support team determination, which should show:

- Distances between intersections or ramps of a proposed interchange, and those of adjacent existing and known proposed interchanges.
- Design speeds. WSDOT uses a target speed approach for determining design speed. The objective of the target speed approach is to establish the design speed at the desired operating speed (see Chapter 1103).
- Grades.
- Truck volume percentages on the freeway, ramps, and affected roadways.
- Adjustment factors (such as peak hour factors).
- Affected freeway, ramp, and local roadway system traffic volumes for the “no-build” and each “build” option. This will include: A.M. and P.M. peaks (noon peaks, if applicable); turning volumes; average daily traffic (ADT) for the current year; and forecast ADT for year of opening and design year.

- Affected main line, ramp, and local roadway system lane configurations.

The study area of the operational analysis on the local roadway system includes documenting that the local network is able to safely and adequately collect and distribute any new traffic loads resulting from the access point revision. Expand the limits of the study area, if necessary, to analyze the coordination required with an in-place or proposed traffic signal system. Record the limits of the analysis as well as how the limits were established in the project Methods and Assumptions Document.

Document the results of analyzing the existing access and the proposed access point revision at all affected locations within the limits of the study area, such as weave, merge, diverge, ramp terminals, crash sites, and HOV lanes; along the affected section of freeway main line and ramps; and on the affected local roadway system. In the report, highlight the following:

- Any location for which there is a significant adverse impact on the operation or safety of the freeway facility, such as causing a reduction of the operational efficiency of a merge condition at an existing ramp; introducing a weave; or significantly reducing the level of service on the main line due to additional travel demand. Note what will be done to mitigate this adverse impact.
- Any location where a congestion point will be improved or eliminated by the proposal, such as proposed auxiliary lanes or collector-distributor roads for weave sections.
- Any local roadway network conditions that will affect traffic entering or exiting the freeway. If entering traffic is to be metered, explain the effect on the connecting local system (for example, vehicle storage).
- When the existing local and freeway network does not meet agreed-upon level of service standards, show how the proposal will improve the level of service or keep it from becoming worse than the no-build condition in the year of opening and the design year. Level of service should not be the only performance measure evaluated. There are other measures of effectiveness that can be used to illustrate a broader traffic operation perspective.

550.03(3)(b) Crash Analysis

This section describes the two parts of an IJR crash analysis: the existing (observed) condition as well as the proposed “no-build,” “build,” and possibly other scenarios as determined by the support team. It is the intent of this section that future readers will fully understand the existing condition and all of the presented scenarios without the need for other documents. The study limits (area and years) are the same as the study limits of the operational analyses. If the support team determines that some limits are different from the operational analysis, document them by describing and justifying the differences in the Methods and Assumptions Document as well as in Policy Point 3 of the IJR. Document all the tools used and all assumptions made and agreed to as well as the basis and reason(s) for using those tools and assumptions. The data used for the crash analysis must be the same as the data used in the operational analysis and the environmental documentation. If not, describe and justify the differences. ([Chapter 321](#), Sustainable Safety, gives crash analysis guidance.)

Crash analysis data needs to include a disclaimer: “Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.”

550.03(3)(b)(1) Existing (Observed) Portion of Crash Analysis

Identify and document the crash histories, severities, and types for the existing freeway section and the adjacent affected local surface system within the study area as determined by the support team. A five-year crash history is a good default; however, the support team will determine the number of years.

Document all the tools used and all assumptions made and agreed to as well as the basis and reason(s) for using those tools and assumptions.

Detailed list of the existing (observed) portion of the crash analysis:

Document the existing safety performance of the freeway section and the adjacent affected local surface system within the study area.

- Produce a diagram of the crash history of the freeway section and the adjacent affected local surface system within the study limits.
- Analyze the existing performance of the freeway section and the adjacent affected local surface system within the study area for over dispersions of crash types, contributing circumstances, and/or severities.
 - o What types of crashes are occurring (overturns, rear-ends, enter-at-angle, hitting fixed object)?
 - o What types of crashes are most prevalent?
 - o Are there any patterns of crash type or cause?
 - o Use ISATe (Enhanced Interchange Safety Analysis Tool) to determine if there are any over dispersions of crash types or causes.
- Determine severity (fatalities, serious injuries, evident injuries, possible injuries, and/or property damage only).
 - o What crash severities are most prevalent?
 - o Are there any crash severity patterns?
 - o Use ISATe to determine if there are any over dispersions of severities.
- Use ISATe to perform an expected safety performance analysis using the observed crashes to determine if the existing safety performance is normal for the existing configuration as compared to others like it (see [Chapter 321](#) for guidance).

550.03(3)(b)(2) Proposed Portion of Crash Analysis

Identify and document the predicted safety performance of the proposed access point revision proposal(s), including the freeway section, speed change lanes, ramps, collector-distributor (c-d) lanes, ramp terminal intersections, and the adjacent affected local surface system, including segments and intersections.

Demonstrate that (1) the final proposal does not have a significant adverse impact on the safety of the freeway or the adjacent affected local surface system, or (2) a list of the mitigation measures mitigate each adverse impact.

Document all the tools used and all assumptions made and agreed to as well as the basis and reason(s) for using those tools and assumptions.

Detailed list of the predicted safety performance portion of the crash analysis.

- Document the predicted safety performance of the freeway section using the Highway Safety Manual (to access ISATe), speed change lanes, ramps, c-d lines, ramp terminal intersections, and the adjacent affected local surface system, including segments and intersections within the study limits for each of the proposed “no-build,” “build,” and possibly other scenarios and alternatives as determined by the support team.
- Document the design elements that contribute to the predicted safety performance, including types and severities of crashes, especially design elements that contribute to significant adverse safety impacts of the freeway or the adjacent affected local surface system.
- Compare the safety performances of the “no-build” scenario(s) with the safety performance of the proposed scenario(s) to demonstrate that the final proposal(s) do not have a significant adverse impact on the safety of the freeway or the adjacent affected local surface system.
 - o Break out fatal and serious injuries in this analysis.

550.03(4) Policy Point 4: Access Connections and Design

Will the proposal provide fully directional interchanges connected to public streets or roads, spaced appropriately, and designed to meet the identified performance needs?

Provide for all directions of traffic movement on Interstate system-to-system type interchanges, unless justified. The intent is to provide full movement at all interchanges, whenever feasible. Partial interchanges are discouraged and will not likely be approved for Interstate access. Less than fully directional interchanges for special-purpose access for transit vehicles, for HOVs, or to or from park & ride lots will be considered on a case-by-case basis.

A proposed new or revised interchange access must connect to a public freeway, road, or street and be endorsed by the local governmental agency or tribal government having jurisdiction over said public freeway, road, or street.

Explain how the proposed access point relates to present and future proposed interchange configurations and the Design Manual spacing criteria. Note that urban and rural interchange spacing for crossroads also includes additional spacing requirements between adjacent ramps, as noted in [Chapter 1360](#).

Develop the proposal in sufficient detail to conduct a design and operational analysis. Include the number of lanes, horizontal and vertical curvature, lateral clearance, lane width, shoulder width, weaving distance, ramp taper, interchange spacing, and all traffic movements. This information is presented as a sketch or a more complex layout, depending on the complexity of the proposal. The resulting footprint should be used to assess the potential environmental impacts for each alternative (See [Policy Point 8](#) below).

The status of all known or anticipated project design analyses must be noted in this policy point, as described in [Chapter 300](#).

550.03(5) Policy Point 5: Land Use and Transportation Plans

Is the proposed access point revision compatible with all land use and transportation plans for the area?

Show that the proposal is consistent with local and regional land use and transportation plans. Before final approval, all requests for access point revisions must be consistent with the regional or statewide transportation plan, as appropriate. The proposed access point revision may affect adjacent land use and, conversely, land use may affect the travel demand generated. Therefore, reference and show compatibility with the land use plans, zoning controls, and transportation ordinances in the affected area.

Explain the consistency of the proposed access point revision with the plans and studies, the applicable provisions of [23 CFR Part 450](#), the applicable transportation conformity requirements of [40 CFR Parts 51 and 93](#), and [Chapter 36.70A RCW](#).

The support team reviews regional and state transportation plans to determine whether the need and proposed solution are already identified. Proposals to request new or reconstructed interchanges must be consistent with those plans.

If the proposed access is not specifically referenced in the transportation plans, define its consistency with the plans and indicate the process for the responsible planning agency to incorporate the project. In urbanized areas, the plan refinement must be adopted by the metropolitan planning organization (MPO) before the project is designed. The action must also be consistent with the multimodal State Transportation Plan. The results should be consistent with the data used to support the Social and Economic analysis conducted in the Environmental Documentation (see [Policy Point 8](#) below).

550.03(6) Policy Point 6: Future Interchanges

Is the proposed access point revision compatible with a comprehensive network plan? Is the proposal compatible with other known new access points and known revisions to existing points?

The report must demonstrate that the proposed access point revision is compatible with other planned access points and revisions to existing points.

Reference and summarize any comprehensive freeway network study, plan refinement study, or traffic circulation study.

Explain the consistency of the proposed access point revision with those studies.

550.03(7) Policy Point 7: Coordination

Are all coordinating projects and actions programmed and funded?

When the request for an access point revision is generated by new or expanded development, demonstrate appropriate coordination between the development and the changes to the transportation system. Coordination will include local agencies, local groups, and public outreach. See [Section 1100.03 Community Engagement](#).

Show that the proposal includes a commitment to complete the other non-interchange/non-intersection improvements that are necessary for the interchange/intersection to function as proposed. For example, if improvements to the local circulation system are necessary for the

proposal to operate, they must be in place before new ramps are opened to traffic. If future reconstruction is part of the mitigation for design year level of service, the reconstruction projects must be in the State Highway System Plan and Regional Transportation Plan.

All elements for improvements are encouraged to include known fiscal commitments and an anticipated time for completion. If the project is to be constructed in phases, it must be demonstrated in Policy Point 3 that each phase can function independently and does not affect the safety and operational efficiency of the freeway. Identify the funding sources, both existing and projected, and the estimated time of completion for each project phase. Review PEL principles to ensure that community engagement efforts implemented during a planning/feasibility study IJR will be robust enough to carry forward into the environmental documentation phase (see [Policy Point 8](#) below).

550.03(8) Policy Point 8: Environmental Processes

What is the status of the proposal's environmental processes? This section should be something more than just a status report of the environmental process; it should be a brief summary of the environmental process.

All requests must closely adhere to the planning and environmental review processes as required in [23 CFR parts 450](#) and [771](#). This means the final FHWA approval of requests for new or revised access cannot precede the completion of these processes or necessary actions.

All requests for access point revisions on freeways must contain information on the status of the environmental approval and permitting processes.

The following are just a few examples of environmental status information that may apply:

- Have the environmental documents been approved? If not, when is the anticipated approval date?
- Did the study team determine that a planning/feasibility study will be completed for the IJR? Will PEL principles be followed during the study to minimize rework during the environmental documentation phase of the project as recorded in the Methods and Assumptions document?
- What applicable permits and approvals have been obtained and/or are pending?
- Are there hearings still to be held?
- Is the environmental process waiting for an engineering and operational acceptability decision?
- Are the assumptions, methodology, study area, traffic analysis, crash data, coordination and public outreach results used in the environmental analysis consistent with the IJR? If no, explain why not and provide justification.

The environmental documentation process followed for the IJR will be the same process used for any other WSDOT project consistent with the respective environmental classification (CE, EA, EIS). Follow the procedures outlined in the *Environmental Manual Chapter 400* and the WSDOT [EA/EIS](#) and [CE](#) web pages. A general description of how this work coincides with the IJR process is provided in [Exhibits 550-3](#) and [550-4](#). Consult with your Region Environmental Office and the HQ NEPA/SEPA Specialist prior to beginning work on the Environmental Documentation to

ensure that the effort is still consistent with the environmental classification made in the Methods and Assumption document.

If the project is being led by a local agency, follow the guidance provided in [NEPA Categorical Exclusions A Guidebook for Local Agencies](#), WSDOT.

550.04 Report Organization and Appendices

Begin the IJR with an executive summary. Briefly describe the access point revision being submitted for a decision and why the revision is needed. Include a brief summary of the proposal.

The IJR must be assembled in the policy point order noted in [550.02\(2\)](#).

Formatting for the IJR includes providing numbered tabs in the report for each policy point section and each appendix and numbering all pages, including references and appendices. A suggestion for page numbering is to number each individual section, such as “Policy Point 3, PP3–4” and “Appendix 2, A2–25.” This allows for changes without renumbering the entire report.

On the bottom of each page, place the revision date for each version of the IJR. As an individual page is updated, this revision date will help track the most current version of that page. Also, include the title of the report on the bottom of each page.

Use a three-ring binder for ease of page replacement. Do not use comb or spiral binding.

Appendix A is reserved for the Methods and Assumptions Document. Include meeting notes where subsequent decisions are made as additional appendices to the original signed document.

Additional appendices may include documents such as [Intersection Control Analysis](#), technical memorandums, memos, and traffic analysis operations output.

550.05 IJR Review and Approval

Concurrence and approval of a new or revised access point is based on the IJR. The IJR must contain sufficient information about and evaluation/analysis of the proposal to provide assurance that the safety and operations of the freeway and local systems are not significantly impacted.

The region, or proponents, with the help of the support team, prepares the IJR and submits four draft copies, including backup traffic data, to the HQ Access and Hearings Section for review.

For a final IJR submittal, contact the HQ Access and Hearing Section for the necessary number of copies.

550.05(1) Interstate IJR Approval

On Interstate projects, a submittal letter is sent by the region to the HQ Access and Hearings Section, requesting final FHWA approval of the IJR. Interstate IJR's are submitted by Headquarters to FHWA for approval.

Interstate access point revisions are reviewed by both WSDOT Headquarters and FHWA. This can be a two-step process:

- If environmental documentation has not yet been approved, an [FHWA](#) finding of engineering and operational acceptability can be given.
- If the environmental documentation is complete, final approval can be given.

Some Interstate IJR's are reviewed and approved by the Washington FHWA Division Office. Other Interstate IJR's are reviewed and approved by the FHWA Headquarters Office in Washington DC. Additional review time is necessary for reports that have to be submitted to Washington DC (see [Exhibit 550-1](#)).

Final IJR approval by FHWA is provided when the appropriate final environmental decision is complete: [ECS](#), [FONSI](#), or [ROD](#).

550.05(2) Non-Interstate IJR Approval

On non-Interstate projects, concurrence from the support team is required on the Methods and Assumptions to document the acceptance of the scope and complexity of the IJR or the acceptance of the decision that an IJR is not required. If an IJR is prepared, the appropriate WSDOT HQ Assistant State Design Engineer grants the final approval (see [Exhibits 550-2](#) and [550-4](#)).

This can be a two-step process:

- If environmental documentation has not yet been approved, a finding of engineering and operational acceptability can be given.
- If the environmental documentation is complete, final approval can be given.

550.06 Updating an IJR

Recognizing that the time period between the approval of the IJR, completion of the environmental documentation, and the construction contract commonly spans several years, the approved IJR will be reviewed and updated to identify changes that may have occurred during this time period. If no work has begun within three years of completion of the environmental documentation, a re-evaluation of the CE/EA/EIS will be required. Submit a summary assessment to the HQ Design Office for evaluation to determine whether the IJR needs to be updated. Contact the HQ NEPA/SEPA Specialist to determine if the environmental documentation must be re-evaluated. The HQ Design Office will forward the assessment to FHWA if necessary. The assessment is a document summarizing the significant changes since it was approved. Contact the HQ Access and Hearings Section and the NEPA/SEPA Specialist to coordinate this summary assessment.

If the project is being led by a local agency, follow the guidance provided in [NEPA Categorical Exclusions A Guidebook for Local Agencies](#), WSDOT.

550.07 Documentation

Refer to [Chapter 300](#) for design documentation requirements.

550.08 References

550.08(1) Federal/State Laws and Codes

[23 Code of Federal Regulations \(CFR\) Part 450](#) (implementing 23 United States Code [USC] Section 135)

[40 CFR Parts 51 and 93](#) (regarding federal conformity with state and federal air quality implementation plans)

[23 USC Sections 111](#) (requires the U.S. Secretary of Transportation to approve access revisions to the Interstate System), [134](#) (metropolitan transportation planning), and [135](#) (statewide transportation planning)

FHWA “Interstate System Access Information Guide”

🔗 www.fhwa.dot.gov/design/interstate/pubs/access/access.pdf

Notice of policy statement: “Additional Interchanges to the Interstate System,” FHWA notice published in the Federal Register, February 11, 1998 (Vol. 63, No. 28)

🔗 www.access.gpo.gov/su_docs/fedreg/a980211c.html

[Revised Code of Washington \(RCW\) 36.70A](#), Growth management – Planning by selected counties and cities

550.08(2) Design Guidance and Supporting Information

Design Manual, [Chapter 320](#), Traffic Analysis

Design Manual, [Chapter 321](#), Sustainable Safety

Design Manual Glossary – Defines many of the terms encountered in this chapter

FHWA Traffic Analysis Toolbox (tools used in support of traffic operations analyses)

🔗 www.ops.fhwa.dot.gov/trafficanalysistools/index.htm

FHWA Environmental Review Toolkit

🔗 www.environment.fhwa.dot.gov/integ/index.asp

Highway Capacity Manual, (HCM) 2010, Transportation Research Council

Highway Safety Manual (HSM), AASHTO, 2010

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

[NEPA Categorical Exclusions A Guidebook for Local Agencies](#), WSDOT

State Highway System Plan 🔗 www.wsdot.wa.gov/planning/HSP

WSDOT GeoPortal – Tool for viewing WSDOT spatial data (like Functional Class, Interchange Drawings, City Limits, and State Routes) via a web browser. Users can check a box to select from a variety of base maps and data layers.

🔗 http://wwwi.wsdot.wa.gov/planning/data/gis/tools/geoportal_int.htm

WSDOT HQ Access and Hearings web page (provides guidance and timelines for preparing IJR and example Methods and Assumptions Documents):

🔗 www.wsdot.wa.gov/design/accessandhearings

Exhibit 550-1 Interstate Routes: IJR Content and Review Levels

Project Type	Support Team	Policy Point								Concurrence	Approval
		1	2	3	4	5	6	7	8		
Interstate Routes											
New freeway-to-crossroad interchange in a Transportation Management Area ^[1]	Yes	✓	✓	✓	✓	✓	✓	✓	✓	FHWA and HQ	FHWA DC
New partial interchange	Yes	✓	✓	✓	✓	✓	✓	✓	✓	FHWA and HQ	FHWA DC
New HOV direct access	Yes	✓	✓	✓	✓	✓	✓	✓	✓	FHWA and HQ	FHWA DC
New freeway-to-freeway interchange	Yes	✓	✓	✓	✓	✓	✓	✓	✓	FHWA and HQ	FHWA DC
Revision to freeway-to-freeway interchange in a Transportation Management Area ^{[1][2]}	Yes	✓	✓	✓	✓	✓	✓	✓	✓	FHWA and HQ	FHWA
New freeway-to-crossroad interchange not in a Transportation Management Area ^[1]	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Revision to freeway-to-freeway interchange not in a Transportation Management Area ^{[1][2]}	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Revision to interchange ^{[2][3]}	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Transit flyer stop on main line	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Transit flyer stop on an on-ramp	No	✓		✓	✓				✓	HQ	FHWA
Addition of entrance or exit ramps that complete basic movements at an existing interchange	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Abandonment of a ramp ^[4]	Yes	✓	✓	✓	✓	✓	✓	✓	✓	HQ	FHWA
Locked gate ^[6]	No	✓			[5]				✓	HQ	FHWA
Access breaks that do not allow any type of access to main line or ramps	No	✓	✓		[5]				✓	HQ	FHWA
Pedestrian structure	No	✓			[5]				✓	HQ	FHWA
Construction/emergency access break	No	✓	✓	✓	✓				✓	Region	FHWA

Notes:

All policy points must be addressed on all studies. The scale and scope of the project dictate the level of effort needed to address each policy point. Blank cells in the table above indicate that the policy point will need to be addressed briefly in the IJR. Consult the HQ Access and Hearings Section for direction.

- [1] In Washington, designated Transportation Management Areas include Clark, King, Kitsap, Pierce, Snohomish, and Spokane counties.
- [2] "Revision" includes changes in interchange configuration, even though the number of access points does not change. Changing from a cloverleaf to a directional interchange is an example of a "revision."
- [3] Revisions that might adversely affect the level of service of the through lanes. Examples include: doubling lanes for an on-ramp with double entry to the freeway; adding a loop ramp to an existing diamond interchange; and replacing a diamond ramp with a loop ramp. Revisions to the ramp terminal intersections may not require an IJR unless the traffic analysis shows an impact to the main line traffic.
- [4] Unless it is a condition of the original approval.
- [5] Update the right of way/limited access plan as necessary.
- [6] As part of [Policy Point 1](#), include a narrative stating that all other alternatives are not feasible.

Exhibit 550-2 Non-Interstate Routes: IJR Content and Review Levels

Project Type	Support Team	Policy Point								Concurrence	Approval
		1	2	3	4	5	6	7	8		
Non-Interstate Routes											
New freeway-to-crossroad interchange on a predominately grade-separated corridor	Yes	✓	✓	✓	✓	✓	✓	✓	✓	Region	HQ
New freeway-to-freeway interchange	Yes	✓	✓	✓	✓	✓	✓	✓	✓	Region	HQ
Revision to freeway-to-freeway interchange	Yes	✓	✓	✓	✓	✓	✓	✓	✓	Region	HQ
New freeway-to-crossroad interchange on a predominately at-grade corridor ^[5]	No	✓		✓	✓				✓	Region	HQ
Revision to interchange ^[1]	No	✓		✓	✓				✓	Region	HQ
Addition of entrance or exit ramps that complete basic movements at an existing interchange	No	✓		✓	✓				✓	Region	HQ
Abandonment of a ramp ^[2]	No	✓		✓					✓	Region	HQ
Transit flyer stop on main line	Yes	✓	✓	✓	✓	✓	✓	✓	✓	Region	HQ
Transit flyer stop on an on-ramp	No	✓		✓	✓				✓	Region	HQ
Locked gate ^[4]	No	✓			[3]				✓	Region	HQ
Pedestrian structure	No	✓			[3]				✓	Region	HQ
Construction/emergency access break	No	✓	✓	✓					✓	Region	HQ

Notes:

Policy points to be addressed will be determined by the IJR support team. The scale and scope of the project dictate the level of effort needed to address each policy point. Blank cells in the table above indicate that the policy point will need to be addressed briefly in the IJR as determined by the support team. Consult the HQ Access and Hearings Section for direction.

- [1] Revisions that might adversely affect the level of service of the through lanes. Examples include: doubling lanes for an on-ramp with double entry to the freeway; adding a loop ramp to an existing diamond interchange; and replacing a diamond ramp with a loop ramp.
- [2] Unless it is a condition of the original approval.
- [3] Update the right of way/limited access plan as necessary.
- [4] As part of [Policy Point 1](#), include a narrative stating that all other alternatives are not feasible.
- [5] Example: Revising an existing at-grade intersection into an access controlled grade-separated interchange.

Exhibit 550-3 Interstate IJR: Process Flow Chart

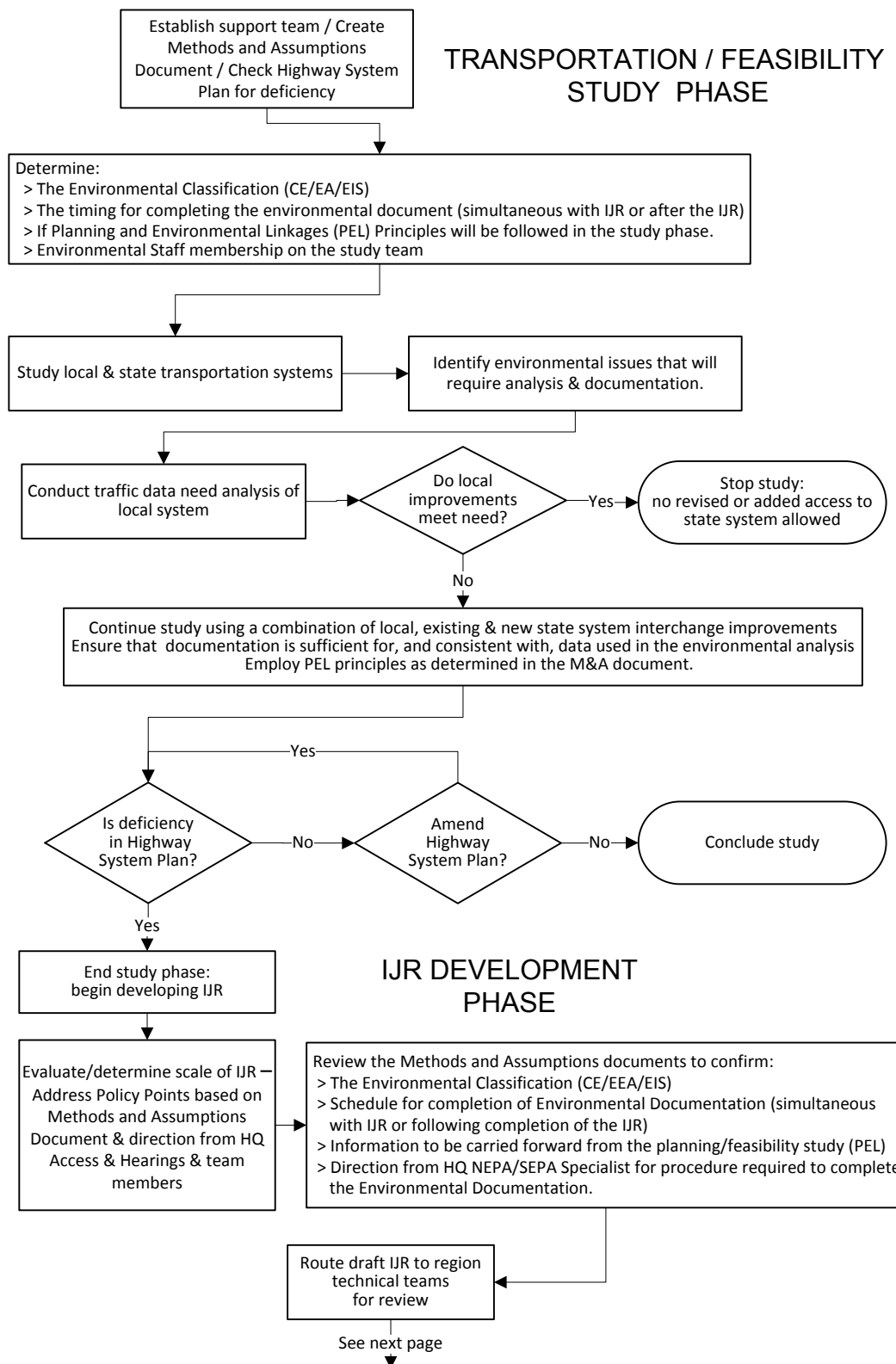


Exhibit 550-3 Interstate IJR: Process Flow Chart (continued)

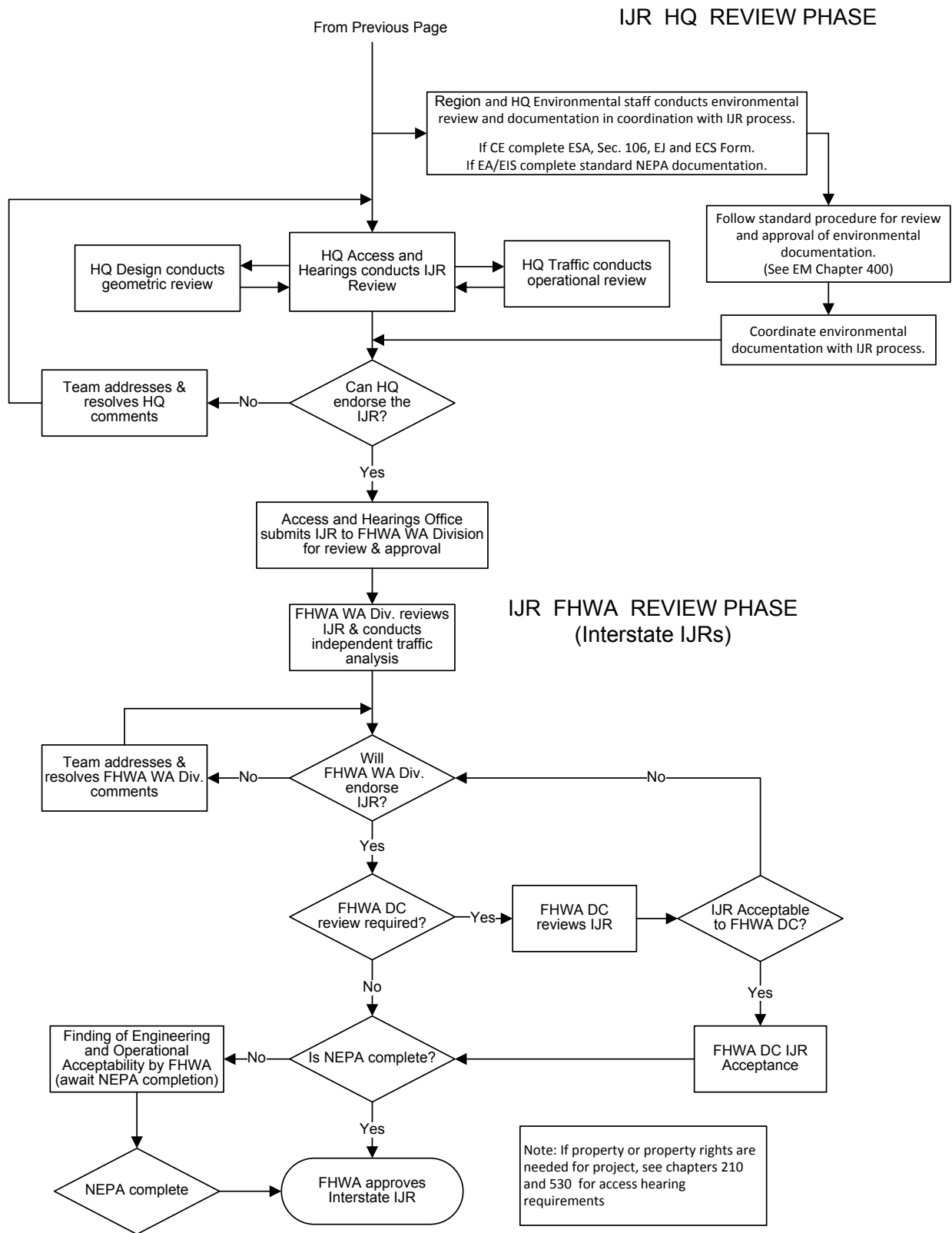


Exhibit 550-4 Non-Interstate IJR: Process Flow Chart

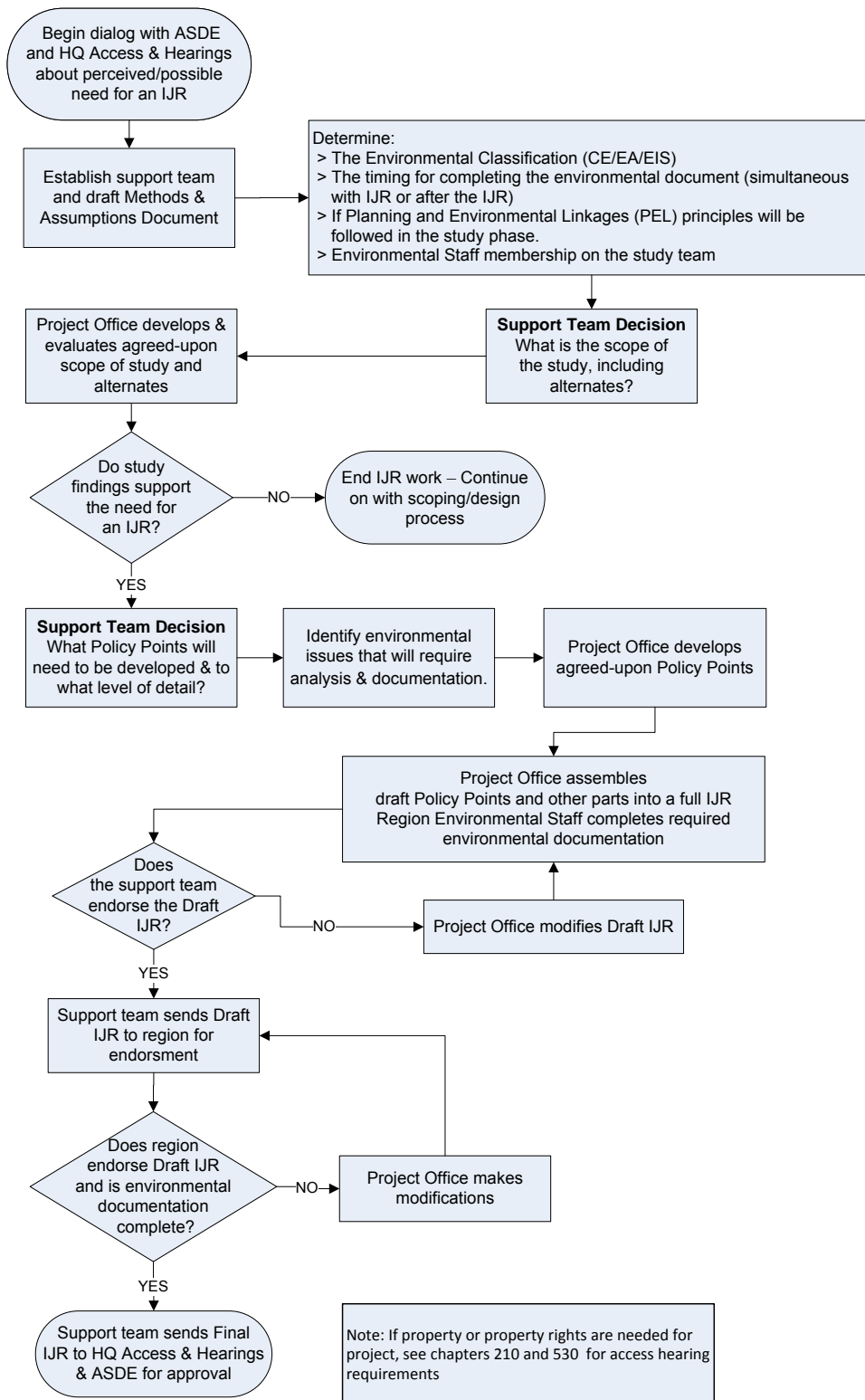


Exhibit 550-5 Methods and Assumptions Document for IJR: Concurrence Form Example

**Methods and Assumptions Document Concurrence Form
for Interchange Justification Report
"Project Title" "MP to MP"**

We the undersigned hereby concur with the methods and assumptions used for the (INSERT PROJECT NAME) Interchange Justification Report.	
IJR Engineer of Record:	By: _____ Date: _____
Traffic Analysis Engineer	By: _____ Date: _____
Region Traffic Engineer	By: _____ Date: _____
Project Development Engineer	By: _____ Date: _____
Development Services and Access Manager	By: _____ Date: _____
Region Environmental Manager	By: _____ Date: _____
Assistant State Design Engineer	By: _____ Date: _____
FHWA Area Engineer	By: _____ Date: _____
FHWA Safety and Design Engineer	By: _____ Date: _____
City Representative	By: _____ Date: _____
County Representative	By: _____ Date: _____

Exhibit 550-6 IJR: Stamped Cover Sheet Example

Interchange Justification Report
“Project Title”
“MP to MP”

This **Interchange Justification Report** has been prepared under my direct supervision, in accordance with Chapter 18.43 RCW and appropriate Washington State Department of Transportation manuals.

<input type="checkbox"/>	IJR Engineer of Record	By: _____ P.E. Project Engineer Date: _____
<input type="checkbox"/>	Traffic Analysis Engineer	By: _____ P.E. Traffic Analysis Engineer Date: _____
<input type="checkbox"/>	Concurrence – Region Traffic Engineer	By: _____ P.E. Date: _____
<input type="checkbox"/>	Concurrence – Project Development Engineer	By: _____ P.E. Date: _____
<input type="checkbox"/>	Concurrence – Environmental Manager	By: _____ Date: _____
<input type="checkbox"/>	WSDOT Approval – Development Services and Access Manager	By: _____ P.E. Date: _____
<input type="checkbox"/>	WSDOT Approval – Assistant State Design Engineer	By: _____ P.E. Date: _____
<input type="checkbox"/>	FHWA Approval – FHWA Safety and Design Engineer	By: _____ Date: _____

The region Project Office is also responsible for providing survey locations of test holes once the test holes have been drilled. The survey information includes the station, offset, elevation, and test hole coordinates. Coordinates are the latitude and longitude or state plane coordinates (north or south as appropriate), but not project coordinates.

610.04(5) Overview of Geotechnical Design Objectives for the Various Project Stages

Geotechnical design objectives for the various design phases are described in the [Geotechnical Design Manual](#).

610.04(6) Earthwork

610.04(6)(a) Project Definition

The designer contacts and meets with the RME (and the HQ Geotechnical Office as needed) at the project site to conduct a field review to help identify the geotechnical issues for the project.

In general, if soil/rock conditions are poor and/or large cuts or fills are anticipated, the RME requests that the HQ Geotechnical Office participate in the field review and reporting efforts.

The designer provides a description and location of the proposed earthwork to the RME as follows:

- For widening of existing facilities, the anticipated width, length, and location of the widening, relative to the current facility, are provided.
- For realignments, the approximate new location proposed for the facility is provided.
- Locations in terms of length can be by milepost or stations.

A brief conceptual-level report that summarizes the results of the investigation is provided to the designer.

610.04(6)(b) Project Design

Geotechnical data necessary to allow completion of the PS&E-level design is compiled during the design phase. This includes soil borings, testing, and geotechnical design based on final geometric data. Detailed design of cut and fill slopes can be done once the roadway geometry is established and geotechnical data are available. The purpose of this design effort is to determine the maximum stable cut or fill slope and, for fills, the potential for short- and long-term settlement. Also, the usability of the cut materials and the type of borrow needed for the project (if any) are evaluated. Evaluate the use of soil bioengineering as an option for building steeper slopes or to prevent surface erosion. (See [Roadside Manual Chapter 740](#), Soil Bioengineering, for more information.)

The designer requests a geotechnical report from the RME. The site data given in 610.04(4), as applicable, is provided. It is important that the request for the geotechnical report be made as early as possible in the design phase. Cost and schedule requirements to generate the report are project-specific and can vary widely. The time required to obtain permits and rights of entry must be considered when establishing schedule requirements.

The [Geotechnical Design Manual](#), Chapter 24, summarizes the type of information and recommendations that are typically included in the geotechnical report for earthwork. The recommendations should include the background regarding analysis approach and any agreements with the region or other customers regarding the definition of acceptable level of risk.

The region Project Office uses the report to finalize design decisions for the project. To meet slope stability requirements, additional right of way might be required or a wall might be needed. Wall design is covered in [Chapter 730](#). Construction timing might require importing material rather than using cut materials. The report is used to address this and other constructibility issues. The report is also used to proceed with completion of the PS&E.

610.04(6)(c) PS&E Development

Adequate geotechnical design information to complete the PS&E is typically received during the design phase. Additional geotechnical work might be needed when right of way cannot be acquired, restrictions are included in permits, or other requirements are added that result in changes to the design.

Special provisions and plan details, if not received as part of the report provided during design, are developed with the assistance of the RME or the HQ Geotechnical Office. The designer uses this information, as well as the design phase report, to complete the PS&E documents. Both the region Materials Laboratory and the HQ Geotechnical Office can review (if requested) the contract plans before the PS&E review process begins. Otherwise, they will review the contract plans during the normal PS&E review process.

610.04(7) Hydraulic Structures, Ponds, and Environmental Mitigation

610.04(7)(a) Project Definition

The designer provides a description and location of the proposed hydraulic/ environmental improvements and other pertinent site information and discusses the extent of the improvements with both the RME and the HQ Hydraulics Section to identify the geotechnical issues to be investigated. At this stage, only the identification and feasibility of the proposed hydraulic structures or environmental mitigation are investigated. The cost and schedule requirements for the geotechnical investigation are also determined at this time.

Examples of hydraulic structures include, but are not limited to, large culverts, pipe arches, underground detention vaults, and fish passage structures. Examples of environmental mitigation include, but are not limited to, detention/retention ponds, wetland creation, and environmental mitigation measures on fill slopes.

It is especially important to identify the potential to encounter high groundwater at the proposed hydraulic structure or pond location. In general, avoid high groundwater locations (see the [Highway Runoff Manual](#)) as groundwater can greatly affect design, constructibility, operations, performance, and maintenance.

610.04(7)(b) Project Design

The designer requests a geotechnical report from the RME. The site data given in 610.04(4), as applicable, is provided along with the following information:

- Pertinent field observations (such as unstable slopes, existing soft soils or boulders, evidence of high groundwater, or erosion around and damage to existing culverts or other drainage structures).
- Jurisdictional requirements for geotechnical design of berms/dams.

It is important that the request for the geotechnical report be made as early as possible in the design phase. Cost and schedule requirements to generate the report are project-specific and can vary widely. The time required to obtain permits and rights of entry must be considered when establishing schedule requirements. Furthermore, since the depth to groundwater can be critical to the feasibility of these types of facilities, and since seasonal variation of groundwater

630.01	General
630.02	References
630.03	Geosynthetic Types and Characteristics
630.04	Geosynthetic Function Definitions and Applications
630.05	Design Approach for Geosynthetics
630.06	Design Responsibility
630.07	Documentation

630.01 General

Geosynthetics include a variety of manufactured products that are used by the Washington State Department of Transportation (WSDOT) in drainage, earthwork, erosion control, and soil reinforcement applications.

The following geosynthetic applications are addressed in the *Standard Specifications for Road, Bridge, and Municipal Construction* (*Standard Specifications*):

- Low survivability underground drainage
- Moderate survivability underground drainage
- Separation
- Soil stabilization
- Moderate survivability permanent erosion control
- High survivability permanent erosion control
- Ditch lining
- Temporary silt fence

The *Standard Specifications* addresses geosynthetic properties as well as installation requirements and are not site-specific. The geosynthetic properties provided are based on the range of soil conditions likely to be encountered in Washington for the applications defined. Other applications, such as prefabricated edge drains, pond liners, and geotextile retaining walls, are currently handled by special provision.

Design responsibilities are discussed in 630.05 and illustrated in Exhibits 630-4 and 630-5.

This chapter does not address applications where geosynthetics are used to help establish vegetation through temporary prevention of erosion (vegetation mats).

630.02 References

Highway Runoff Manual, M 31-15, WSDOT

Hydraulics Manual, M 23-03, WSDOT

Plans Preparation Manual, M 22-31, WSDOT

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

Temporary Erosion and Sediment Control Manual, M 3109, WSDOT

WSDOT *Pavement Policy*, available at the Pavements website:

www.wsdot.wa.gov/business/materialslab/pavements/default.htm

630.03 Geosynthetic Types and Characteristics

Geosynthetics include woven and nonwoven geotextiles, geogrids, geonets, geomembranes, and geocomposites. (Examples of the various types of geosynthetics are provided in [Exhibit 630-6](#).) Terms used in the past for these construction materials include *fabrics*, *filter fabric*, or *filter cloth*, which are for the most part synonymous with the newer term *geotextile*.

(1) Definitions

Definitions of the geosynthetic types are as follows:

(a) Woven Geotextiles

Slit polymer tapes, monofilament fibers, fibrillated yarns, or multifilament yarns simply woven into a mat. Woven geotextiles generally have relatively high strength and stiffness and, except for the monofilament wovens, relatively poor drainage characteristics.

(b) Nonwoven Geotextiles

A sheet of continuous or staple fibers entangled randomly into a felt for needle-punched nonwovens and pressed and melted together at the fiber contact points for heat-bonded nonwovens. Nonwoven geotextiles tend to have low-to-medium strength and stiffness with high elongation at failure and relatively good drainage characteristics. The high elongation characteristic gives them superior ability to deform around stones and sticks.

(c) Geogrids

A polymer grid mat constructed either of coated yarns or a punched and stretched polymer sheet. Geogrids usually have high strength and stiffness and are used primarily for soil reinforcement.

(d) Geonets

Similar to geogrids, but typically lighter weight and weaker, with smaller mesh openings. Geonets are used in light reinforcement applications or are combined with drainage geotextiles to form a drainage structure.

(e) Geomembranes

Impervious polymer sheets that are typically used to line ponds or landfills. In some cases, geomembranes are placed over moisture-sensitive swelling clays to control moisture.

(f) Geocomposites

Prefabricated edge drains, wall drains, and sheet drains that typically consist of a cusped or dimpled polyethylene drainage core wrapped in a geotextile. The geotextile wrap keeps the core clean so that water can freely flow through the drainage core, which acts as a conduit. Prefabricated edge drains are used in place of shallow geotextile-wrapped trench drains at the edges of the roadway to provide subgrade and base drainage. Wall drains and sheet drains are typically placed between the back of the wall and the soil to drain the soil retained by the wall.

pipe through the geotextile. (*Blinding* is the coating of the geotextile surface with soil particles such that the openings are effectively plugged.) If the geotextile openings (AOS) are designed to be small enough to capture most of the suspended soil particles, the geotextile will likely blind, reducing the permeability enough to allow water to overtop the fence. Therefore, it is best to allow some geotextile openings that are large enough to allow the silt-sized particles to easily pass through. Even if some silt particles pass through the fence, the water flow rate below the fence will be decreased and the volume of silt-laden water passing through the geotextile is likely to be relatively small and the water is partially filtered.

The geotextile apparent opening size (AOS) and permittivity are typically used to specify the filtration performance of geotextiles. The geotextile function in silt fence applications is more complex than this and AOS and permittivity do not relate directly to how well a silt fence will perform. However, nominal values of AOS and permittivity can be specified such that the types of geotextile products known to perform satisfactorily in this application are selected. These values are provided in the [Standard Specifications](#).

The source of load on the geotextile is from silt buildup at the fence and water ponding. The amount of strength required to resist this load depends on whether or not the geotextile is supported with a wire or polymer grid mesh between the fence posts. Obviously, unsupported geotextile must have greater strength than supported geotextile. If the strength of the geotextile or its support system is inadequate, the silt fence could fail. Furthermore, unsupported geotextile must have enough stiffness that it does not deform excessively and allow silt-laden water to go over the top of the fence.

(a) Need for Silt Fence

The need for a silt fence can be anticipated where construction activities disturb and expose soil that could erode. The ground surface is considered disturbed if vegetative cover is at least partially removed over a significant area by construction activities. Consider whether or not silt-laden runoff water from the disturbed area can reach an environmentally sensitive area or a constructed stormwater system. If the exposed soil is a clean sand or gravel or if a significant zone of heavy vegetative cover separates the exposed soil from the environmentally sensitive area, a silt fence may not even be needed. Contact the Headquarters (HQ) Hydraulics Section for help in determining whether or not a silt fence is needed in such situations.

(b) Feasibility of Silt Fence

The feasibility of a geotextile silt fence depends on the magnitude of water flow to the fence, the steepness of the slope behind the fence, and whether or not flow is concentrated at the fence. If the silt fence is not feasible, alternative erosion control methods may be needed (see the [Temporary Erosion and Sediment Control Manual](#)).

Consider all feasible erosion control options in terms of potential effectiveness and economy before making the final decision to use a silt fence. Select the best option for the site conditions, including site geometry and contours, soil type, and rainfall potential. Consider silt fences for temporary erosion control in disturbed areas in the following circumstances:

- Fully covering disturbed areas temporarily with polyethylene sheeting or other temporary covering is not feasible or practical.

- Permanent ground cover for disturbed areas is not yet established.
- Runoff water reaches the silt fence primarily as sheet flow rather than as concentrated flows, with the exception of some ditch and swale applications.
- Slopes above the silt fence are not steeper than 1.5H:1V.
- The sheet flow length (length of slope contributing runoff water to the silt fence) is not too long.

(c) **Sheet Flow Length**

Maximum sheet flow lengths allowed for silt fences are provided in [Exhibit 630-2](#), which is based on the typical 2-year, 24-hour design storm for Washington, resulting in a 24-hour rainfall of 3 inches.

Slope	Sheet Flow Length
1.5H:1V	100 ft
2H:1V	115 ft
4H:1V	150 ft
6H:1V	200 ft

Maximum Sheet Flow Lengths for Silt Fences
Exhibit 630-2

The sheet flow length represents the area contributing runoff water from precipitation. The sheet flow length is defined in [Exhibit 630-8](#). The sheet flow lengths provided in [Exhibit 630-2](#) were determined assuming a bare soil condition, with the soil classified as a silt. These are worst-case assumptions because less runoff would be expected for sand or gravel soils or when some vegetation is present.

The sheet flow length is usually equal to or greater than the disturbed soil slope length. However, undisturbed sloping ground above the disturbed slope area may also contribute runoff to the silt fence area. The length of undisturbed sloping ground above the disturbed slope to be included in the total contributing slope length depends on the amount and type of vegetation present, the slope steepness, and the degree of development above the slope.

If unsure whether the proposed silt fence meets the requirements in [Exhibit 630-2](#), contact the HQ Hydraulics Section for assistance.

Average or Ditch Swale Grade	Ditch or Swale Storage Length	Allowable Contributing Area per Foot of Ditch or Swale Storage Width
16%	13 ft	200 ft ²
10%	20 ft	250 ft ²
5%	40 ft	300 ft ²
4%	50 ft	400 ft ²
3%	65 ft	500 ft ²
2%	100 ft	600 ft ²
1%	200 ft	1000 ft ²

Maximum Contributing Area for Ditch and Swale Applications
Exhibit 630-3

(d) Temporary Silt Fence

Temporary silt fences may also be used in ditch or swale applications. If the area contributing runoff to the fence exceeds the value determined from [Exhibit 630-3](#), hydraulic overload will occur. The ditch or swale storage length and width are defined in [Exhibit 630-9](#). The assumptions used in the development of [Exhibit 630-3](#) are the same as those used for [Exhibit 630-2](#) in terms of the design storm and ground conditions.

As an example, if a site has a 13-foot-wide ditch with an average slope of 2%, the fence can be located such that 7800 ft² of area drain to it. If it appears that the area draining to the fence will be larger than the allowable, it may be possible to divide the contributing area into smaller areas and add a silt fence for each smaller area as shown in [Exhibit 630-10](#).

The minimum storage length for the ditch behind each silt fence must be maintained. If this is not possible, it may be necessary to use an alternate erosion control structure, as described in the [Temporary Erosion and Sediment Control Manual](#), or develop a special silt fence design.

[Exhibit 630-3](#) was developed with the assumption that water will be able to pond to a depth of at least 2 feet behind the fence. If this is not the case (the ditch or swale depth is less than 2 feet), the table cannot be used. Furthermore, the ditch depth must be greater than the height of the silt fence at its lowest point within the ditch. Otherwise, there will not be enough storage available behind the fence and water will circumvent the fence by flowing around it.

(e) Locating a Silt Fence

Locate silt fences on contour as much as possible. At the ends of the fence, turn it up hill such that it captures the runoff water and prevents water from flowing around the end of the fence. This is illustrated in [Exhibit 630-11](#).

Silt fences are designed to capture up to a 2-foot depth of water behind the fence. Therefore, the ground line at the ends of the fence must be at least 2 feet above the ground line at the lowest part of the fence. This 2-foot requirement applies to ditches as well as to general slope erosion control.

If the fence must cross contours (except for the ends of the fence), use gravel check dams placed perpendicular to the back of the fence to minimize concentrated flow and erosion along the back of the fence (see [Exhibit 630-12](#)).

- The gravel check dams are approximately 1 foot high at the back of the fence and are continued perpendicular to the fence at the same elevation until the top of the dam intercepts the ground surface behind the fence.
- Locate the gravel check dams every 10 feet along the fence.
- In general, the slope of the fence line is not to be steeper than 3H:1V.
- For the gravel check dams, use Crushed Surfacing Base Course, Gravel Backfill for Walls, or Permeable Ballast (see the [Standard Specifications](#)).

If the silt fence application is considered critical (such as when the fence is placed immediately adjacent to environmentally sensitive areas like streams, lakes, or wetlands), place a second silt fence below the first silt fence to capture any silt that passes through the first fence and/or place straw bales behind the silt fence. Locate silt fences at least 7 feet from an environmentally sensitive area.

Where this is impossible, and a silt fence must be used, a special design may be necessary.

Temporary silt fences are sometimes used to completely encircle underground drainage inlets or other similar features to prevent silt from entering the drainage system. This is acceptable, but the silt fence functions primarily as a barrier, and not as a ponding or filtering mechanism, unless the drainage inlet is in a depression that is large enough to allow water to pond behind the silt fence.

- If the drainage inlet and silt fence are not in a large enough depression, silt-laden water will simply be directed around the fence and must be captured by another fence or sedimentation pond downslope.
- If the depression is deep, locate the silt fence no more than 2 feet below the top of the depression to prevent overtopping. A site-specific design may be needed if the silt fence is located deeper than 2 feet within the depression.

It may be necessary to relocate silt fences during the course of a construction project as cuts and fills are built or as disturbed areas change. An erosion control/silt fence plan that accounts for the anticipated construction stages (and eventual removal) should be developed. Do not assume that one silt fence location can routinely be used for the entire life of the contract. Periodically check the locations in the field during the construction project, and field-adjust the silt fence locations as necessary to ensure the silt fences function as intended.

(7) Standard Specification Geotextile Application Identification in the Contract Plans

Identify the geotextile in the contract plan detail in a way that ties it to the appropriate application in the *Standard Specifications*. For example:

- If a geotextile is to be used to line an underground trench drain 3 feet deep and the native soil has less than 15% passing the #200 sieve, identify the geotextile on the plan sheet as “Construction Geotextile for Underground Drainage, Low Survivability, Class A.”
- If the geotextile is to be placed beneath riprap on a slope without a cushion layer between the geotextile and the riprap, and the native soil contains 35% passing the #200 sieve, identify the geotextile on the plan sheet as “Construction Geotextile for Permanent Erosion Control, High Survivability, Class B.”
- If the geotextile is to be placed between the roadway base course and a moist silt subgrade with a resilient modulus of 6,500 psi, and the roadway is planned to be constructed during the dry summer and early fall months, identify the geotextile on the plan sheet as “Construction Geotextile for Separation.”

(8) Site-Specific Designs (All Applications)

A site-specific design is required:

- For all reinforcement applications.
- For applications not covered by the *Standard Specifications*.

Consider a site-specific design for:

- High-risk applications.
- Exceptionally large geotextile projects: if the geotextile quantity in a single application is over 35,000 yd² or over 85,000 yd² for the separation application.
- Severe or unusual soil or groundwater conditions.

720.03(5)(c)(1) Bridge Over a Roadway

For a project that will widen an existing structure over a highway or where the highway will be widened under an existing structure, the vertical clearance can be as little as 16.0 feet on the Interstate System or other freeways or 15.5 feet on nonfreeway routes. An approved design analysis is required for clearance less than 16.0 feet on Interstate routes or other freeways and 15.5 feet on nonfreeway routes.

For a planned resurfacing of the highway under an existing bridge, if the clearance will be less than 16.0 feet on the Interstate System or other freeways and 15.5 feet on nonfreeway routes, evaluate the following options and include in a design analysis request:

- Pavement removal and replacement
- Roadway excavation and reconstruction to lower the roadway profile
- Providing a new bridge with the required vertical clearance

Reducing roadway paving and surfacing thickness under the bridge to achieve the minimum vertical clearance can cause accelerated deterioration of the highway and is not recommended. Elimination of the planned resurfacing in the immediate area of the bridge might be a short-term solution if recommended by the Region Materials Engineer (RME). Solutions that include milling the existing surface followed by overlay or inlay must be approved by the RME to ensure adequate pavement structure is provided.

For other projects that include an existing bridge where no widening is proposed on or under the bridge, and the project does not affect vertical clearance, the clearance can be as little as 14.5 feet. For these projects, document the clearance in the Design Documentation Package. For an existing bridge with less than a 14.5-foot vertical clearance, an approved design analysis request is required.

720.03(5)(c)(2) Bridge Over a Railroad Track

For an existing structure over a railroad track (see [Exhibit 720-2](#)), the vertical clearance can be as little as 22.5 feet. A lesser clearance can be used with the agreement of the railroad company and the approval of the Washington State Utilities and Transportation Commission. Coordinate railroad clearance issues with the HQ Design Office Railroad Liaison.

Exhibit 720-3 Bridge Vertical Clearances

Project Type	Vertical Clearance ^[8]	Documentation Requirement (see notes)
Interstate and Other Freeways^[1]		
New Bridge	> 16.5 ft	[2]
Widening Over or Under Existing Bridge	> 16 ft	[2]
	< 16 ft	[4]
Resurfacing Under Existing Bridge	> 16 ft	[2]
	< 16 ft	[4]
Other With No Change to Vertical Clearance	> 14.5 ft	[3]
	< 14.5 ft	[4]
Nonfreeway Routes		
New Bridge	> 16.5 ft	[2]
Widening Over or Under Existing Bridge	> 15.5 ft	[2]
	< 15.5 ft	[4]
Resurfacing Under Existing Bridge	> 15.5 ft	[2]
	< 15.5 ft	[4]
Other With No Change to Vertical Clearance	> 14.5 ft	[3]
	< 14.5 ft	[4]
Bridge Over Railroad Tracks^[7]		
New Bridge	> 23.5 ft	[2]
	< 23.5 ft	[4][5]
Existing Bridge	> 22.5 ft	[2]
	< 22.5 ft	[4][5]
Pedestrian Bridge Over Roadway		
New Bridge	> 17.5 ft	[2]
Existing Bridge	17.5 ft	[6]
Notes:		
[1] Applies to all bridge vertical clearances over highways and under highways at interchanges.		
[2] No documentation required.		
[3] Document to Design Documentation Package.		
[4] Approve <u>design analysis</u> required.		
[5] Requires written agreement between railroad company and WSDOT and approval via petition from the WUTC.		
[6] Maintain 17.5-ft clearance.		
[7] Coordinate railroad clearance with the HQ Design Office Railroad Liaison.		
[8] See 720.03(5) .		

Rockerries (rock walls) behave to some extent like gravity walls. However, the primary function of a rockery is to prevent erosion of an oversteepened but technically stable slope. Rockeries consist of large, well-fitted rocks stacked on top of one another to form a wall.

An example of a rockery and reinforced slope is provided in [Exhibit 730-10](#).

730.02 References

(1) Federal/State Laws and Codes

[Washington Administrative Code \(WAC\) 296-155](#), Safety standards for construction work

(2) Design Guidance

[Bridge Design Manual](#), M 23-50, WSDOT

[Standard Plans for Road, Bridge, and Municipal Construction \(Standard Plans\)](#), M 21-01, WSDOT

[Plans Preparation Manual](#), M 22-31, WSDOT

[Roadside Manual](#), M 25-30, WSDOT

730.03 Design Principles

The design of a retaining wall or reinforced slope consists of the following principal activities:

- Develop wall/slope geometry
- Provide adequate subsurface investigation
- Evaluate loads and pressures that will act on the structure
- Design the structure to withstand the loads and pressures
- Design the structure to meet aesthetic requirements
- Ensure wall/slope constructibility
- Coordinate with other design elements

The structure and adjacent soil mass also needs to be stable as a system, and the anticipated wall settlement needs to be within acceptable limits.

730.04 Design Requirements

(1) Wall/Slope Geometry

Wall/slope geometry is developed considering the following:

- Geometry of the transportation facility itself
- Design Clear Zone requirements (see [Chapter 1600](#))
- Flare rate and approach slope when inside the Design Clear Zone (see [Chapter 1610](#))
- Right of way constraints
- Existing ground contours
- Existing and future utility locations
- Impact to adjacent structures
- Impact to environmentally sensitive areas

For wall/slope geometry, also consider the foundation embedment and type anticipated, which requires coordination between the various design groups involved.

Retaining walls are designed to limit the potential for snagging vehicles by removing protruding objects (such as bridge columns, light fixtures, or sign supports).

Provide a traffic barrier shape at the base of a new retaining wall constructed 12 feet or less from the edge of the nearest traffic lane. The traffic barrier shape is optional at the base of the new portion when an existing vertical-faced wall is being extended (or the existing wall may be retrofitted for continuity). Depending on the application, precast or cast-in-place Single Slope Concrete Barrier with vertical back or Type 4 Concrete Barrier may be used for both new and existing walls except when the barrier face can be cast as an integral part of a new wall. Design analyses may be considered, but they require approval as prescribed in [Chapter 300](#). A design analysis is not required where sidewalk exists in front of the wall or in other situations where the wall face is otherwise inaccessible to traffic.

(2) Investigation of Soils

All retaining wall and reinforced slope structures require an investigation of the underlying soil/rock that supports the structure. [Chapter 610](#) provides guidance on how to complete this investigation. A soil investigation is an integral part of the design of any retaining wall or reinforced slope. The stability of the underlying soils, their potential to settle under the imposed loads, the usability of any existing excavated soils for wall/reinforced slope backfill, and the location of the groundwater table are determined through the geotechnical investigation.

(3) Geotechnical and Structural Design

The structural elements of the wall or slope and the soil below, behind, and/or within the structure are designed together as a system. The wall/slope system is designed for overall external stability as well as internal stability. Overall external stability includes stability of the slope the wall/reinforced slope is a part of and the local external stability (overturning, sliding, and bearing capacity). Internal stability includes resistance of the structural members to load and, in the case of MSE walls and reinforced slopes, pullout capacity of the structural members or soil reinforcement from the soil.

(a) Scour

At any location where a retaining wall or reinforced slope can be in contact with water (such as a culvert outfall, ditch, wetland, lake, river, or floodplain), there is a risk of scour at the toe. This risk must be analyzed. Contact the HQ Geotechnical Office and HQ Hydraulics Office to determine whether a scour analysis is required.

(4) Drainage Design

One of the principal causes of retaining wall/slope failure is the additional hydrostatic load imposed by an increase in the water content in the material behind the wall or slope. This condition results in a substantial increase in the lateral loads behind the wall/slope since the material undergoes a possible increase in unit weight, water pressure is exerted on the back of the wall, and the soil shear strength undergoes a possible reduction. To alleviate this, adequate drainage for the retaining wall/slope

740.01	General
740.02	Design
740.03	Procedures
740.04	Documentation
740.05	References

740.01 General

The function of a noise barrier is to reduce traffic noise levels in adjoining areas. The noise abatement decisions are made during the environmental stage of project development, which is a highly interactive process. Before a noise barrier is designed, the Washington State Department of Transportation (WSDOT) needs to be confident that there is significant need, a cost-effective and environmentally acceptable noise barrier, a source of funds, and acceptance by adjacent property owners, local governmental agencies, and the general public.

Preliminary design information that may be found in the noise report includes:

- Sources of noise.
- Noise receiver locations.
- Predicted level of noise reduction.
- Locations of existing and future noise –impacts along the project corridor.
- Barrier location and height recommendations based on what is feasible and reasonable.

Design of a noise barrier project is the result of a team effort coordinated by the Project Engineer.

This chapter addresses the factors that are considered when designing a noise barrier and the associated procedures and documentation requirements.

740.02 Design

The two basic types of noise barriers are the earth berm and the noise wall. An earth berm can be constructed to the full height required for noise abatement or to partial height in conjunction with a noise wall to reach the required height. A noise wall can be made of concrete, masonry, metal, wood, or other approved innovative products, and can be supported by spread, pile, shaft, or trench footings.

Consideration of the noise report and the visual characteristics of adjacent land forms, vegetation, and structural elements (such as buildings, bridges, and retaining walls) will determine whether a proposed noise barrier might be berm, wall, or both.

An earth berm is the primary alternative if the visual and environmental quality of the corridor will be preserved or enhanced and materials and right of way widths are available. (See the [Roadside Manual](#) for criteria for determining whether a vegetated earth berm is appropriate.)

The region uses the noise report and other environmental documents (see the [Environmental Manual](#)) to help determine the location, exposure conditions, length, and height of the proposed noise barrier.

To design and locate a noise barrier of any kind, consider the following:

- Desired noise abatement
- Future right of way needs
- Cost and constructability
- Neighborhood character
- Visual character and quality of the corridor
- Future maintenance of the noise barrier and the whole right of way
- Wind
- Supporting soil
- Earthquakes
- Groundwater
- Existing drainage systems and water courses
- Exposure to vehicular impacts
- Potential for vandalism
- Existing vegetation and roadside restoration required
- Access for maintenance equipment and enforcement, traffic service, and emergency vehicles
- Access to fire hydrants from both sides
- Pedestrian and bicycle access
- Available and attainable width of right of way for berms
- Aesthetic and structural characteristics of available wall designs
- Visual compatibility of each wall design with other transportation structures within the corridor
- Construction limits for footings
- Locations of existing survey monuments
- Access to and maintenance of right of way behind a wall, including drainage structures
- Use of right of way and wall by adjacent property owners
- Drainage and highway runoff
- Drainage from adjacent land
- Existing utilities and objects to relocate or remove
- Water and electricity needs, sources, and access points

Avoid objects such as bridge columns, light fixtures, or sign supports that protrude and may present a potential for snagging vehicles.

740.02(1) Earth Berm

Berm slopes are a function of the material used, the attainable right of way width, and the desired visual quality. Slopes steeper than 2H:1V (3H:1V for mowing) are not recommended. Design the end of the berm with a lead-in slope of 10H:1V and curve it toward the right of way line.

Refer to the [Roadside Manual](#) for guidance regarding vegetation on berms.

740.02(2) Noise Wall

When feasible, to encourage competitive bidding, include several alternate noise wall designs in the contract and permit the contractor to submit alternate designs under the value engineering specification.

There are noise wall designs in the [Standard Plans](#). Additional designs are in various stages of development to become standard plans. The draft-standard design sheets and other preapproved plans are available from the Headquarters (HQ) Bridge and Structures Office. The HQ Bridge and Structures Office also works with the regions to facilitate the use of other designs as bidding options.

When a noise wall has ground elevations that are independent of the roadway elevations, a survey of ground breaks (or cross sections at 25 foot intervals) along the entire length of the wall is needed for evaluation of constructability and to assure accurate determination of panel heights.

Size of openings (whether lapped, door, or gated) depends on the intended users. Agencies such as the local fire department can provide the necessary requirements. Unless an appropriate standard plan is available, such openings are designed and detailed for the project.

When a noise wall is inside the Design Clear Zone, design its horizontal and vertical (ground elevation) alignment as if it were a rigid concrete traffic barrier. (See Chapter 1610 for maximum flare rates.)

Provide a concrete traffic barrier shape at the base of a new noise wall constructed 12 feet or less from the edge of the nearest traffic lane. The traffic barrier shape is optional at the base of the new portion when an existing vertical-faced wall is being extended (or the existing wall may be retrofitted for continuity). Standard Concrete Barrier Type 4 is recommended for both new and existing walls except when the barrier face can be cast as an integral part of a new wall. [Design analyses](#) may be considered, but they require approval as prescribed in [Chapter 300](#). [A design analysis](#) is not required where sidewalk exists in front of the wall or in other situations where the wall face is otherwise inaccessible to traffic. For flare rates and approach slopes for concrete barriers, see [Chapter 1610](#), Traffic Barriers.

To designate a standard noise wall, select the appropriate general special provisions (GSPs) and state the standard plan number, type, and foundation type.

Wall type is a function of exposure and wind speed (see [Exhibit 740-1](#)).

A geotechnical report identifying the angle of internal friction “ f ” and the allowable bearing pressure is needed for selection of a standard foundation. The standard spread footing designs require an allowable bearing pressure of 1 Tsf. The standard trench and shaft footing designs require an “ f ” of at least 32° for D1 and 38° for D2.

A special design of the substructure is required for noise walls on substandard soil, where winds exceed 90 mph, and for exposures other than B1 and B2 as defined in [Exhibit 740-1](#).

For maintenance of the surface of a tall wall (10 feet or more), consider harness tie offs for the fall protection required by the Department of Labor and Industries.

Exhibit 740-1 Standard Noise Wall Types

	Exposure				
	B1		B2		C
Wind Speed	80 mph	90 mph	80 mph	90 mph	
Wall Type	A	B	C	D	Special Design *
<p>Wind speed is according to Figure 1-2.1.2.A of the (AASHTO) <i>Guide Specifications for Structural Design of Sound Barriers</i>. Assume the wind to be perpendicular to the wall on both sides and design for the most exposed side.</p> <p>Exposure is determined by the nature of the immediately adjacent ground surface and the extension of a plane at the adjacent ground surface elevation for 1500 feet to either side of the noise wall:</p> <p>Exposure B1 = Urban and suburban areas with numerous closely spaced obstructions having the size of single-family or larger dwellings that prevail in the upwind direction from the noise barrier for a distance of at least 1,500 feet.</p> <p>Exposure B2 = Urban and suburban areas with more open terrain not meeting the requirements of Exposure B1.</p> <p>Exposure C = Open terrain with scattered obstructions that includes flat, open country, grasslands, and elevated terrain.</p> <p>*For a noise wall with Exposure C, on a bridge or overpass or at the top of a slope, consult the HQ Bridge and Structures Office, as a special design will probably be necessary.</p>					

740.03 Procedures

The noise unit notifies the Project Engineer’s Office when a noise barrier is recommended in the noise report.

The Project Engineer’s Office is responsible for interdisciplinary teams, consultation, and coordination with the public, noise specialists, maintenance, construction, region Landscape Architecture Office (or the HQ Roadside and Site Development Section), right of way personnel, Materials Laboratory, State Bridge and Structures Architect, HQ Bridge and Structures Office, CAE Support Team, HQ Development Services & Access Manager, consultants, and many others.

If a noise wall is contemplated, the region evaluates the soils (see Chapters 610 and 710) and obtains a list of acceptable wall design options. The list is obtained by sending information pertaining to soils and drainage conditions, alignment, and height of the proposed wall to the State Bridge and Structures Architect.

If a vegetated earth berm is considered, see the *Roadside Manual* for procedures.

The State Bridge and Structures Architect coordinates with the HQ Bridge and Structures Office, HQ Hydraulics Section, HQ Geotechnical Office, and the region to provide a list of acceptable standard, draft-standard, and preapproved proprietary noise wall designs, materials, and finishes that are compatible with existing visual elements of the corridor. Only wall designs from

this list may be considered as alternatives. Limit design visualizations of the highway side of proposed walls (available from the CAE Support Team in Olympia) to options from this list. The visual elements of the private property side of a wall are the responsibility of the region unless addressed in the environmental documents.

After the noise report is completed, any changes to the –dimensions or location of a noise barrier must be reviewed by the appropriate noise unit to determine the impacts of the changes on noise abatement.

On limited access highways, coordinate any opening in a wall or fence (for pedestrians or vehicles) with the HQ Development Services & Access Manager and obtain approval from the Director & State Design Engineer, Development Division.

On nonlimited access highways, an access connection permit is required for any opening (approach) in a wall or fence.

The HQ Bridge and Structures Office provides special substructure designs to the regions upon request; reviews contract design data related to standard, draft-standard, and preapproved designs; and reviews plans and calculations that have been prepared by others (see [Chapter 710](#)).

Approval by the State Bridge and Structures Architect is required for any attachment or modification to a noise wall and for the design, appearance, and finish of door and gate-type openings.

Approval by the State Bridge and Structures Architect is also required for the final selection of noise wall appearance, finish, materials, and configuration.

740.04 Documentation

Refer to [Chapter 300](#) for design documentation requirements.

740.05 References

740.05(1) Design Guidance

Guide Specifications for Structural Design of Sound Barriers, AASHTO, 2002

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

740.05(2) Supporting Information

Environmental Manual, M 31-11, WSDOT

Roadside Manual, M 25-30, WSDOT

- 1100.01 General
- 1100.02 Practical Design Procedure
- 1100.03 Community Engagement
- 1100.04 Multiagency, Interdisciplinary, and Stakeholder Advisory Team
- 1100.05 Need and Performance Identification
- 1100.06 Context Identification
- 1100.07 Design Control Selection
- 1100.08 Alternative Formulation and Evaluation
- 1100.09 Design Element Selection and Dimensions
- 1100.10 Documentation Tools
- 1100.11 References

1100.01 General

The Washington State Department of Transportation (WSDOT) has adopted practical design as an approach to making project decisions. This chapter provides a process and informational overview of practical design and implementation expectations with this approach. This chapter will introduce terminology, general information, and a procedural process overview, while the remaining chapters in Division 11 provide specific design policy details for each procedural step. WSDOT's practical design approach is based on context sensitive solutions and performance-based design, which utilize a collaborative approach, design flexibility, and a high likelihood of variable solutions. As a result, WSDOT's practical design finds consistency through the procedural process applied rather than specific project-type outcomes.

This chapter provides:

- An overview and description of the WSDOT Practical Solutions initiative.
- An overview of the practical design process and the relevant chapter information necessary to complete each process step.
- Information regarding the importance of design control selection.

1100.01(1) *Practical Solutions*

Practical Solutions is a two-part strategy that includes least cost planning and practical design, which WSDOT defines in [Executive Order \(EO\) E 1090](#).

WSDOT deploys this strategy to enable more flexible and sustainable transportation investment decisions. It encourages this by: (1) increasing the focus on addressing identified performance needs throughout all phases of development, and (2) engaging local partners and stakeholders at the earliest stages of scope definition to account for their input at the right stage of the development process. Practical Solutions includes one or a combination of strategies, including, but not limited to, operational improvements, off-system solutions, transportation demand management, and incremental strategic capital solutions.

1100.01(1)(a) Least Cost Planning

Least cost planning is an approach to making planning decisions that consider a variety of conceptual strategies to achieve the desired system performance targets for the least cost. Central to least cost planning is a process that identifies regional and corridor performance areas, engages communities to ascertain local contexts and needs, and applies methods to evaluate and implement short- and long-term solutions.

The outcome of least cost planning is a recommended set of multimodal strategies that are cost-effective and balance the goals and objectives of state and local needs. This approach informs practical design solutions by providing the following potential outcomes:

- Identify performance gaps for a corridor segment now and in the future.
- Integrate inputs from partners that support corridor segment performance.
- Define what is known about context and what may happen on and around a corridor.
- Identify sets of potential strategies to address the gaps at certain time frames.
- Reduce the need for higher-cost mobility capital solutions by first identifying and ranking operational improvements and demand management strategies.

[Executive Order \(EO\) E 1090](#) instructs that the solution may or may not be on a state corridor.

1100.01(1)(b) Practical Design

Practical design is an approach to making project decisions that focuses on the specific problem the project intends to address. This performance-based approach looks for lower-cost solutions that meet outcomes that WSDOT, partnering agencies, communities, and stakeholders have identified. Practical design is a fundamental component to the Vision, Mission, Values, Goals, and Reforms identified in [Results WSDOT](#), the department's Strategic Plan. The primary objectives of the practical design approach are: (1) focusing on project need, and (2) seeking the most reasonable low-cost solution to meet that need.

Practical design allows flexibility and freedom to innovate, and considers incremental solutions to address uncertainties in future scenarios. Practical design can be applied at all phases of project development; however, it is most effective at the scoping level or earlier, where key decisions are made as to what design controls and elements are affected by alternatives and how they can best be configured to meet the project and contextual needs.

With practical design, decision-making focuses on the maximum benefit to the system, rather than the maximum benefit to the project. Practitioners are to “design up,” starting with minimal design element dimensions and increasing those values until acceptable cost-effective performance is obtained. Focusing on the specific project need minimizes the scope of work for each project so that systemwide needs can be optimized through individual project savings.

1100.02 Practical Design Procedure

Practical design, despite its name, is not always fully confined to the conventional design phase. It begins when a location under evaluation moves from a discussion of strategies to one of potential solutions within those strategies. The practical design procedures apply when a location under evaluation in planning moves from a discussion of strategies to one of potential solutions within those strategies, when scoping phase requires a Basis of Design, or when the

preliminary engineering phase for a funded project is initiated. In each of these situations, practical design procedures apply whether or not least cost planning has occurred. Exhibit 1100-1 shows the documentation needs correlated to individual procedural steps.

WSDOT's practical design process consists of seven primary procedural steps:

1. Assemble a project advisory team as needed (see [1100.04](#)).
2. Clearly identify the baseline need, in terms of performance, contributing factors, and underlying reasons for the baseline need (see [Chapter 1101](#)).
3. Identify the land use and transportation context (which includes environmental use and constraints) for the location (see [Chapter 1102](#)).
4. Select design controls compatible with the context (see [Chapter 1103](#)).
5. Formulate and evaluate potential alternatives that resolve the baseline need and are bound by the selected context and design controls (see [Chapter 1104](#)).
6. Select design elements employed and/or changed by the selected alternative (see [Chapter 1105](#)).
7. Determine design element dimensions consistent with the alternatives performance needs, context, and design controls (see [Chapter 1106](#)).

The Basis of Design (BOD) is used to document the outcomes of applying these procedural steps. It also serves as a management tool throughout the design phase, to keep a project team focused on the baseline performance need and agreed performance trade-offs in order to prevent scope creep. A BOD is required on all projects, unless design elements are not employed or changed (see [Chapter 1105](#)). A BOD is only required on scoping projects as determined by the Capital Program Development and Management (CPDM) Office. See [1100.10\(1\)](#) for further information about the BOD.

1100.03 Community Engagement

WSDOT has a strategic goal of engaging the community in order to strengthen partnerships, increase credibility, drive priorities, and inform decision-making. Involving the community is essential to fully understand the performance gaps, context identification (see [Chapter 1102](#)), local environmental issues, and modal needs and priorities.

WSDOT encourages recognition of individual community contexts, values, and needs. WSDOT uses best practices and the flexibility available to engage communities in developing transportation solutions. We will do so in order to enhance public trust and develop targeted designs that provide for the performance needs of the state, regional, and local transportation systems. – [Executive Order 1096](#)

Use the [WSDOT Community Engagement Plan](#) and document the findings of community engagement efforts (see [1100.10\(6\)](#)).

1100.04 Multiagency, Interdisciplinary, and Stakeholder Advisory Team

Collaborative decisions contribute to success in project delivery, and are emphasized through the context sensitive design approach in WSDOT's practical design policies. Provide for consent-based outcomes early in the project development timeline as indicated in WSDOT [Executive Order 1096 - WSDOT 2015-17: Agency Emphasis and Expectations](#) and [Executive Order 1028 – Context Sensitive Solutions](#). Convening a Multiagency, Interdisciplinary and Stakeholder Advisory Team (MAISA) Team is an accepted approach to meet the intent of these policies. The MAISA Team is a collaborative body that provides recommendations to the WSDOT project manager and engineer of record, specifically in these areas:

- Need Identification
- Context Identification
- Design Control Selection
- Alternative Formulation
- Performance Trade-off Decision Preferences (including weighing environmental constraints and regulatory issues)
- Alternative Evaluation

The Engineer of Record or project manager convenes the MAISA Team, basing its membership on the kind of skills, knowledge, and responsibilities indicated by the issues pertinent to design decision making; including planning, project development, environment, modally oriented designs, and context sensitive design. In addition, include WSDOT members on the MAISA team who have positional or delegated authority to make decisions associated with the areas outlined in this chapter. Key decisions made by the engineer of record are based on recommendations made by the MAISA Team. These recommendations and decisions are documented in the appropriate sections of the Basis of Design, and provide fundamental boundaries for the project team to work within as design concepts move forward. The justification for whether or not each MAISA Team recommendation will be incorporated into the project are also provided in writing separately to the MAISA Team, in order to provide the Team an opportunity for feedback, and attached to the Basis of Design prior to its approval.

For more information on potential methods for organizing, managing, and collaborating with the MAISA teams, see the WSDOT Project Management Online Guide:

www.wsdot.wa.gov/projects/projectmgmt/onlineguide/preconstructioninitiatealign.

For additional guidance regarding MAISA teams, see the guidance document *Multiagency, Interdisciplinary, and Stakeholder Advisory Team* found on the Design Support website:

www.wsdot.wa.gov/Design/Support.htm.

Direct link to guidance:

www.wsdot.wa.gov/publications/fulltext/design/ASDE/Practical_Design.pdf

1100.05 Need and Performance Identification

The most fundamental function of practical design is to focus on the primary reason a location is under evaluation. Ask why there is a project under consideration at this location, and identify the specific need. If it is a mobility project; why is there a mobility need and what is specifically contributing to that need? WSDOT's practical design approach requires that the need be translated into specific performance metrics and that targets be selected to be achieved by the design. A contributing factors analysis (see [Chapter 1101](#)) is used to better define what to focus

on in order to resolve the specific performance problem, helping to define the potential scope of project alternatives.

[Chapter 1101](#) provides details on how performance needs are identified and utilized in practical design. However, understanding performance and associated performance terms is critical to the application of [Chapter 1101](#). It is recommended that various teams and partners collaborating on the project view the guidance document *Performance Based Design* before proceeding with application of [Chapter 1101](#). [Direct link to guidance document:](#)
www.wsdot.wa.gov/publications/fulltext/design/ASDE/Practical_Design.pdf

1100.06 Context Identification

Context identification refers to understanding the characteristics, activities, and functions within a geographical area. WSDOT is committed to providing context sensitive solutions (see [E 1028](#)), and context identification is a key component required to implement practical design. WSDOT's context identification process requires that two interrelated context facets be identified: land use and transportation. It also requires that a context condition be selected for design—either existing, future, or transition between existing and future contexts. [Chapter 1102](#) provides the context identification information.

1100.07 Design Control Selection

Design controls are specific design elements that create significant boundaries and influence on all other design elements. WSDOT has identified five primary design controls:

1. Design Year
2. Terrain Classification
3. Modal Priority
4. Access Control
5. Target Speed

[Chapter 1103](#) presents more information related to these design controls.

1100.08 Alternative Formulation and Evaluation

Under practical design, the goal is to develop a solution for the baseline need at the least cost. However, it is critical to understand how the solution affects other known or identified needs, termed “contextual needs.” [Chapter 1101](#) provides a discussion on baseline and contextual performance needs, and [Chapter 1104](#) discusses how these needs are utilized to develop and evaluate alternatives.

WSDOT's Practical Solutions approach requires that operational and demand management strategies are considered prior to implementing a capital strategy. The intent is to account for low-cost solutions being applied before making large capital investments.

In some cases, the planning phase will have identified a strategy based on least cost planning analysis. Focusing on the preferred strategy can help guide the development of



alternative solutions. The guidance document *Alternative Strategies and Solutions* discusses the three primary strategies and examples of solutions within those strategies.

The guidance document is found on the Design Support website:

<http://www.wsdot.wa.gov/Design/Support.htm>.

Direct link to guidance document:

www.wsdot.wa.gov/publications/fulltext/design/ASDE/Practical_Design.pdf

1100.09 Design Element Selection and Dimensions

Design element selection is based entirely on the alternative selected to resolve the baseline need and balance performance trade-offs. [Chapter 1105](#) provides instruction for design element selection. [Chapter 1106](#) provides information related to choosing dimensions for design elements.

1100.10 Documentation Tools

Basis of Design (BOD), Basis of Estimate (BOE), Design Parameter Sheets, and Alternative Comparison Tables are all documentation tools used to record decisions and analyses needed in development of a solution that is consistent with WSDOT's practical design approach.

1100.10(1) Basis of Design

The BOD is organized around the practical design procedural steps (see [1100.02](#)) necessary to support WSDOT's practical design approach. It provides a template for documenting each step in the process. The BOD includes the following base information and sections:

- Planning Document Summary
- General Project Information
- Section 1 – Project Need
- Section 2 – Context
- Section 3 – Design Controls
- Section 4 – Alternative Analysis
- Section 5 – Design Element Selection

[Exhibit 1100-1](#) shows the major activities associated with WSDOT's practical design approach and corresponding *Design Manual* chapters and Basis of Design sections.

Where it's anticipated or known that a BOD will be used, project design, scoping, and planning teams are encouraged to start the BOD at the earliest stages possible. Although a BOD may be only partially completed during the planning or scoping phase, information documented on the BOD provides an opportunity for greater consistency between strategies developed in planning and solutions developed in scoping and design. Information documented on a BOD, whether that work is performed during planning, scoping, or design, is determined only through the use of consent-based recommendations (see [Section 1100.04](#)).

Contact the Region Program Management Office regarding the need to initiate a BOD during the project scoping phase. Since the BOD is ultimately a document that supports design decisions, the approval of a BOD is a part of, and included in, the project Design Approval process (see [Chapter 300](#)).

The Basis of Design form can be downloaded at: www.wsdot.wa.gov/Design/Support.htm.

1100.10(1)(a) Basis of Design Exemptions

A BOD may be used to support design decisions on any project, but is required on all projects where one or more design elements are employed or changed (see [Chapter 1105](#)), except as provided in the following sections.

1100.10(1)(a)(1) All Projects

If the only design elements changed or employed by the project are listed in Exhibit 1105-1, then a Basis of Design (BOD) may not be needed. The Assistant State Design Engineer (ASDE) must concur with the request to exempt the BOD requirement. Submit a request by email explaining the reasons the exemption from the BOD requirement is warranted. The request should explain the unique circumstances that make use of the BOD unnecessary. Each project will be evaluated on a case by case basis. In situations where a BOD has been prepared for the project and no design elements were employed or changed, an ASDE approval of the BOD is not required.

1100.10(1)(a)(2) Preservation Projects

A Basis of Design form is not required for Preservation projects when the only design elements changed or employed are listed in [Chapter 1120](#), and the criteria and guidance provided in [Chapter 1120](#) for those design elements is followed.

1100.10(1)(a)(3) Safety Projects

Safety projects (developed under the I-2 funding program) may not require a BOD even though design elements are changed or employed. However, the Assistant State Design Engineer (ASDE) must provide concurrence to exempt the project from the BOD requirement. Submit a request to the ASDE by email explaining the reasons that an exemption from the BOD requirement is warranted. The request should explain the unique circumstances that make use of the BOD unnecessary. Each project will be evaluated on a case by case basis.

Circumstances that may contribute to a decision to exempt a safety project from the need to prepare a BOD include:

- A programmatic project endorsed by the WSDOT Highway Safety Panel (e.g. FHWA Intersection Improvement Program ISIP treatments, Rumble Strips, etc.)
- A Collision Analysis Report (CAR) was approved by the WSDOT Highway Safety Panel AND:
 - The CAR clearly identifies the project need.
 - The CAR compared and rated alternatives.

1100.10(2) **Basis of Estimate**

A Basis of Estimate will always be required, and it should be updated throughout all phases of development. Refer to the [Cost Estimating Manual for WSDOT Projects](#) for additional information on estimating and the Basis of Estimate.

1100.10(3) **Alternative Comparison Table**

The Alternative Comparison Table (ACT) is designed to provide solutions evaluated in accordance with WSDOT's Practical Solutions approach. This table is used to evaluate solutions accounting for the resolution of the baseline performance need at the least cost, with an understanding of the effects on other contextual performance metrics. The table also enables discussions to occur around performance trade-offs that may be necessary depending on the range of potential solutions being considered and their benefits or impacts across all performance metrics identified. The Alternative Comparison Table is supplemental documentation for Section 4 of the BOD, and can also be used to document the need to refine performance targets (see [Chapter 1106](#)). The ACT can be downloaded from:

www.wsdot.wa.gov/Design/Support.htm.

1100.10(4) **Design Parameter Sheets**

While a primary function of the BOD is to select the design elements that will be employed or changed in a project (see [Chapter 1105](#)), a primary function of the design parameter sheets is to document the dimensions selected for the various design elements selected and noted in Section 5 of the Basis of Design. A design parameter sheet template can be found at the following link: www.wsdot.wa.gov/Design/Support.htm.

1100.10(5) **Documenting Community Engagement**

Community engagement is a fundamental component of WSDOT's Practical Solutions strategy, and key to practical design implementation. Community engagement will be consistent with the WSDOT Community Engagement Plan (www.wsdot.wa.gov/planning/).

In order to be consistent with the *Community Engagement Plan*, as well as to provide source documentation for teams working on the project, a Community Engagement Documentation Package (CEDP) is suggested for use. Note that there is no strict format for the CEDP. The general elements for the CEDP package can be found in the guidance document *Documenting Community Engagement* on the Design Support website:

www.wsdot.wa.gov/Design/Support.htm

Direct link to guidance document:

www.wsdot.wa.gov/publications/fulltext/design/ASDE/Practical_Design.pdf

1100.11 References

1100.11(1) *Federal/State Directives, Laws, and Codes*

Revised Code of Washington (RCW) 47.04.280 – Transportation system policy goals

<http://apps.leg.wa.gov/rcw/default.aspx?cite=47.04.280>

Revised Code of Washington (RCW) 47.05.010 – The statement of purpose for priority programming of transportation projects

<http://apps.leg.wa.gov/RCW/default.aspx?cite=47.05.010>

Engrossed Substitute House Bill 2012 (Passed Legislation amending RCW 47.01 for Practical Design – link not available by publication)

Secretary's Executive Order 1090 – Moving Washington Forward: Practical Solutions

<http://wwwi.wsdot.wa.gov/publications/policies/fulltext/1090.pdf>

Secretary's Executive Order 1096 – WSDOT 2015-17: Agency Emphasis and Expectations

<http://wwwi.wsdot.wa.gov/publications/policies/fulltext/1096.pdf>

Secretary's Executive Order 1028 – Context Sensitive Solution

<http://wwwi.wsdot.wa.gov/publications/policies/fulltext/1028.pdf>

Exhibit 1100-1 Basis of Design Flowchart

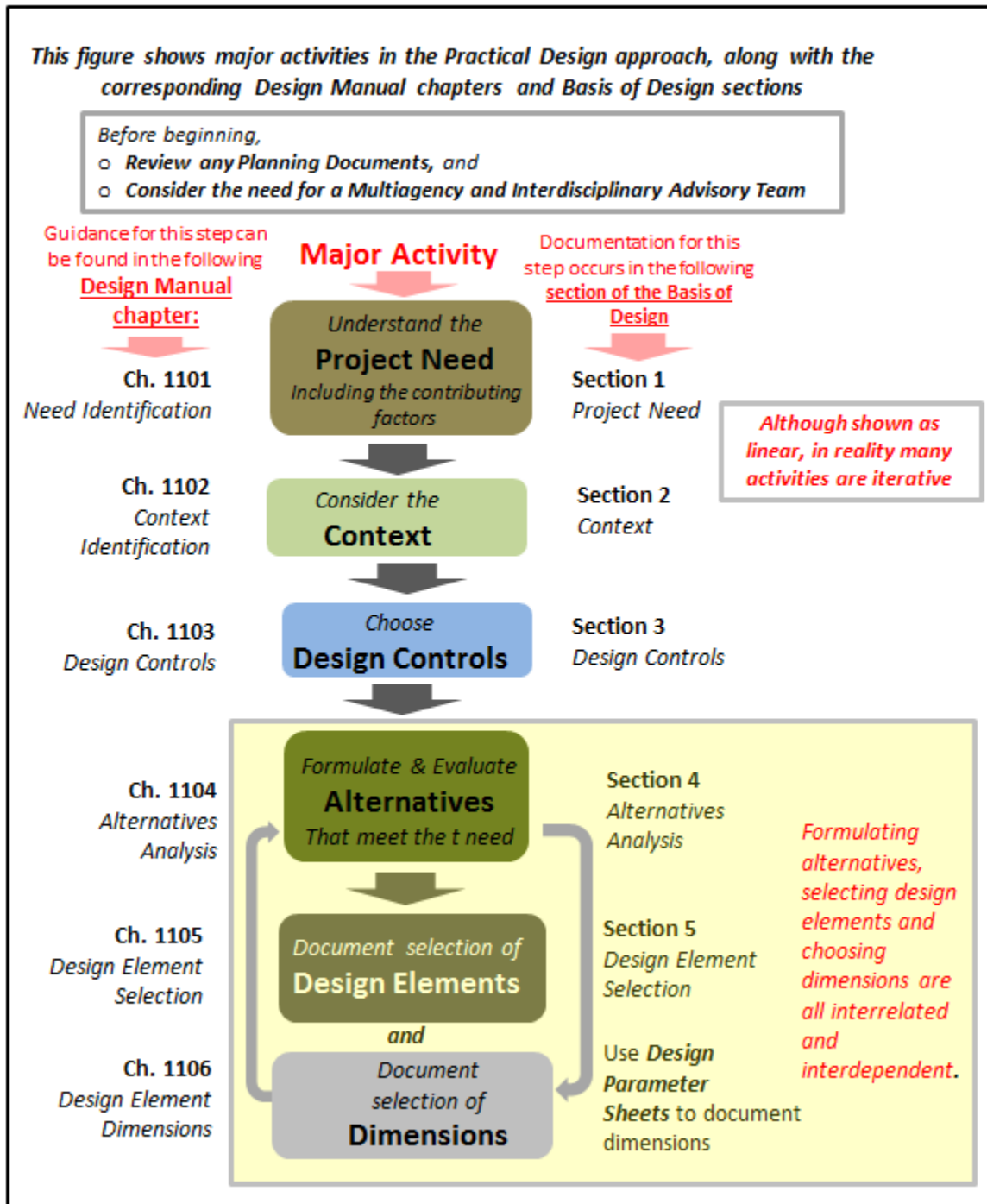


Exhibit 1103-3 Modal Compatibility Assessment Example

Land Use Characteristic	Modal Compatibility
High proximity to activity centers	Pedestrian, Transit, Bicycle
Large number of industrial and commercial land uses in surrounding area	Freight
High densities of both residential and employment	Bicycle, Pedestrian, Transit
No or minimal building setbacks adjacent to roadway	Pedestrian
Human scale architecture present	Pedestrian, Transit
Transportation Characteristic	Modal Compatibility
Large number of accesses	Auto
Well-established grid network	Bicycle, Pedestrian, Transit, Auto
T-2 freight route	Freight
Streetside elements present	Pedestrian, Transit
Frequent signalized intersections along route	Auto, Transit, Pedestrian

1103.04 Control: Access Control

Access is a critical component informed by an understanding of the contextual characteristics. Access is the primary connection between the land use and transportation contexts. The type of access control selected (see [Chapter 520](#)) affects accessibility and impacts the types of activities and functions that can occur on a segment. It is important for mobility and economic vitality projects to consider whether the current access classification and/or planned access classification conforms to the context selected for design (see [Chapter 1102](#)).

During development of the state highway system, access management functioned to preserve the safety and efficiency of regional highways. However, the level of access management can also significantly affect accessibility to land uses and, in turn, the various modal mobility needs and economic vitality of a place. It is necessary to select the appropriate type of access during planning and design. However, if access control has been acquired by purchase of access rights, this evaluation and selection is not necessary.

A choice to change the current or planned access control is a major decision and is to be consistent with the contextual information, desired performance targets, and modal priorities for a location.

Example: A managed access Class 2 route has incurred significant development in adjacent and surrounding parcel uses, increasing the number of local trips made on a segment of the route. Over time, additional intersections and access connection permits were granted. In this situation, it may be more appropriate to consider selecting managed access Class 4 or 5 because of the alteration in functions and activities along that segment over time.

Conversely, a route may have a need oriented around improving motor vehicle travel time performance, and managed access Class 1 is selected to assist in achieving that modal priority performance need. In this situation, the access helps to control features within the design consistent with the need, context, and modal priority.

If an alteration to current or planned access is determined necessary, consult the Development Services and Access Manager for preliminary approval for the selection, and document on the Basis of Design form (see [Chapter 1100](#)). For additional information on access control and access management, see Chapters [520](#), [530](#), and [540](#).

1103.05 Control: Design Speed

WSDOT uses a target speed approach for determining design speed. The objective of the target speed approach is to establish the design speed at the desired operating speed. The target speed selection is derived from all other design controls presented within this chapter, as well as transportation and land use context characteristics. The target speed approach exercises the connection that's been found in research and through experience between operating speed, design controls, and context characteristics.

Engage the public and local agency staff and officials prior to selecting the target speed. Once the target speed is selected, it becomes the design speed for the project. The goal of the target speed approach is that the speed ultimately posted on the completed project is the same as the design and ultimately the operating speed. In order to achieve this outcome, consider the impact of existing or proposed contextual characteristics, modal priorities, access control selection, performance need(s), and contributing factors analyses that have been developed for the project (see [1103.03\(3\)](#), [1103.04](#), and Chapters [1101](#), [1102](#), and either [530](#) or [540](#), as appropriate).

When selecting a target speed that is lower than the existing posted speed, or where excessive operating speeds were identified from contributing factors analysis of the baseline performance need, consider the use of roadway treatments that will help achieve the selected target speed (see [1103.05\(2\)](#)) during alternatives formulation. When selecting a target speed in excess of the existing posted speed, measures such as greater restriction of access control and segregation of modes may be necessary to reduce conflicts in activities and modal uses. Use caution when basing a target speed on one or more contextual characteristics that are proposed to take place after project opening, as the goal of ending up with a posted speed equal to the design speed at opening may be jeopardized.

Concurrence of the Region Traffic Engineer is required when speed management treatments are proposed to accomplish a desired target speed operation. When a design speed is proposed and assumed for a project or project segment that is lower than the existing posted speed, the approval of the State Traffic Engineer is also required.

The region Traffic Engineer is responsible for setting the posted speed on the highway once the project is completed. Because target speed is only one of the considerations used when establishing posted speed, and achieving a posted speed that is equal to the design speed is critical to project success, engage and include the region Traffic Engineer and Traffic Office staff in key decision-making that will affect the design speed selection.

1103.05(1) *Low, Intermediate, and High Speeds*

To provide a general basis of reference between target speed and geometric design, three classifications of target speed have been established:

1. **Low Speed is 35 mph and below.** A low target speed selection is ideal for pedestrian and bicycle modal oriented environments. Transportation contexts that include frequent transit stops, intermodal connections, moderate to high intersection density, or moderate to high

- 1104.01 General
- 1104.02 Alternative Solution Formulation
- 1104.03 Alternative Solution Evaluation
- 1104.04 Documentation
- 1104.05 References

1104.01 General

Washington State Department of Transportation's (WSDOT's) practical design approach requires that alternatives are formulated and evaluated while considering acceptable performance trade-offs to meet the need(s) of a project at the lowest level of investment. This chapter discusses how:

- Information determined from planning phases and Chapters [1101](#), [1102](#), and [1103](#) is utilized in alternative solution formation.
- To evaluate the alternative solutions developed.

This chapter presents methods for developing alternatives. For projects requiring an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), a final proposed alternative may only be determined through the National Environmental Policy Act (NEPA) process and/or the State Environmental Policy Act (SEPA) process (see Chapter 400 of the [Environmental Manual](#) for more information). If an EA or EIS has not been initiated under NEPA/SEPA, follow the procedures in this chapter. To help advance the project, account for appropriate NEPA/SEPA terminology is considered and used, that public and agency outreach is appropriately detailed, and that all information regarding alternatives development is documented for use later in the NEPA/SEPA process, according to [23 CFR 168\(d\)](#). Terminology used in this chapter assumes that NEPA/SEPA have not been initiated. In the event that the NEPA/SEPA process has been initiated and an EA or EIS will be required, coordinate with the region Environmental Office staff to make sure that this alternative formulation and evaluation is performed in accordance with NEPA/SEPA guidance.

1104.02 Alternative Solution Formulation

An important function of alternative solution formulation is to identify alternatives that address the baseline need while balancing the performance trade-offs identified in the process. Need identification and contributing factor analysis (CFA) are critical to alternative solution formulation (see [Chapter 1101](#) and guidance document [Contributing Factors Analysis](#) for more information). The baseline performance metric(s) aid in focusing on the most basic need that any alternative solution must address, while preventing potential scope creep for perceived peripheral needs. CFA identifies the contributing factors and underlying reason(s) the baseline need exists, forming the basis of what constitutes a strategic investment. Alternative solutions formulation will be conducted according to the following principles:

- Form solutions around contributing factors or the underlying root reason(s) identified from CFA. Address the underlying root reason(s) determined from CFA in at least one alternative.

- The relative benefit between each alternative is evaluated against the baseline and contextual performance metrics to determine the most appropriate solution for the least cost. (See [1104.03\(3\)](#) for information on calculating the benefit/cost of alternatives.) The selected context and design controls are boundaries for design to work within. Formulate alternatives compatible with context and design controls in order to obtain the most reasonable and acceptable outcomes.
- The same type of baseline performance need in different contexts, and with different controls, may yield different alternatives.

Planning phase corridor sketches or studies may identify WSDOT's strategy for the corridor. (See the guidance document *Alternative Strategies and Solutions* for more information regarding different strategies that may be considered.) If this has occurred, at least one alternative based on that identified strategy is to be developed and carried into the alternative evaluation process (see 1104.03). In some cases, planning studies may have developed specific alternatives to resolve the identified baseline need(s). It is the responsibility of the design phase to carry planning phase alternatives into the alternative evaluation process, unless planning phase alternatives are considered obsolete. In some cases, an alternative developed in the planning phase may present opportunities for phased implementation not previously considered, which could be refined during the alternative formulation and evaluation process in the scoping or design phases.

1104.03 Alternative Solution Evaluation

Alternative solution evaluation involves an understanding of the performance benefits obtained from alternative solutions in relation to the selected design year and cost. It is the intent of the alternative solution evaluation process to:

- Compare solutions that resolve the baseline need(s) in consideration with the benefits or impacts associated with the contextual performance needs.
- Analyze the relative value of each alternative and what performance trade-offs may be necessary to accept, or if trade-offs are deemed unacceptable, what performance trade-offs to mitigate with low-cost countermeasures.
- Mitigate unacceptable performance trade-offs with the proven countermeasures or the identification and planned implementation of a future phase by WSDOT or a partner.
- Refine targets (see 1104.03(2) and [Chapter 1106](#)) if mitigation measures applied to the formulated alternatives continues to yield unacceptable performance trade-offs.

1104.03(1) Alternatives Comparison

Comparing alternatives has always been fundamental to the design process and has been conducted by a number of methods. WSDOT's alternatives comparison process is intended to align with performance-based decision-making complementary with a practical design approach. The process centers around ensuring the basic performance need is addressed while understanding the potential effects to other performance areas. A solution that meets the baseline need but creates another performance need, or a solution where performance trade-offs are not conscientiously and collaboratively accepted, is not considered practical.

An Alternative Comparison Table (ACT) has been developed to assist in evaluating alternatives against the effects to both the baseline and contextual performance metrics identified. Effects can be positive, neutral, or negative and include benefits and drawbacks. The intent of comparing alternatives is to:

- Obtain an alternative solution for the least cost while understanding and accepting the performance trade-offs that may be inherently necessary depending on the performance metrics under evaluation.
- Compare alternatives against their ability to accomplish the baseline need.
- Evaluate alternatives against their relative effects on contextual needs.
- Provide the opportunity to explore and incorporate mitigation or countermeasures to address identified contextual needs that would otherwise not be treated when performance trade-offs are not considered acceptable.
- Provide the documented alternative formulation and evaluation outcomes that are consistent with the environmental process and expectations.

Note that if there are a large number of contextual needs under consideration, it may be beneficial to prioritize or use a weighted evaluation of the contextual needs in order to expedite the alternative evaluation.

As discussed in 1104.02, at least one alternative based on the outcome of Contributing Factors Analysis should be compared against other alternatives.

The Alternative Comparison Table template and examples can be found at:

www.wsdot.wa.gov/Design/Support.htm

1104.03(2) Performance Trade-off Decisions

In performance trade-off decisions the intent is to give priority to the project's baseline need. However, there will be situations where evaluations reveal that trade-offs are too significant, and there is an inability to adequately resolve them with low-cost countermeasures, phased solutions, or general acceptance of the performance trade-off. In these situations, it is appropriate to consider alternatives that still optimize the baseline performance metric, but do not necessarily obtain initial performance targets selected for design (See [Chapter 1101](#)), in order to arrive at an acceptable performance balance. See Section [1106.04\(1\)](#) for guidance on refining performance targets in general, and [Section 321.05](#) for additional guidance on refining safety targets in particular.

1104.03(3) Benefit/Cost Analysis

Inherent with understanding the performance trade-offs being made, is the overall benefit/cost for the alternatives proposed. In some cases, decisions will be made based on life cycle cost for maintenance items, as discussed in [Chapter 301](#). In other cases, perceived benefits are a challenge to quantify and will need analysis such as that discussed in *NCHRP Report 642: Quantifying the Benefits of Context Sensitive Solutions*:

www.trb.org/Publications/Blurbs/162282.aspx

1104.04 Documentation

The [Alternative Comparison Table](#) (ACT) is used to assist in evaluating alternatives. Summarize the alternatives evaluated with the ACT in Section 4 of the Basis of Design (BOD). Alternative formulation and evaluation will also be documented through the NEPA process. Environmental staff will help account for consistency with the environmental process, expectations and requirements throughout any alternative formulation and evaluation that occurs within project development.

1104.05 References

1104.05(1) *Federal/State Directives, Laws, and Codes*

[42 United States Code \(USC\) 4321](#), National Environmental Policy Act of 1969 (NEPA)

[Chapter 43.21C](#) Revised Code of Washington (RCW), State Environmental Policy Act (SEPA)

[Chapter 468-12](#) Washington Administrative Code (WAC), WSDOT SEPA Rules

[Secretary's Executive Order 1090](#) – Moving Washington Forward: Practical Solutions

[Secretary's Executive Order 1096](#) – WSDOT 2015-17: Agency Emphasis and Expectations

[Secretary's Executive Order 1028](#) – Context Sensitive Solutions

[Secretary's Executive Order 1018](#) – Environmental Policy Statement

1104.05(2) *Guidance and Resources*

[Environmental Manual](#), M 31-11, WSDOT

[Standard Plans for Road, Bridge, and Municipal Construction](#) (Standard Plans), M 21-01, WSDOT

[Understanding Flexibility in Transportation Design – Washington](#), WA-RD 638.1, Washington State Department of Transportation, 2005

www.wsdot.wa.gov/research/reports/fullreports/638.1.pdf

1104.05(3) *Supporting Information*

[Designing Walkable Thoroughfares: A Context Sensitive Approach](#), Institute of Transportation Engineers, Washington D.C., 2010.

www.ite.org

[NCHRP Report 642 – Guidelines for Quantifying the Benefits of Context Sensitive Solutions](#), Transportation Research Board, Washington D.C., 2014

<http://www.trb.org/Publications/Blurbs/162282.aspx>

[NCHRP Synthesis 443 – Practical Highway Design Solutions](#), Transportation Research Board, Washington D.C., 2013

<http://www.trb.org/Main/Blurbs/168619.aspx>

- 1105.01 General
- 1105.02 Selecting Design Elements
- 1105.03 Related Elements
- 1105.04 Documentation
- 1105.05 References

1105.01 General

Design elements are specific components associated with roadway design, such as lane widths, shoulder widths, alignments, clear zone etc. Design controls (see [Chapter 1103](#)) are conscientiously chosen and used to determine the dimensions of design elements. The relative effect that a given design element will have on performance will depend on the selected design controls and context identification. For more information, see the guidance document [The Effects of Different Design Elements on Performance](#).

1105.02 Selecting Design Elements

Design elements that have been included in a project are documented on the [Basis of Design](#) form by the project team. Include the design elements that are **employed** and/or **changed** by the preferred alternative or strategy. (See [Chapter 1100](#) for more information about Basis of Design.)

- An element is **employed** if it has been chosen for inclusion in the preferred alternative because it contributes directly to meeting the project need(s). These design elements are the “building blocks” that are included in the preferred alternative because it’s been demonstrated that they contribute to resolving the project need or needs.
- An element is **changed** if one of the following applies:
 - o A new element is added
 - o An existing element is removed or relocated
 - o A dimension—such as a width—is modified
- A design element that is not changed or employed is not documented in the Basis of Design.

The next step after selecting design elements is to choose the appropriate dimension for each element. (See [Chapter 1106](#) for information on selecting design element dimensions.)

The following link provides examples that may help clarify how to select design elements:

www.wsdot.wa.gov/Design/Support.htm

1105.02(1) *Required Design Elements and Criteria*

In addition to the design element selection process described above, there are additional legal and policy-based considerations that require that the decision of whether or not to include certain design elements in the project also depends on the program or project conditions. See [Exhibit 1105-1](#) for additional information regarding whether or not to include these design elements in a project.

Exhibit 1105-1 Required Design Elements

Program or Sub-Program	Design Elements						
	ADA	Clear Zone [1]	Roadside Safety Hardware [3]	Signing & Delineation [4]	Illumination [7]	ITS [8]	Signal Hardware
I-1 Mobility I-3 Economic Initiative - Trunk System I-6 Sound Transit	Apply the content in Chapter 1510 (section 1510.05)	Apply the content in Chapter 1600	Apply the content in chapters 1600 , 1610 and 1620	Apply the content in Chapter 1020 for signing and Chapter 1030 for delineation	Apply the content in Chapter 1040	Apply the content in Chapter 1050	[5]
All Preservation (P-1, P-2, P-3)	Apply the content in Chapter 1120 (section 1120.03(2))	[2]	Apply the content in Chapter 1120 (section 1120.03(7))	[2] [6]	[2]	[2]	[5]
I-2 Safety I-4 Environmental Retrofit I-3 All Other	Apply the content in Chapter 1510 (section 1510.05)	[2]	[2]	[2] [6]	[2]	[2]	[5]

Notes:

[1] See [Chapter 1600](#)

[2] Only Include when changed or employed as described in [1105.02](#).

[3] Includes all roadside safety design elements in chapters [1600](#), [1610](#), and [1620](#).

[4] See [Chapter 1020](#) for signing and [Chapter 1030](#) for delineation

[5] Consult the Assistant State Design Engineer, HQ Traffic Office, and Capital Program Development and Management Office (CPDM) to determine policy requirements.

[6] Consult the HQ Traffic Office for policy requirements if the design element “delineation” is changed or employed in the design.

[7] See [Chapter 1040](#)

[8] See [Chapter 1050](#)

1105.03 Related Elements

Design elements can be interrelated. Even if a specific design element has not changed in accordance with the definition in [1105.02](#), consideration is to be given to whether or not the preferred alternative has changed the conditions in a way that may affect the performance of the unchanged element.

Example: A project team proposes to provide a two-way left-turn lane along a portion of their project by reducing the width of each highway shoulder, in order to address a baseline need related to safety for turning traffic. By reducing the shoulder width, they note that the traveled way is now closer to the roadside than in the existing condition. Project team discussions with their interdisciplinary team determine whether the project would adversely affect safety performance due to roadside conditions such as steep slopes or objects in the clear zone.

1105.04 Documentation

Document design elements that are changed or employed in the preferred alternative in [Section 5](#) of the [Basis of Design](#) (BOD) form unless exempted in Section 1100.10(1).

As a design alternative matures over time, it is likely that design elements may be added or dropped through the iterative process inherent with design. It is important to update the Basis of Design documentation with these changes at the various documentation and approvals milestones.

The Basis of Design is available to download here:

www.wsdot.wa.gov/Design/Support.htm

1105.05 References

The Effects of Different Design Elements on Performance, WSDOT Guidance Document:

www.wsdot.wa.gov/Design/Support.htm

- 1106.01 General
- 1106.02 Dimensioning Design Elements
- 1106.03 Dimensioning Iterations
- 1106.04 Documenting Dimensions
- 1106.05 References

1106.01 General

Practical design resolves the project need with the least investment, and relies on a “design-up” approach. A design-up approach means developing project alternatives utilizing the smallest dimensions that meet the need by providing the desired performance.

Flexibility in the choice of design element dimensions is primarily provided by designing for the appropriate context, design controls, and understanding the performance to obtain. This chapter outlines two methods that build upon the context, design controls, and performance selection in order to dimension elements: quantitative analysis method and criteria-based evaluation method.

1106.02 Dimensioning Design Elements

Context, design controls, and performance needs are significant factors when selecting design element dimensions. Context is critical, because many design element dimensions have a different relative importance to certain performance categories in different contexts. For additional information, see the examples below and the guidance document *Effects of Different Design Elements on Performance*:

 www.wsdot.wa.gov/publications/fulltext/design/ASDE/Practical_Design.pdf

Example: Shoulder width in an urban context affects safety and mobility performance differently than when applied in a rural context.

Design controls, particularly target speed and access control selection, significantly influence many geometric design element dimensions.

Example: A high target speed selection results in larger horizontal turning radii versus a lower target speed selection. A high target speed may necessitate separating a bike lane with an outer separation, versus a lower target speed where that separation is not needed. Intersection densities associated with the selected access control will effect what is necessary for decision sight distance.

The selected baseline and contextual performance metrics and targets, and associated trade-offs, will impact many different design element dimensions.

Example: A prioritized bicycle mobility and safety performance target may result in reducing motor vehicle lane widths in order to provide a needed bike lane width, even though there is a known impact to motor vehicle mobility and safety performance.

Understanding boundaries established through the selected context identification, design controls, and performance needs enables projects to “design up” by testing the lower values first (see also [Chapter 300](#)).

Two methods are available when evaluating design element dimensions:

- Quantitative Analysis Method
- Criteria-Based Evaluation Method

Whenever viable, dimension design elements in *Design Manual* divisions 12 through 15 using quantitative methods and according to the context, design controls, and desired performance selected. Note: this does not apply to design elements related to Americans with Disabilities Act (ADA), which must apply ADA-related criteria presented in [Chapter 1510](#) to be compliant with state and federal ADA laws.

If quantitative tools cannot analyze the design elements, use the criteria-based evaluation method. Identify performance trade-offs that may result from the outcome of applying these methods, and update the Alternative Comparison Table (ACT), as appropriate. Dimensioning iterations are expected to occur as discussed in [1106.03](#).

1106.02(1) Element Dimensioning Using Quantitative Analysis Method

The use of quantitative engineering methods and tools is required whenever such tools are available. Some quantitative tools only address particular context and design elements related to a particular performance category under evaluation. Currently, two primary tools exist to quantitatively evaluate performance. These are the *Highway Safety Manual* (HSM) and the *Highway Capacity Manual* (HCM), which evaluate multimodal safety performance and traffic operational mobility performance, respectively.

Designers can use quantitative methods to readily input and verify the performance results of their design elements.

1106.02(1)(a) Highway Safety Manual and Safety Modeling

Safety is and always has been a primary performance category for WSDOT. Past design policy relied on the assumption that the application of design criteria equated to a desired level of safety performance for the expenditure. This anecdotal assumption may not have always been true for all locations, given their operational and geometric characteristics. The strict application of criteria to achieve safety performance is known as “nominal safety.” To achieve a more reliable safety performance, scientific estimation of crashes using site conditions is necessary and is termed “substantive safety.” A new understanding of safety performance, crash modification factors, and roadway functions has led to a growing body of knowledge about the relationship between roadway characteristics and safety performance.

The application of the *Highway Safety Manual* (HSM) and its companion tools allows for a judicious understanding of how a particular design can perform with respect to safety. This enables analysis of safety-specific performance metrics that may be more critical to address. The HSM covers multiple transportation road types and can be a valuable tool to analyze various geometric alternatives in any program type.

Washington State’s [Target Zero Strategic Safety Plan](#) identifies the department’s baseline performance metric for safety: reduce the risk of serious injury and fatal crashes. This baseline performance metric is to be evaluated at all locations resolving a mobility or economic vitality

category need, as discussed in [Chapter 1101](#). Projects in the I-2 safety program may also identify other specific baseline safety performance metrics, to further target crash types of concern and reduce the risk of serious injury and fatal crashes. Additionally, other locations may have identified specific safety performance metrics as either baseline or contextual performance metrics. In general, outside of the safety program, other specific safety performance metrics should be the result of the contributing factors analysis (see [Chapter 1101](#)). For more information on sustainable highway safety tools and analysis, see [Chapter 321](#).

1106.02(1)(b) Highway Capacity Manual and Traffic Modeling

The *Highway Capacity Manual* (HCM) provides quantitative methods for evaluating mobility operational performance. However, some quantitative outputs from some HCM methods are specific to free-flow speed operations or level of service, and may not be appropriate for use given the baseline mobility performance metric selected for a specific location. Traffic modeling software provides a more relevant method for understanding the mobility operational performance; however, the reliability of the outputs varies given the traffic forecasting for design years further in the future. Utilize traffic modeling to ascertain potential mobility operational performance whenever feasible.

1106.02(2) Element Dimensioning Using Criteria-Based Evaluation Method

The criteria-based evaluation method relies on applying criteria presented within the *Design Manual* chapters. The application of criteria-based evaluation requires engineering judgment regarding a specific criteria's relevance to a particular alternative under consideration or its direct or indirect effect on a particular performance outcome. The criteria-based evaluation method is intended to assist with a determination of common application and dimensioning of a particular design element. However, site-specific factors cannot always be accounted for within the design criteria, and it is therefore ultimately up to the Engineer of Record.

Variations to design element criteria provided in *Design Manual* chapters can be heavily influenced by the selected context and design controls. Use the context, design controls, and performance target(s) selected to inform engineering judgment in the application of criteria.

1106.03 Dimensioning Iterations

Dimensioning is a crucial part of alternatives formulation and evaluation. A project alternative will likely go through several iterations to identify design elements, select design element dimensions, and balance dimensions with the potential inclusion of countermeasures or treatments to offset an adverse performance impact.

1106.04 Documenting Dimensions

While a primary function of the Basis of Design is to document the design elements selected to be included in a project, a primary function of the Design Parameter sheets is to document the dimensions chosen for the various design elements included in a project. Document design element dimensions on the Design Parameter sheets.

Important Note: If the dimension for an existing design element doesn't change, no documentation is required on the Parameter sheets. A Parameter Sheet entry left blank means that the element was not selected to be included in the project. (See [Chapter 1105](#) for design

element selection guidance.) A Parameter Sheet template can be found here:

🔗 <http://www.wsdot.wa.gov/Design/Support.htm>.

1106.04(1) Performance Target Refinement Procedure

In some situations it may be necessary to refine (or adjust) performance targets for one or more metrics from the initial targets established and documented on the Basis of Design. Refining a performance target occurs when the MAISA and/or Engineer of Record determines any of the following apply:

- All reasonable alternatives have been considered, and no alternative is able to meet the initial target established.
- An alternative can meet the initial target, but in doing so, unacceptable performance trade-offs result for other metrics, and the alternatives evaluated cannot mitigate for the performance gap with low cost countermeasures or treatments.

The refined targets are entered into the Basis of Design prior to approval, and information about the refinement process is kept with other project records, including consideration of potential countermeasures, treatments, and/or design elements considered for the identified alternatives.

1106.04(2) Design Analysis

A Design Analysis is required where a dimension chosen does not meet the value, or lie within the range of values, provided for that element in the *Design Manual* (see Chapter 300.)

1106.05 References

Effects of Different Design Elements on Performance, WSDOT guidance document

🔗 <http://www.wsdot.wa.gov/Design/Support.htm>

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

Highway Safety Manual (HSM), AASHTO

Washington State's Target Zero Strategic Safety Plan

🔗 <http://www.targetzero.com/plan.htm>

- 1120.01 [General](#)
- 1120.02 [Preservation Projects](#)
- 1120.03 [Preservation Project Features and Elements](#)
- 1120.04 [Documentation](#)

1120.01 General

This chapter provides information specific to programmatic preservation project types. Pavement preservation work engages specific design elements and features that are necessary to addressing programmatic intent.

This chapter identifies those elements and features to be evaluated and potentially addressed during the course of a preservation project. The elements listed here may also be in addition to the project need identified in the Project Summary or Basis of Design (see [1120.04](#)).

1120.02 Preservation Projects

Preservation projects are funded in three program areas:

- **Pavement preservation projects** preserve pavement structure, extend pavement service life, and restore the roadway for reasonably safe operations. (See Roadway Preservation – P1 Scoping instructions.)
- **Structures preservation projects** preserve the state’s bridge network through cost effective actions. There are numerous types of bridge preservation actions including: deck rehabilitation, seismic retrofit, painting steel bridges, scour repair, and others. (See Structures Preservation – P2 scoping instructions.)
- **Preservation of other facilities** includes basic safety guardrail and signing, major drainage, major electrical, unstable slopes and other project types. (See Other Facilities – P3 Scoping instructions.)

The work described in this chapter may apply to projects in one or multiple program areas. For more information on these programs see the Planning & Programming – Scoping website:

<http://wwwi.wsdot.wa.gov/Planning/CPDMO/PlanProgScoping.htm>

1120.03 Preservation Project Features and Elements

This section applies to features and design elements to be addressed on pavement preservation projects.

This section may also apply to other preservation projects. To determine which features and elements to address in these projects consult with region and headquarters subject matter experts.

See [1120.04](#) Documentation for instructions on using the Basis of Design to document design elements and adjusted features.

1120.03(1) Adjust existing features

- Adjust existing features such as monuments, catch basins, and access covers that are affected by resurfacing.
- Evaluate drainage grates and replace as needed to address bicycle safety (see Drainage Grates and Manhole Covers in [Chapter 1520](#)).
- For guidance on existing curb see [1230.05](#).

1120.03(2) ADA requirements

- Address ADA requirements according to WSDOT policy (see [Chapter 1510](#)).

1120.03(3) Cross slope lane

- Rebuild the cross slope to a minimum 1.5% when the existing cross slope is flatter than 1.5% and the steeper slope is needed to provide adequate highway runoff. See Chapters [1230](#) and [1250](#) for more information about cross slope.

1120.03(4) Cross slope shoulder

- When rebuilding the lane cross slope, evaluate shoulder cross slope in accordance with [Chapter 1230](#).

1120.03(5) Vertical clearance

- Paving projects, and seismic retrofit projects, may impact vertical clearances (see [Chapter 720](#) for bridge clearances and [Chapter 1020](#) for overhead sign assemblies.) If vertical clearance will be changed by the project, evaluate this in accordance with [Chapter 720](#) and include this design element in the Basis of Design and the Design Parameters sheets.

1120.03(6) Delineation

- Install and replace delineation in accordance with [Chapter 1030](#) (this includes only pavement markings, guideposts, and barrier delineation).
- Replace rumble strips if they are removed through project actions, or if their average depth is less than 3/8", unless there is a documented justification for their removal (see [Chapter 1600](#)).

1120.03(7) Barriers and terminals

- When the guardrail, terminal, and/or transition will be reduced to less than 26.5 inches from the ground to the top of the rail element, adjust the height in accordance with guidance provided in [1610.04\(1\)](#) and [1610.04\(2\)\(a\)](#). This guardrail work may be programmed under a separate project except for crack, seat, and overlay projects or where the cross- slope has been adjusted, thus affecting the barrier height.
- One terminal that was used extensively on Washington's highways was the Breakaway Cable Terminal (BCT). This system used a parabolic flare similar to the Slotted Rail Terminal (SRT) and a Type 1 anchor (Type 1 anchor posts are wood set in a steel tube or a concrete foundation). Replace BCTs on Interstate routes. On non-Interstate routes and Interstate ramps, BCTs that have at least a 3-foot offset may remain in place unless

the guardrail run or anchor is being reconstructed or reset. (Raising the rail element is not considered reconstruction or resetting.)

- Evaluate the guardrail length of need for runs that need to be raised as a result of an HMA overlay in accordance with [Chapter 1610](#). Up to 250 feet of additional run length within each run is permissible in preservation projects.
- Note that removal is an option if guardrail is no longer needed based on validation of the original guardrail purpose from past project documentation and after consulting [Chapters 1600](#) and [1610](#).
- When adjusting terminals that are equipped with CRT posts, the top-drilled holes in the posts need to remain at the surface of the ground.
- Pre-cast concrete barrier sections (either New Jersey or “F” shape) are normally installed at 32” height, which includes provision for up to 3” overlay. A 29” minimum height for this type of barrier must be maintained following an overlay.
- Single slope concrete barrier may be pre-cast or cast in place, and is installed new at a height of 42”, 48”, or 54”. A 30” minimum height must be maintained for this type of barrier following an overlay.

1120.03(8) Fill and Ditch Slopes

- See [Chapter 1230](#) for Fill and Ditch in-slopes steeper than 4H:1V on Interstate HMA Overlays and PCCP Single Lane Rehab projects.

1120.04 Documentation

Use the [Basis of Design](#) to document decisions when the project employs or changes one or more design elements that are not otherwise referenced in this chapter. Document any changes to dimensions on the design parameter sheets.

1230.01	General
1230.02	Context and Modally Integrated Cross Sections
1230.03	Cross Section Zones and Elements
1230.04	Medians and Outer Separations
1230.05	Curbs
1230.06	Cross Slope
1230.07	Structure Width
1230.08	Documentation
1230.09	References

1230.01 General

Geometric cross sections for state highways are governed by the need to balance identified performance metrics (see [Chapters 1101](#) and [1104](#)), the context (see [Chapter 1102](#)) and selected design controls (see [Chapter 1103](#)). The objective is to optimize the use of available public space and/or reasonable investment in right of way acquisition. The geometric cross section is composed of multiple lateral design elements such as lanes, shoulders, medians, bike facilities, and sidewalks. The design task is to select and size these elements according to, designated performance target(s), design controls, and context. There is flexibility in the selection of design elements, dimensioning (see [Chapter 1106](#)), and configurations to obtain the desired level of performance for a given mode and/or context.

1230.02 Context and Modally Integrated Cross Sections

The geometric cross section of a roadway is composed of different zones. The cross-section examples shown in [Exhibits 1230-2a through 1230-6d](#) depict various configurations that may be included in a cross section. The examples are included to stimulate designer creativity and awareness of modal accommodations, and are not intended to be standard cross sections to be reproduced for a given modal orientation. The cross section examples show what is possible for specific contexts and performance needs. It is expected that project alternatives will innovative diverse configurations to best balance baseline and contextual needs (see [Chapter 1101](#)) for the modes and contexts represented. The cross section examples present ranges to achieve different performance needs.

The cross section configurations also provide a range of dimensions for different design elements that are the basis of dimensioning an element (see [1230.03](#)). For a more detailed explanation of each cross section zone or element that makes up a cross section, see [1230.04](#). Higher-range values are presented as boundaries to consider for cost; however, exceeding those ranges in median, streetside, and roadside design is acceptable and encouraged in some contexts and is situationally dependent.

1230.02(1) Jurisdictional Design and Maintenance

On all state highways in rural locations outside of cities or towns or limited access design areas, geometric design is to be consistent with this *Design Manual*.

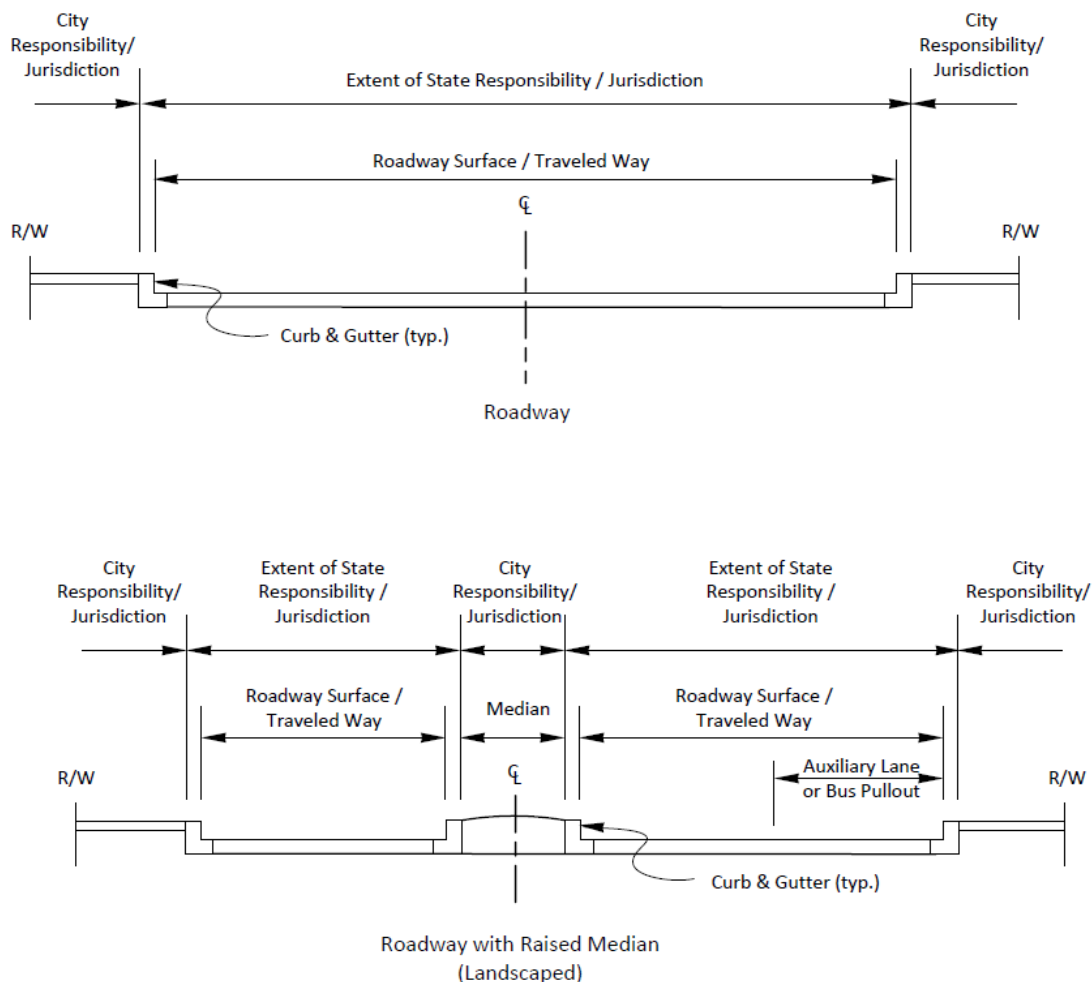
On state highways within an incorporated city or town, develop design features in cooperation with the local agency. For NHS routes, use the *Design Manual*. For non-NHS routes, the [Local](#)

Agency Guidelines may be used for dimensioning design elements using the Criteria Based Method. However, use of Quantitative Methods for dimensioning design elements may provide additional flexibility and is recommended (see [Chapter 1106](#) for additional information about the dimensioning methods).

Cross-sectional design within incorporated cities or towns can get complicated due to the joint-jurisdictional authority. WSDOT typically has jurisdiction of the traveled way zone, and cities typically have jurisdiction of the streetside zones (see [Exhibit 1230-1](#)). When no curb is present, the city or town holds responsibility for the roadside beyond the paved shoulder. Despite the jurisdictional differences, it is extremely important to cooperatively determine a cross-sectional design. Design elements within the streetside or roadside zones are necessary to emphasize the traveled way zone design, and vice-versa.

Refer to [Chapter 301](#) for additional information on jurisdictional maintenance responsibilities and considerations for maintenance agreements

Exhibit 1230-1 State and City Jurisdictional Responsibilities





“Moving the Curb” Photo courtesy of NACTO.org

1230.02(6)(b)(2) Parklets and Plazas

Parklets and plazas reuse existing right of way in urban and rural town centers, providing public space to support the economic vitality and social livability performance of a particular context. As geometric cross sections are reconfigured, spaces may become available at nodes or where repurposing a parking zone area into either plazas or parklets. The primary intent of presenting these treatments is for low-speed roadways or main streets with volumes at or below 20,000 ADT. However, there are many potential constraints external to the engineering design that may need resolution before application. Consult with Real Estate Services to discuss the specific property management-related concerns and any potential lease and/or economic payment considerations proportionally appropriate for utilization of the highway space in this manner, as further detailed in [RCW 47.24.020\(15\)](http://RCW 47.24.020(15)).

A parklet specifically uses the parking zone to create a space for pedestrians. A common application provides seating accommodations to support local restaurants and shops. Parklet designs will vary depending on local jurisdiction regulations, but they typically include railing and/or planter boxes to provide a separation of uses between people and traffic. Parklet design should not cover catch basins or other features that may require frequent maintenance. Parklets interact with motorized vehicle traffic best when placed on tangent alignments.

Plazas can reuse right of way to define a relatively large common public space. Plazas are typically associated with a central gathering location for special events, and will likely have limited application on Washington state highways.





1230.03 Cross Section Zones and Elements

The geometric cross section of a roadway is comprised of different zones. Examples are shown in Exhibits [1230-2a](#) through [1230-6d](#), but these examples are not the only cross-sectional options available. Which zones to apply depends on the performance needs, context (see [Chapter 1102](#)) and design controls (see [Chapter 1103](#)) determined for a particular location. Which zonal design elements apply, and how they are configured within each zone, depends largely on the balance of performance needs determined and the context identified. The following subsection list the cross-sectional zones and their design elements.

Maintaining the continuity of a roadway is an important consideration in alternative formulation, particularly for limited access and other high-speed highways. However, it is also appropriate to intentionally change continuity in response to obvious changes in context, in order to impact driver behavior. When designing intentional changes to the continuity of the geometric cross section, it is important to consider what is needed to enable the transition. High-speed to low-speed changes will need to transition the geometric cross section over a distance utilizing a speed transition segment (see [Chapter 1103](#)). At other locations where low target speeds are already established, roadway changes can be more oriented around maintaining speed and operations.

1230.03(1) Traveled Way Zone

The traveled way zone refers to any lanes or buffers contained within either the edge lines or curbing when stripes are not provided, excluding any parking areas that may be present. The traveled way zone is typically only provided for motorized vehicles and bicycle modes. The traveled way zone includes all auxiliary and special-use lanes, and is therefore different from the term traveled way, which is used in other applications of roadway design.

- 1260.01 General
- 1260.02 References
- 1260.03 Stopping Sight Distance (Eye height – 3.5 ft, Object height – 2.0 ft)
- 1260.04 Passing Sight Distance (Eye height – 3.5 ft, Object height – 3.5 ft)
- 1260.05 Decision Sight Distance (Eye height – 3.5 ft, Object height – 2.0 ft)
- 1260.06 Documentation

1260.01 General

Sight distance allows the driver to assess developing situations and take actions appropriate for the conditions. Sight distance relies on drivers being aware of and paying attention to their surroundings and driving appropriately for conditions presented. For the purposes of design, sight distance is considered in terms of stopping sight distance, passing sight distance, and decision sight distance.

For additional information, see the following chapters:

Chapter	Subject
1250	Sight distance at railroad crossings
1310	Sight distance at intersections at grade
1320	Sight distance at roundabouts
1340	Sight distance at driveways
1515	Sight distance for shared-use paths

1260.02 References

1260.02(1) Design Guidance

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)

1260.02(2) Supporting Information

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

Passing Sight Distance Criteria, NCHRP 605

1260.03 Stopping Sight Distance (Eye height – 3.5 ft, Object height – 2.0 ft)

1260.03(1) Design Criteria

Stopping sight distance is provided when the sight distance available to a driver equals or exceeds the stopping distance for a passenger car traveling at the design speed.

Stopping distance for design is very conservatively calculated, with lower deceleration and slower perception reaction time than normally expected from the driver. Provide design stopping sight distance at all points on all highways and on all intersecting roadways, unless a design analysis is deemed appropriate.

1260.03(1)(a) Stopping Sight Distance

Stopping sight distance is the sum of two distances: the distance traveled during perception and reaction time and the distance to stop the vehicle. The perception and reaction distance used in design is the distance traveled in 2.5 seconds at the design speed.

The design stopping sight distance is calculated using the design speed and a constant deceleration rate of 11.2 feet/second². For stopping sight distances on grades less than 3%, see [Exhibit 1260-1](#); for grades 3% or greater, see [Exhibit 1260-2](#).

**1260.03(1)(b) Design Stopping Sight Distance**

[Exhibit 1260-1](#) gives the design stopping sight distances for grades less than 3%, the minimum curve length for a 1% grade change to provide the stopping sight distance for a crest (K_c) and sag (K_s) vertical curve, and the minimum length of vertical curve for the design speed (VCL_m). For stopping sight distances when the grade is 3% or greater, see [Exhibit 1260-2](#).

Design Speed (mph)	Design Stopping Sight Distance (ft)	K_c	K_s	VCL_m (ft)
25	155	<u>12</u>	<u>26</u>	75
30	200	<u>19</u>	<u>37</u>	90
35	250	<u>29</u>	49	105
40	305	<u>44</u>	<u>64</u>	120
45	360	<u>61</u>	<u>79</u>	135
50	425	<u>84</u>	96	150
55	495	<u>114</u>	115	165
60	570	<u>151</u>	136	180
65	645	<u>193</u>	157	195
70	730	<u>247</u>	<u>181</u>	210
75	820	<u>312</u>	206	225
80	910	<u>384</u>	231	240

Design Stopping Sight Distance
Exhibit 1260-1

1420.03(3) Sight Distance

Provide stopping sight distance in accordance with [Chapter 1260](#). This provides sight distance for an automobile. The longer distance needed for a bus to stop is compensated for by the greater eye height of the driver, with the resulting vertical curve length about equal to that for an automobile.

Sag vertical curves may be shortened where necessary. (See [Chapter 1220](#) for guidance.)

1420.03(4) Grades

Grades for ramps are covered in [Chapter 1360](#). [Design Analyses](#) will be considered for:

- Downgrade on-ramps with grades increased by an additional 1%.
- Upgrade off-ramps with grades increased by an additional 2%.

These increased grades help when geometrics are restricted, and they assist transit vehicles with the acceleration when entering and the deceleration when exiting the freeway.

1420.03(5) Ramp Widths

1420.03(5)(a) Lane Widths

Use widths for separated roadway HOV facilities. (See Minimum Traveled Way Widths for Articulated Buses in [Chapter 1410](#).) On tangents, the minimum lane width may be reduced to 12 feet.

1420.03(5)(b) Shoulder Widths

Ramp shoulder width criteria are modified as follows:

- The minimum width for the sum of the two shoulders is 10 feet for one-lane ramps and 12 feet for two or more lanes.
- The minimum width for one of the shoulders is 8 feet for disabled vehicles. The minimum width for the other shoulder is 2 feet. (See [Chapter 1610](#) for shy distance at barrier.)
- The wider shoulder may be on the left or the right. Maintain the wide shoulder on the same side throughout the ramp.

Minimum Ramp Widths for Articulated Buses	
R (ft)*	W _R (ft)
Tangent	21
500	23
400	23
300	24
200	26
150	27
100	30
75	34
50	40
*R is to the curve inside edge of traveled way	

1420.03(5)(c) Total Ramp Widths

When an A-BUS is the intersection design vehicle at the ramp terminal, make the total width of the ramp (lane width plus shoulders) wide enough to allow an A-BUS to pass a stalled A-BUS. This width has two components:

- The vehicle width (U = 8.5 feet on tangent) for each vehicle
- Lateral clearance (C = 2 feet) for each vehicle

The vehicle width and the lateral clearance are about the width of an A-BUS from edge of mirror to edge of mirror.

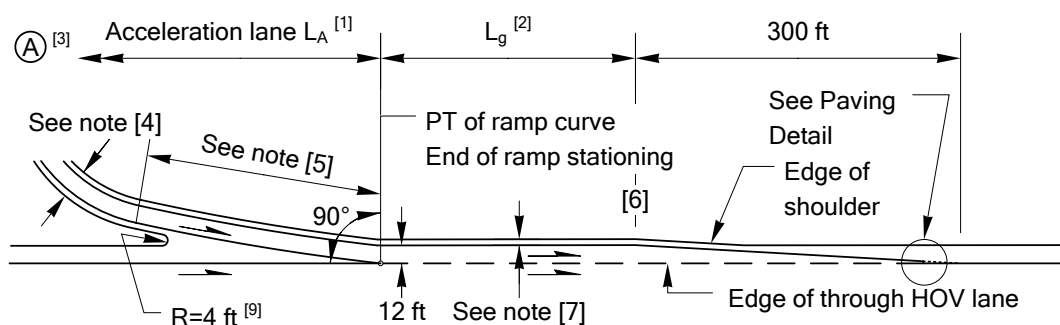
The table above gives the minimum ramp width (W_R), including shoulders, at various radii (R) for an articulated bus. For ramp locations on a tangent section or on a curve with a radius greater than 150 feet, consider the W_R width when requesting a reduced lane or shoulder width. For ramp curves with a radius less than 150 feet, check the total ramp width and, if necessary, widen the shoulders to provide the W_R width.

1420.03(6) On-Connections

1420.03(6)(a) Parallel On-Connections

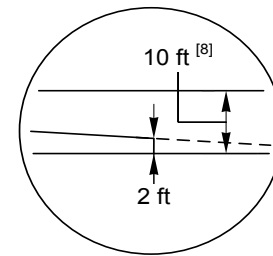
For left-side on-connections, use the parallel on-connection.

A parallel on-connection adds a parallel lane that is long enough for the merging vehicle to accelerate in the lane and then merge with the through traffic. This merge is similar to a lane change and the driver can use side and rear view mirrors to advantage.



Notes:

- [1] For acceleration lane length L_A , see 1420.03(6)(b). Check L_A for each ramp design speed.
- [2] L_g is the gap acceptance length. Begin L_g at the beginning of the parallel lane, as shown, but not before the end of the acceleration lane L_A . (See 1420.03(6)(c) for the length L_g .)
- [3] Point (A) is the point controlling the ramp design speed or the end of the transit stop zone or other stopping point.
- [4] For ramp lane and shoulder widths, see 1420.03(5).
- [5] A transition curve with a minimum radius of 3,000 ft is desirable. The desirable length is 300 ft. When the main line is on a curve to the right, the transition may vary from a 3,000 ft radius to tangent to the main line. The transition curve may be replaced by a 50:1 taper with a minimum length of 300 ft.
- [6] Angle point for width transitions, when required. (See Chapter 1210 for pavement transitions.)
- [7] For ramp shoulder width, see 1420.03(5)(b).
- [8] The 10 ft left shoulder is the minimum width; 14 ft is desirable. Maintain this shoulder width for at least 500 ft; 1,000 ft is desirable.
- [9] Radius may be reduced when concrete barrier is placed between the ramp and main line.



Paving Detail

General:

For striping, see the *Standard Plans*.

Lane widths are shown for illustrative purposes. Determine lane widths according to 1420.03(5)(c), Chapter 1230 and using Chapter 1106 procedures. Verify lane width selection with transit providers that may utilize these connections.

1600.03(1) Design Clear Zone on Limited Access State Highways and Other State Highways Outside Incorporated Cities and Towns

Use the Design Clear Zone Inventory form ([Exhibit 1600-3](#)) to identify potential features to be mitigated and propose corrective actions.

Guidance for establishing the Design Clear Zone for highways outside incorporated cities is provided in [Exhibit 1600-2](#). This guidance also applies to limited access facilities within the city limit. Providing a clear recovery area that is consistent with this guidance does not require any additional documentation. However, there might be situations where it is not practicable to provide these recommended distances. In these situations, document the decision as a design analysis as discussed in [Chapter 300](#).

For state highways that are in an urban environment, but outside an incorporated city, evaluate both median and roadside clear zones as discussed above using [Exhibit 1600-2](#). However, there is flexibility in establishing the Design Clear Zone in urbanized areas adjacent to incorporated cities and towns. To achieve this flexibility, an evaluation of the impacts, including safety, aesthetics, the environment, economics, modal needs, and access control, can be used to establish the Design Clear Zone. This discussion, analysis, and legal agreement development takes place early in the consideration of the median and roadside designs. A legal agreement on the responsibility for design, construction, operation, and maintenance for these median and roadside sections must be formalized with the city and/or county. Document the design decision for the selected Design Clear Zone as part of the design approval (see [Chapter 300](#)).

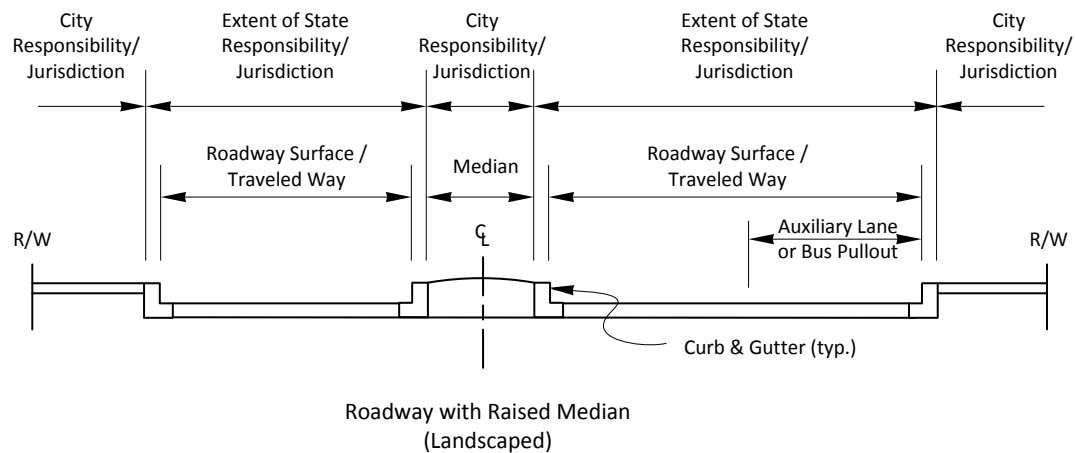
Because AASHTO's *A Policy on Geometric Design of Highways and Streets* had addressed the concept of operational offset within the discussion of clear zone, some practitioners misinterpreted this offset as providing an adequate clear zone. The 18-inch operational offset beyond the face of curb is a lateral clearance for opening car doors or for truck mirrors.

1600.03(2) Design Clear Zone Inside Incorporated Cities and Towns

For managed access state highways within an urban area, it might not be practicable to provide the Design Clear Zone distances shown in [Exhibit 1600-2](#). Roadways within an urban area generally have curbs and sidewalks and might have objects such as trees, poles, benches, trash cans, landscaping, and transit shelters along the roadside.

For projects on city streets as state highways that include work in those areas that are the City's responsibility and jurisdiction (see [Exhibit 1600-1](#)), design the project using the city's Development/Design Standards. The standards adopted by the city must meet the requirements set by the Design Standards Committee for all projects on arterials, bike projects, and all federal-aid projects.

Exhibit 1600-1 City and State Responsibilities and Jurisdictions



1600.03(2)(a) Roadside and Median

For managed access state highways inside incorporated cities, it is the city's responsibility to establish an appropriate Design Clear Zone in accordance with guidance contained in the City and County Design Standards (*Local Agency Guidelines*, Chapter 42.) [Exhibit 1600-1](#) shows an example of state and city responsibilities and jurisdictions. Document the Design Clear Zone established by the city in the Design Documentation Package. Have the responsible transportation official from the City (e.g., City Engineer) document the Design Clear Zone, and their acknowledgement and acceptance of the design and maintenance responsibilities for project roadsides and medians, in a letter addressed to WSDOT, and file this letter as part of the local agency coordination in the Design Documentation Package. Respond to the sender by letter acknowledging receipt. Sample templates for these letters will be made available online at the Design Support website under the Design Documentation section.

1600.03(3) Design Clear Zone and Calculations

The Design Clear Zone guidance provided in [Exhibit 1600-2](#) is a function of the posted speed, sideslope, and traffic volume. There are no distances in the table for 3H:1V fill slopes. Although fill slopes between 4H:1V and 3H:1V are considered traversable if free of fixed objects, these slopes are defined as nonrecoverable slopes. A vehicle might be able to begin recovery on the shoulder, but likely will not be able to further this recovery until reaching a flatter area (4H:1V or flatter) at the toe of the slope. Under these conditions, the Design Clear Zone distance is called a recovery area. The method used to calculate the recovery area and an example are shown in [Exhibit 1600-4](#).

For ditch sections, the following criteria determine the Design Clear Zone:

- (a) For ditch sections with foreslopes 4H:1V or flatter (see [Exhibit 1600-5](#), Case 1, for an example), the Design Clear Zone distance is the greater of the following:
- The Design Clear Zone distance for a 10H:1V cut section based on speed and the average daily traffic (ADT).
 - A horizontal distance of 5 feet beyond the beginning of the backslope.

When a backslope steeper than 3H:1V continues for a horizontal distance of 5 feet beyond the beginning of the backslope, it is not necessary to use the 10H:1V cut slope criteria.

- (b) For ditch sections with foreslopes steeper than 4H:1V and backslopes steeper than 3H:1V, the Design Clear Zone distance is 10 feet horizontal beyond the beginning of the backslope (see [Exhibit 1600-5](#), Case 2, for an example).
- (c) For ditch sections with foreslopes steeper than 4H:1V and backslopes 3H:1V or flatter, the Design Clear Zone distance is the distance established using the recovery area formula (see [Exhibit 1600-4](#); also see [Exhibit 1600-5](#), Case 3, for an example).

1600.04 Mitigation Guidance

There are three general categories of features to be mitigated: sideslopes, fixed objects, and water. This section provides guidance for determining when these objects present a significant risk to an errant motorist. For each case, the following conditions need added consideration:

- Locations with high expected crash frequency.
- Locations with pedestrian and bicycle usage. (See Chapters [1510](#), Pedestrian Facilities, [1515](#), Shared-Use Paths, and [1520](#), Roadway Bicycle Facilities.)
- Playgrounds, monuments, and other locations with high social or economic value.
- Redirectional land forms, also referred to as earth berms, were installed to mitigate objects located in depressed medians and at roadsides. They were constructed of materials that provided support for a traversing vehicle. With slopes in the range of 2H:1V to 3H:1V, they were intended to redirect errant vehicles. The use of redirectional land forms has been discontinued as a means for mitigating fixed objects. Where redirectional land forms currently exist as mitigation for a fixed object, provide designs where the feature they were intended to mitigate is removed, relocated, made crashworthy, or shielded with barrier. Landforms may be used to provide a smooth surface at the base of a rock cut slope.

The use of a traffic barrier for features other than those described below requires justification.

1600.04(1) Side Slopes

1600.04(1)(a) Fill Slopes

Fill slopes can present a risk to an errant vehicle with the degree of severity dependent upon the slope and height of the fill. Providing fill slopes that are 4H:1V or flatter can mitigate this condition. If flattening the slope is not feasible or cost-effective, the installation of a barrier might be appropriate. [Exhibit 1600-6](#) represents a selection procedure used to determine whether a fill sideslope constitutes a condition for which a barrier is a cost-effective mitigation. The curves are based on the severity indexes and represent the points where total costs associated with a traffic barrier are equal to the predicted cost of crashes over the service life for selected slope heights without traffic barrier. If the ADT and height of fill intersect on the “Barrier Recommended” side of the embankment slope curve, then provide a barrier if flattening the slope is not feasible or cost-effective.

Do not use [Exhibit 1600-6](#) for slope design. Design slopes consistent with guidance in Chapter [1230](#), evaluating designs with clear, traversable slopes before pursuing a barrier option. Also, if [Exhibit 1600-6](#) indicates that barrier is not recommended at an existing slope, that result is not justification for a design analysis. For example, if the ADT is 4,000 and the embankment height is 10 feet, barrier might be cost-effective for a 2H:1V slope, but not for a 2.5H:1V slope. This process only addresses the potential risk of exposure to the slope.

the condition. Where barrier is not cost-effective, use the recovery area formula to evaluate fixed objects on critical fill slopes less than 10 feet high.

1600.04(1)(b) Cut Slopes

A cut slope is usually less of a risk than a traffic barrier. The exception is a rock cut with a rough face that might cause vehicle snagging rather than providing relatively smooth redirection.

Analyze the potential motorist risk and the benefits of treatment of rough rock cuts located within the Design Clear Zone. Conduct an individual investigation for each rock cut or group of rock cuts. A cost-effectiveness analysis that considers the consequences of doing nothing, removal, smoothing of the cut slope, and other viable options to reduce the severity of the condition can be used to determine the appropriate treatment. Some potential options are:

- Graded landform along the base of a rock cut.
- Flexible barrier
- More rigid barrier
- Rumble strips

1600.04(2) Fixed Objects

Use engineering judgment when considering the following objects for mitigation:

- Wooden poles or posts with cross-sectional areas greater than 16 square inches that do not have breakaway features.
- Signs, illumination, cameras, weather stations, and other items mounted on nonbreakaway poles, cantilevers, or bridges.
- Trees with a diameter of 4 inches or more, measured at 6 inches above the ground surface.
- Fixed objects extending above the ground surface by more than 4 inches; for example, boulders, concrete bridge rails, signal/electrical/ITS cabinets, piers, and retaining walls.
- Drainage items such as culvert and pipe ends.

Mitigate fixed features that exist within the Design Clear Zone when practicable. Although limited in application, there may be situations where removal of an object outside the right of way is appropriate. The possible mitigative measures are listed as follows in order of preference:

- Remove
- Relocate
- Reduce impact severity (using a breakaway feature)
- Shield the object by using longitudinal barrier or impact attenuator

1600.04(2)(a) Trees

When evaluating new plantings or existing trees, consider the maximum allowable diameter of 4 inches, measured at 6 inches above the ground when the tree has matured. When removing trees within the Design Clear Zone, complete removal of stumps is preferred. However, to avoid significant disturbance of the roadside vegetation, larger stumps may be mitigated by grinding or cutting them flush to the ground and grading around them.

Removal of trees may be beneficial to reduce the impacts of driving errors, which result in angle crashes and roadside and clear zone encroachments. It is recognized that different facilities have

1610.01	General	1610.07	Cable Barrier
1610.02	References	1610.08	Concrete Barrier
1610.03	Definitions	1610.09	Special-Use Barriers
1610.04	Project Criteria	1610.10	Bridge Traffic Barriers
1610.05	Barrier Design	1610.11	Other Barriers
1610.06	Beam Guardrail	1610.12	Documentation

1610.01 General

The Washington State Department of Transportation (WSDOT) uses traffic barriers to reduce the overall severity of crashes that occur when a vehicle leaves the traveled way. Consider whether a barrier is preferable to the recovery area it may replace. In some cases, installation of a traffic barrier may result in more crashes, as it presents an object that can be struck. Barriers are designed so that such encounters might be less severe and not lead to secondary or tertiary crashes. However, when impacts occur, traffic barriers are not guaranteed to redirect vehicles without injury to the occupants or additional crashes.

Barrier performance is affected by the characteristics of the types of vehicles that collide with them. For example, motor vehicles with large tires and high centers of gravity are commonplace on our highways and they are designed to mount obstacles. Therefore, they are at greater risk of mounting barriers or of not being decelerated and redirected as conventional vehicles would be.

When barriers are crash-tested, it is impossible to replicate the innumerable variations in highway conditions. Therefore, barriers are crash-tested under standardized conditions. These standard conditions were previously documented in National Cooperative Highway Research Program (NCHRP) Report 350. These guidelines have been updated and are now presented in the *Manual for Assessing Safety Hardware* (MASH).

Barriers are not placed with the assumption that the system will restrain or redirect all vehicles in all conditions. It is recognized that the designer cannot design a system that is foolproof or will address every potential crash situation. Instead, barriers are placed with the assumption that, under normal conditions, they might provide lower potential for occupant deceleration and vehicle redirection for given roadside crashes when compared to a location without barrier.

Traffic barriers do not prevent crashes or injuries from occurring. They are intended to lower the potential severity for crash outcomes based on the conditions for which they are installed. Consequently, barriers should not be used unless a reduced crash frequency and severity potential is likely. No matter how well a barrier system is designed, optimal performance is dependent on drivers' proper use, maintenance, and operation of their vehicles and the proper use of vehicle restraint systems. At the time of installation, the ultimate choice of barrier type and placement is made by gaining an understanding of site and traffic conditions, having a thorough understanding of and using the criteria presented in Chapters 1600 and 1610, and using engineering judgment.

1610.02 References

1610.02(1) Design Guidance

Bridge Design Manual LRFD, M 23-50, WSDOT

Roadside Design Guide, AASHTO, 2011

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

Traffic Manual, M 51-02, WSDOT

1610.02(2) Supporting Information

NCHRP 350, TRB, 1993

Manual for Assessing Safety Hardware (MASH), AASHTO, 2009

Determining Length of Need. This e-learning course for WSDOT employees covers the “Length of Need,” which is a calculation of how much longitudinal barrier is necessary to shield objects on the roadside. Request this training via the web-based Learning Management System.

1610.03 Definitions

Refer to the *Design Manual Glossary* for many of the terms used in this chapter.

1610.04 Project Criteria

See [Chapter 1105](#) Design Element Selection. Additionally, follow the guidance in this chapter for any project that introduces new barrier onto the roadside (including median). Remove barrier that is not needed. Use the criteria in [Chapter 1600](#) as the basis for removal.

1610.04(1) Barrier Terminals and Transitions

Install, replace, or upgrade transitions as discussed in [Chapter 1120](#) and [1610.06\(5\)](#), Transitions and Connections.

Impact attenuator criteria can be found in [Chapter 1620](#), Impact Attenuator Systems. Concrete barrier terminal criteria can be found in [1610.08\(3\)](#).

When installing new terminals, consider extending the guardrail to meet the length-of-need criteria found in [1610.05\(5\)](#).

When the end of a barrier has been terminated with a small mound of earth, remove and replace with a crash-tested terminal, except as noted in [1610.09](#).

Redirectional landforms, also referred to as earth berms, were formerly installed to help mitigate crashes with fixed objects located in depressed medians and at roadsides. They were constructed of materials that provided support for a traversing vehicle. With slopes in the range of 2H:1V to 3H:1V, they were intended to redirect errant vehicles. The use of redirection landforms has been discontinued. Where redirection land forms currently exist as mitigation for a fixed object, provide alternative means of mitigation of the fixed object, such as remove,

relocate, upgrade with crash-tested systems, or shield with barrier. Landforms may be used to provide a smooth surface at the base of a rock cut slope.

Replace guardrail terminals that do not have a crash-tested design with crash-tested guardrail terminals (see [1610.06\(4\)](#), Terminals and Anchors). Common features of systems that do not meet current crash-tested designs include:

- No cable anchor.
- A cable anchored into concrete in front of the first post.
- Second post not breakaway (CRT).
- Design A end section (Design C end sections may be left in place—see the [Standard Plans](#) for end section details).
- Terminals with beam guardrail on both sides of the posts (two-sided).
- Buried guardrail terminals that slope down such that the guardrail height is reduced to less than 28 inches.

When the height of an existing terminal will be reduced to less than 26.5 inches from the ground to the top of the rail element, adjust the height to a minimum of 28 inches and a maximum of 30 inches. A rail height of 30 inches is desirable to accommodate future overlays. When adjusting terminals that are equipped with CRT posts, the top-drilled holes in the posts need to remain at the surface of the ground.

One terminal that was used extensively on Washington's highways was the Breakaway Cable Terminal (BCT). This system used a parabolic flare similar to the Slotted Rail Terminal (SRT) and a Type 1 anchor. (Type 1 anchor posts are wood set in a steel tube or a concrete foundation.) Replace BCTs on Interstate routes. On non-Interstate routes and Interstate ramps, BCTs that have at least a 3-foot offset may remain in place unless the guardrail run or anchor is being reconstructed or reset (raising the rail element is not considered reconstruction or resetting).

Existing transitions that do not have a curb but are otherwise consistent with the designs shown in the [Standard Plans](#) may remain in place.

1610.04(2) Standard Run of Barrier

A "Standard Run" of barrier consists of longitudinal barrier as detailed in the [Standard Plans](#).

1610.04(2)(a) Barrier Height Criteria

For HMA Overlay Projects that will reduce the height of W-beam guardrail to less than 26.5 inches from the ground to the top of the rail element, adjust the height to a minimum of 28 inches and a maximum of 30 inches. A rail height of 30 inches is desirable to accommodate future overlays.

If Type 1 Alternate W-beam guardrail is present, raise the rail element after each overlay. If Type 1 Alternate is not present, the blockout may be raised up to 4 inches. This requires field drilling a new hole in the guardrail post. See the [Standard Plans](#).

Overlays in front of safety shape concrete barriers can extend to the top of the lower, near-vertical face of the barrier before adjustment is necessary.

- Allow no more than 1-foot 1-inch from the pavement to the beginning of the top near-vertical face of the safety shape barriers. [See the *Standard Plans*](#).
- Allow no less than 2-foot 8-inches from the pavement to the top of the single-slope barrier.
- Allow no less than 35 inches to the center of the top cable for four-cable high-tension cable barriers.

Note: There are new high-tension cable barrier systems under development, which may change the selection and placement criteria. The Headquarters (HQ) Design Office will circulate guidance on these new developments as they are adopted as WSDOT policy.

1610.04(2)(b) Additional Standard Run Considerations

Examples of barriers that are not acceptable as a “Standard Run” are:

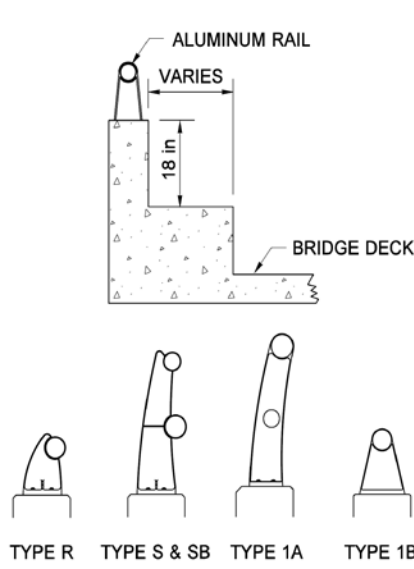
- W-beam guardrail with 12-foot 6-inch post spacing or no blockouts, or both.
- W-beam guardrail on concrete posts.
- Cable barrier on wood or concrete posts.
- Half-moon or C-shaped rail elements.

1610.04(3) Bridge Rail

When Bridge Rail is included in a project, the bridge rails, including crossroad bridge rail, are to meet the following criteria:

- Use an approved, crash-tested concrete bridge rail on new bridges or bridges to be widened. The [Bridge Design Manual](#) provides examples of typical bridge rails. Consult the HQ Bridge and Structures Office regarding bridge rail selection and design and for design of the connection to an existing bridge.
- An existing bridge rail on a highway with a posted speed of 30 mph or below may remain in place if it is not located on a bridge over a National Highway System (NHS) highway. When Type 7 bridge rail is present on a bridge over an NHS highway with a posted speed of 30 mph or below, it may remain in place regardless of the type of metal rail installed. Other bridge rails are to be evaluated for strength and geometrics. (See [1610.10](#) for guidance on retrofit techniques.)
- The Type 7 bridge rail is common. Type 7 bridge rails have a curb, a vertical-face parapet, and an aluminum top rail. The curb width and the type of aluminum top rail are factors in determining the adequacy of the Type 7 bridge rail, as shown in [Exhibit 1610-1](#). Consult the HQ Bridge and Structures Office for assistance in evaluating other bridge rails.

Exhibit 1610-1 Type 7 Bridge Rail Upgrade Criteria



Aluminum Rail Type	Curb Width	
	9 Inches or Less	Greater Than 9 Inches*
Type R, S, or SB	Bridge rail adequate	Bridge rail adequate
Type 1B or 1A	Bridge rail adequate	Upgrade bridge rail
Other	Consult the HQ Bridge and Structures Office	

*When the curb width is greater than 9 inches, the aluminum rail must be able to withstand a 5 kip load.

1610.05 Barrier Design

When selecting a barrier, consider the flexibility, cost, and maintainability of the system. It is generally desirable to use the most flexible system possible to minimize damage to the impacting vehicle and injury to the vehicle's occupant(s). However, since nonrigid systems sustain more damage during an impact, the exposure of maintenance crews to traffic might be increased with the more frequent need for repairs.

Maintenance costs for concrete barrier are lower than for other barrier types. In addition, deterioration due to weather and vehicle impacts is less than most other barrier systems. Unanchored precast concrete barrier can usually be realigned or repaired when moved from its alignment. However, heavy equipment may be necessary to reposition or replace barrier segments. Therefore, in medians, consider the shoulder width and the traffic volume when determining the acceptability of unanchored precast concrete barrier versus rigid concrete barrier. See [Exhibit 1610-2](#) for deflection area requirements.

Drainage, alignment, and drifting snow or sand are considerations that can influence the selection of barrier type. Beam guardrail and concrete barrier can contribute to snow drifts. Consider long-term maintenance costs associated with snow removal at locations prone to snow drifting. Slope flattening is recommended when the safety benefit justifies the additional cost to eliminate the need for the barrier. Cable barrier is not an obstruction to drifting snow and can be used if slope flattening is not feasible.

With some systems, such as concrete and beam guardrail, additional shoulder widening or slope flattening is common. However, selection of these types of barriers is sometimes limited due to the substantial environmental permitting and highway reconstruction needs. Permits issued under the SEPA and NEPA processes may lead to the use of a barrier design such as cable barrier, which has fewer potential environmental impacts and costs.

1610.05(1) *Sight Distance*

When selecting and placing a barrier system, consider the possible impact the barrier type and height may have on sight distance. In some cases, barriers may restrict the sight distances of road users entering the roadway, such as from road approaches, intersections, and other locations. In these cases, the barrier may need to be adjusted to meet the sight distance requirements at these locations.

1610.05(2) *Shy Distance*

Provide 2 feet of additional widening for shy distance when a barrier is to be installed in areas where the roadway is to be widened and the shoulder width will be less than 8 feet. This shy distance is not needed when the section of roadway is not being widened or the shoulders are at least 8 feet wide.

1610.05(3) *Barrier Deflections*

Expect all barriers except rigid barriers (such as concrete bridge rails, barrier integral to retaining walls or embedded cast-in-place barriers) to deflect when hit by an errant vehicle. The amount of deflection is primarily dependent on the stiffness of the system. However, vehicle speed, angle of impact, and weight also affect the amount of barrier deflection. For flexible and semirigid roadside barriers, the deflection distance is designed to help prevent the impacting vehicle from striking the object being shielded. For unrestrained rigid systems (unanchored precast concrete barrier), the deflection distance is designed to help prevent the barrier from being knocked over the side of a drop-off or steep fill slope (2H:1V or steeper).

In median installations, design systems such that the anticipated deflection will not enter the lane of opposing traffic using deflection values that were determined from crash tests. When evaluating new barrier installations, consider the impacts where significant traffic closures are necessary to accomplish maintenance. Use a rigid system where deflection cannot be tolerated, such as in narrow medians or at the edge of bridge decks or other vertical drop-off areas. Runs of rigid concrete barrier can be cast in place or extruded with appropriate footings.

In some locations where deflection distance is limited, anchor precast concrete barrier. Unless the anchoring system has been designed to function as a rigid barrier, some movement can be expected and repairs may be more expensive. Use of an anchored or other deflecting barrier on top of a retaining wall without deflection distance provided requires approval from the HQ Design Office.

Refer to [Exhibit 1610-2](#) for barrier deflection design values when selecting a longitudinal barrier. The deflection distances for cable and beam guardrail are the minimum measurements from the face of the barrier to the fixed feature. The deflection distance for unanchored concrete barrier is the minimum measurement from the back edge of the barrier to the drop-off or slope break.

Exhibit 1610-2 Longitudinal Barrier Deflection

Barrier Type	System Type	Deflection
Cable barrier or beam guardrail, Types 20 and 21, on G-2 posts	Flexible	Up to 12 ft ^[1] (face of barrier to object)
Beam guardrail, Types 1, 1a, 2, 10, and 31	Semirigid	3 ft (face of barrier to object)
Two-sided W-beam guardrail, Types 3 and 4	Semirigid	2 ft (face of barrier to object)
Permanent concrete barrier, unanchored	Rigid Unrestrained	3 ft ^[2] (back of barrier to object)
Temporary concrete barrier, unanchored	Rigid Unrestrained	2 ft ^[3] (back of barrier to object)
Precast concrete barrier, anchored	Rigid Anchored	6 inches (back of barrier to object)
Rigid concrete barrier	Rigid	No deflection
<p>Notes:</p> <p>[1] See 1610.07(2)</p> <p>[2] When placed in front of a 2H:1V or flatter fill slope, the deflection distance can be reduced to 2 feet.</p> <p>[3] When used as temporary bridge rail, anchor all barrier within 3 feet of a drop-off.</p>		

1610.05(4) Flare Rate

Flare the ends of longitudinal barriers where practicable. The four functions of a flare are to:

- Locate the barrier and its terminal as far from the traveled way as feasible.
- Reduce the length of need.
- Redirect an errant vehicle.
- Minimize a driver's reaction to the introduction of an object near the traveled way.

Keeping flare rates as flat as practicable preserves the barrier's redirection performance and minimizes the angle of impact. However, it has been shown that an object (or barrier) close to the traveled way might cause a driver to shift laterally, slow down, or both. The flare reduces this reaction by gradually introducing the barrier so the driver does not perceive the barrier as an object to be avoided. The flare rates in [Exhibit 1610-3](#) are intended to satisfy the four functions listed above. More gradual flares may be used. Flare rates are offset parallel to the edge of the traveled way. Transition sections are not normally flared.

Situations exist where hardware installations may have barrier flare rates different than shown in [Exhibit 1610-3](#). If a Standard Plan for a barrier installation shows a different taper rate than is shown in [Exhibit 1610-3](#), the taper rate shown on the Standard Plan can be used.

Exhibit 1610-3 Longitudinal Barrier Flare Rates

Posted Speed (mph)	Rigid & Rigid Anchored System	Unrestrained Rigid System	Semirigid System
65–70	20:1	18:1	15:1
60	18:1	16:1	14:1
55	16:1	14:1	12:1
50	14:1	12:1	11:1
45	12:1	11:1	10:1
40 or below	11:1	10:1	9:1

1610.05(5) Length of Need

The length of traffic barrier needed to shield a fixed feature (length of need) is dependent on the location and geometrics of the object, direction(s) of traffic, posted speed, traffic volume, and type and location of traffic barrier. When designing a barrier for a fill slope (see [Chapter 1600](#)), the length of need begins at the point where the need for barrier is recommended. For fixed objects and water, Exhibits [1610-10a](#) and [10b](#) show design parameters for determining the needed length of a barrier for both adjacent and opposing traffic on relatively straight sections of highway.

When barrier is to be installed on the outside of a horizontal curve, the length of need can be determined graphically, as shown in [Exhibit 1610-10c](#). For installations on the inside of a curve, determine the length of need as though it were straight. Also, consider the flare rate, barrier deflection, and barrier end treatment to be used.

When beam guardrail is placed in a median, consider the potential for impact from opposing traffic when conducting a length of need analysis. When guardrail is placed on either side of objects in the median, consider whether the trailing end of each run of guardrail will shield the leading end of the opposing guardrail. Shield the leading end when it is within the Design Clear Zone of opposing traffic (see [Exhibit 1610-10d](#)). This is also a consideration when objects are placed in the outer separations between the main line and collector-distributors.

Before the actual length of need is determined, establish the lateral distance between the proposed barrier installation and the object shielded. Provide a distance that is greater than or equal to the anticipated deflection of the longitudinal barrier. (See [Exhibit 1610-2](#) for barrier deflections.) Place the barrier as far from the edge of the traveled way as possible while maintaining the deflection distance.

If the end of the length of need is near an adequate cut slope, extend the barrier and embed it in the slope (see [1610.06\(4\)](#)). Avoid gaps of 300 feet or less. Short gaps are acceptable when the barrier is terminated in a cut slope. If the end of the length of need is near the end of an existing barrier, it is recommended that the barriers be connected to form a continuous barrier. Consider maintenance access issues when determining whether or not to connect barriers.

1610.05(6) Median Barrier Selection and Placement Considerations

The most desirable barrier installation uses the most flexible system appropriate for the location and one that is placed as far from the traveled way as practicable. Engineers are faced with the fact that barrier systems and vehicle fleets continue to evolve. What may be an optimal choice of barrier based on the majority of vehicles on the road today may not be the best selection for vehicles on the road in the foreseeable future. This continuum of change does not allow engineers to predict the future with any degree of certainty. Consequently, engineering decisions need to be made based on the most reliable and current information.

Engineers are constantly striving to develop more effective design features to improve highway safety. However, economics and feasibility do not permit new designs to be employed as soon as they are invented. The fact that a new design has been developed does not mean that the old design is unsafe. Although new designs may have been tested under controlled conditions, their performance under relevant applications may demonstrate unexpected performance aspects. Therefore there may be a need to modify application methods based on that practical experience.

Good engineering judgment is called for in determining the appropriate placement of barrier systems. Solutions may need to be arrived at while considering competing factors such as crash frequency and severity. As discussed previously, performance of the system relies on the interaction of the vehicle, driver, and system design at any given location. Additionally, the ability to access the system for maintenance and availability of parts plays into the final decision.

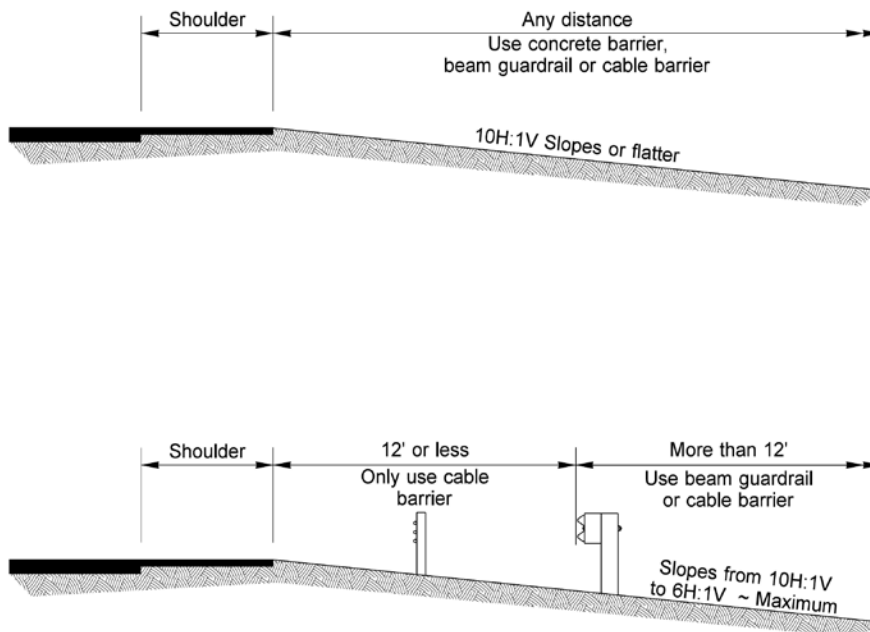
With median barriers, the deflection characteristics and placement of the barrier for a traveled way in one direction can have an impact on the traveled way in the opposing direction. In addition, the median slopes and environmental issues often influence the type of barrier that is appropriate.

In narrow medians, avoid placement of barrier where the design deflection extends into oncoming traffic. Narrow medians provide little space for maintenance crews to repair or reposition the barrier. Therefore, avoid installing deflecting barriers in medians that provide less than 8 feet from the edge of the traveled way to the face of the barrier.

In wider medians, the selection of barrier might depend on the slopes in the median. At locations where the median slopes are relatively flat (10H:1V or flatter), unrestrained precast concrete barrier, beam guardrail, and cable barrier can be used depending on the available deflection distance. At these locations, position the barrier as close to the center as possible so that the recovery distance can be maximized for both directions. There may be a need to offset the barrier from the flow line to avoid impacts to the drainage flow.

In general, cable barrier is recommended with medians that are 30 feet or wider. However, cable barrier may be appropriate for narrower medians if adequate deflection distance exists. In wide medians where the slopes are steeper than 10H:1V but not steeper than 6H:1V, cable barrier placed near the center of the median is preferable. For additional cable barrier placement guidance, see Exhibits [1610-13a](#) through [13c](#). Place beam guardrail at least 12 feet from the slope breakpoint, as shown in [Exhibit 1610-4](#). Do not use concrete barrier at locations where the foreslope into the face of the barrier is steeper than 10H:1V.

Exhibit 1610-4 Traffic Barrier Locations on Slopes



At locations where the roadways are on independent alignments and there is a difference in elevation between the roadways, the slope from the upper roadway might be steeper than 6H:1V. In these locations, position the median barrier along the upper roadway and provide deflection and offset distance as discussed previously. Barrier is generally not needed along the lower roadway except where there are fixed features in the median.

When W-beam barrier is placed in a median as a countermeasure for cross-median crashes, design the barrier to be struck from either direction of travel. For example, the installation of beam guardrail might be double-sided (Type 31-DS).

1610.05(7) Aesthetic Barrier Treatment

When designing a barrier for use on a Scenic Byway, consider barriers that are consistent with the recommendations in the associated corridor management plan (if one is available). Contact the region or HQ Landscape Architect Office to determine whether the project is on such a designated route. Low-cost options may be feasible, such as weathering agents, stains, colorants, or coatings applied to galvanized steel beam guardrail and its components. Higher-cost options, such as steel-backed timber rail and stone guardwalls, might necessitate a partnering effort to fund the additional costs. Grants might be available for this purpose if the need is identified early in the project definition phase.

1610.05(8) Barrier Delineation

Refer to [1030.06](#) for delineation requirements.

1610.06 Beam Guardrail

1610.06(1) *Beam Guardrail Systems*

Beam guardrail systems are shown in the [Standard Plans](#).

Strong post W-beam guardrail (Types 1 through 4, and 31) and three beam guardrail (Types 10 and 11) are semirigid barriers used predominantly on roadsides. They have limited application as median barrier. Installed incorrectly, strong post W-beam guardrail can cause vehicle snagging or spearing. This can be avoided by lapping the rail splices in the direction of traffic (as shown in the [Standard Plans](#)), by using crash-tested end treatments, and by blocking the rail away from the strong posts. However, avoid the use of blockouts that extend from the post to the rail element for a distance exceeding 16 inches. Placement of curb at guardrail installations also requires careful consideration.

Previously, WSDOT standard practice was to install W-beam guardrail at a rail height of 27 inches. However, there are newer designs that use a 31-inch rail height. One is the 31 inch-high WSDOT Type 31. The Type 31 system uses many of the same components as the WSDOT Type 1 system. However, the main differences are that the blockouts extend 12 inches from the posts, the rail height is 31 inches from the ground to the top of the rail, and the rail elements are spliced between posts.

The 31-inch-high system offers tolerance for future HMA overlays. The Type 31 system allows a 3-inch tolerance from 31 inches to 28 inches without adjustment of the rail element.

1610.06(2) *W-Beam Barrier Selection and Placement*

During the project development processes, consult with maintenance staff to help identify guardrail runs that may need to be upgraded.

- Use the 31-inch-high guardrail design for new runs. When guardrail is installed along existing shoulders with a width greater than 4 feet, the shoulder width may be reduced by 4 inches to accommodate the 12-inch blockout.
- See standard plans for guidance on transitioning between Type 1 and Type 31 guardrail.
- Existing runs of Type 1 guardrail are acceptable to leave in place and can be extended if the design height of 28 inches is used in the extended section. Where future overlays are anticipated, extend with Type 1 alternate or Type 31 guardrail.
- For existing runs below 26.5 inches, adjust or replace the rail to a height of 28 inches minimum to 30 inches maximum, or replace the run with the 31-inch-high guardrail design.
- Some 31-inch-high proprietary guardrail designs that do not incorporate the use of blockouts have been successfully crash-tested. The use of this type of system may be appropriate for some applications. Contact the HQ Design Office for further details.

1610.06(3) Additional Guidance

- Weak post W-beam guardrail (Type 20) and three beam guardrail (Type 21) are flexible barrier systems that can be used where there is adequate deflection distance (see the [Standard Plans](#)). These systems use weak steel posts. The primary purpose of these posts is to position the guardrail vertically, and they are designed to bend over when struck. These more flexible systems will likely result in less damage to the impacting vehicle. Since the weak posts will not result in snagging, blockouts are not necessary.
- Keep the slope of the area between the edge of the shoulder and the face of the guardrail 10H:1V or flatter. On fill slopes between 6H:1V and 10H:1V, avoid placing within 12 feet of the break point. Do not place beam guardrail on a fill slope steeper than 6H:1V. (See [Exhibit 1610-4](#) for additional guidance on beam guardrail slope placement.)
- On the high side of superelevated sections, place beam guardrail at the edge of shoulder prior to the slope break.
- For W-beam guardrail installed at or near the shoulder, 2 feet of shoulder widening behind the barrier is generally provided from the back of the post to the beginning of a fill slope (see [Exhibit 1610-11](#), Case 2). If the slope is 2H:1V or flatter, this distance can be 2.5 feet measured from the face of the guardrail rather than the back of the post (see [Exhibit 1610-11](#), Case 1).
- On projects where no roadway widening is proposed and the minimum 2-foot shoulder widening behind the barrier is not practicable, long post installations are available as shown in [Exhibit 1610-11](#), Cases 3, 4, 5, and 6. When guardrail is to be installed in areas where the roadway is to be widened or along new alignments, the use of Cases 5 and 6 requires a design analysis.
- Rail washers on beam guardrail are not normally used. If rail washers are present, removal is not necessary except for posts 2 through 8 of an existing BCT installation. However, if the rail element is removed for any reason, do not reinstall rail washers. In areas where heavy snow accumulations are expected to cause the bolts to pull out, specify snowload post washers and rail washers in the contract documents. (Snowload post washers are used to help prevent the bolts from pulling through the posts, and snowload rail washers are used to help prevent the bolt head from pulling through the rail.) In other installations, it is normal to have the rail pull loose from the bolt head when impacted. Do not use rail washers within the limits of a guardrail terminal except at the end post where they are needed for anchorage of the rail.
- The use of curb in conjunction with beam guardrail is discouraged. If a curb is needed, the 3 inch-high curb is preferred. If necessary, the 4-inch-high extruded curb can be used behind the face of rail at any posted speed. The 6-inch-high extruded curb can be used at locations where the posted speed is 50 mph or below. When replacing extruded curb at locations where the posted speed is above 50 mph, use 3 inch-high or 4-inch-high curb. (See the [Standard Plans](#) for extruded curb designs.)
- **Note:** When used in conjunction with the 31-inch-high Type 31 W-beam guardrail, an acceptable option is to place up to a 6-inch-high extruded curb at a maximum 6 inch offset outside the face of the rail at any posted speed. Contact the WSDOT Design Office for more information.

1610.06(4) Terminals and Anchors

A guardrail anchor is needed at the end of a run of guardrail to develop tensile strength throughout its length. In addition, when the end of the guardrail is subject to head-on impacts, a crash-tested guardrail terminal is needed (see the [Standard Plans](#)).

1610.06(4)(a) Buried Terminal (BT)

A buried terminal is designed to terminate the guardrail by burying the end in a backslope. The BT is the preferred terminal because it eliminates the exposed end of the guardrail.

The BT uses a Type 2 anchor to develop the tensile strength in the guardrail. The backslope needed to install a BT is to be 3H:1V or steeper and at least 4 feet in height above the roadway. The entire BT can be used within the length of need for backslopes of 1H:1V or steeper if the barrier remains at full height in relation to the roadway shoulder to the point where the barrier enters the backslope. For backslopes between 1H:1V and 3H:1V, design the length of need beginning at the point where the W-beam remains at full height in relation to the roadway shoulder—usually beginning at the point where the barrier crosses the ditch line. If the backslope is flatter than 1H:1V, provide a minimum 20-foot-wide by 75-foot-long distance behind the barrier and between the beginning length of need point at the terminal end to the mitigated object to be protected.

For new BT installations, use the Buried Terminal Type 2. **Note:** Previously, another BT option (the Buried Terminal Type 1) was an available choice. For existing situations, it is acceptable to leave this option in service as long as height requirements and other previous design criteria can still be met.

1610.06(4)(a)1. Buried Terminal Type 2

Flare the guardrail to the foreslope/backslope intersection using a flare rate that meets the criteria in [1610.05\(4\)](#). Provide a 4H:1V or flatter foreslope into the face of the guardrail and maintain the full guardrail height to the foreslope/backslope intersection in relation to a 10H:1V line extending from edge of shoulder breakpoint. (See the [Standard Plans](#) for details.)

1610.06(4)(b) Non-flared Terminal

If a buried terminal cannot be installed as described in [1610.06\(4\)\(a\)](#), consider a non-flared terminal (see [Exhibit 1610-12a](#)). These systems use W-beam guardrail with a special end piece that fits over the end of the guardrail. When hit head on, the end piece is forced over the rail, absorbing the energy of the impacting vehicle in the process. An anchor is typically included for developing the tensile strength of the guardrail. The length of need does not begin at the impact head, but will vary by system. Non-flared terminals may be provided for two different design levels which are based on the posted speed of the highway. For highways with a posted speed of 50 mph or above, use only a TL-3 (Test Level 3) product. For highways with a posted speed of 45 mph or below, either a TL-2 or a TL-3 product is acceptable.

For Type 31 guardrail there are currently two acceptable non-flared terminals, the SKT- MGS and the SoftStop (see [Exhibit 1610-12a](#)).

The availability and acceptance of these systems is expected to change rapidly over time. For example, an updated version of the SKT terminal called the MSKT may soon be available. Refer to the WSDOT Traffic Barrier website for the latest information on availability or acceptance of different systems.

Although non-flared terminals do not need to have an offset at the end, a flare is recommended so that the end piece does not protrude into the shoulder. See the [Standard Plans](#). Four feet of widening is needed at the end posts to properly anchor the systems. When widening includes an embankment, fill material will be necessary for optimum terminal performance. (See the Standard Plans for widening details.)

Terminals for guardrail runs as shown in [Exhibit 1610-4](#) require no additional embankment at the terminal.

No snowload rail washers are allowed within the limits of these terminals.

When a Beam Guardrail Type 1 non-flared terminal is needed, one proprietary terminal the Sequential Kinking Terminal (SKT) may be used (see Exhibit 1610-12a). This terminal is available in two designs based on the posted speed of the highway. The primary difference in these designs is the length of the terminal. For highways with a posted speed of 50 mph or above, use the 50-foot-long SKT 350 (TL-3) terminal. For highways with a posted speed of 45 mph or below, use the 25-foot-long SKT-350 (TL-2). The FHWA has granted approval to use the above non-flared proprietary terminals without justification.

Note: Approved shop drawings for terminals can be found by accessing the following website:
www.wsdot.wa.gov/design/policy/trafficbarriers.htm

1610.06(4)(c) Flared Terminal

WSDOT does not use a flared terminal system for the Type 31 system. However, if a flared terminal is needed for other applications, there are currently two acceptable proprietary designs: the Slotted Rail Terminal (SRT) and the Flared Energy Absorbing Terminal (FLEAT). Both of these designs include an anchor for developing the tensile strength of the guardrail. The length of need begins at the third post for both flared terminals.

1. The SRT uses W-beam guardrail with slots cut into the corrugations and posts throughout the length of the terminal. The end of the SRT is offset from the tangent guardrail run by the use of a parabolic flare. When struck head on, the first two posts are designed to break away, and the parabolic flare gives the rail a natural tendency to buckle, minimizing the possibility of the guardrail end entering the vehicle. The buckling is facilitated by the slots in the rail. The remaining posts provide strength to the system for redirection and deceleration without snagging the vehicle. The SRT has a 4-foot offset at the first post.

The SRT terminal can be supplied with wood or steel posts. Match the type of SRT posts with those of the longitudinal barrier run to which the terminal will be connected.

2. The FLEAT uses W-beam guardrail with a special end piece that fits over the end of the guardrail and posts. The end of the FLEAT is offset from the tangent guardrail run by the use of a straight flare. When struck head on, the end piece is forced over the rail, bending the rail and forcing it away from the impacting vehicle.

Note: Approved shop drawings for terminals can be found by accessing the following website:
www.wsdot.wa.gov/design/policy/trafficbarriers.htm

The FLEAT is available in two designs based on the posted speed of the highway. For highways with a posted speed of 50 mph or above, use a FLEAT 350, which has a 4-foot offset at the first post. For highways with a posted speed of 45 mph or below, use a FLEAT TL-2, which has a 1-foot 8-inch offset at the first post.

The FLEAT terminal can be supplied with wood or steel posts. Match the type of FLEAT posts with those of the longitudinal barrier run to which the terminal will be connected.

When a flared terminal is specified, it is critical that the embankment quantity also be specified so that the area around the terminal can be constructed as shown in the [Standard Plans](#).

Terminals for guardrail runs as shown in [Exhibit 1610-4](#) require no additional embankment at the terminal.

Snowload rail washers are not allowed within the limits of these terminals.

The FHWA has granted approval to use the SRT and the FLEAT sole source proprietary flared terminals without justification.

1610.06(4)(d) Terminal Evolution Considerations

Some currently approved terminals have been in service for a number of years. During this time, there have been minor design changes. However, these minor changes have not changed the devices' approval status. Previous designs for these terminals may remain in place. (For guidance on BCT terminals, see [1610.04\(1\)](#).)

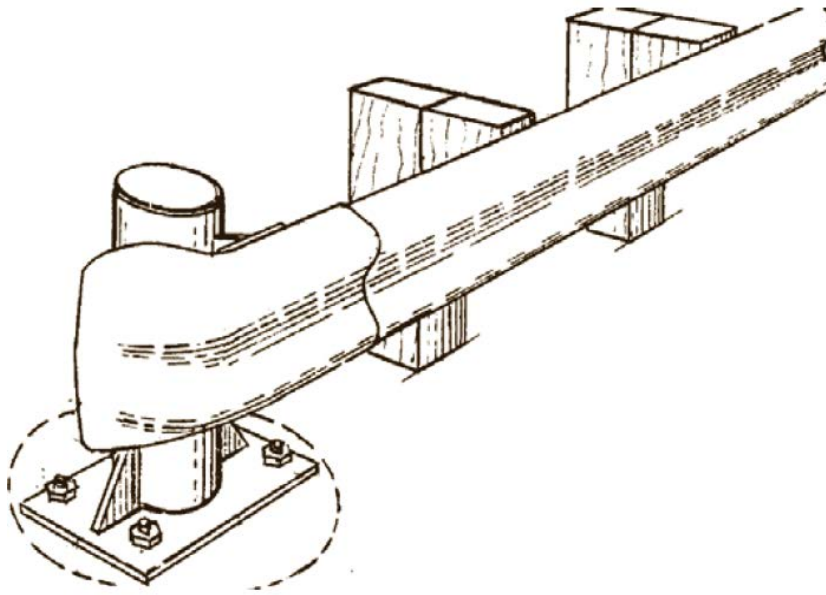
Note: If questions arise concerning the current approval status of a device, contact the HQ Design Office for clarification when replacement is being considered.

1610.06(4)(e) Other Anchor Applications

Use the Type 10 anchor to develop the tensile strength of the guardrail on the end of Type 31 guardrail runs where a crash-tested terminal is not needed. The Type 1 or Type 4 anchor is used for older Beam Guardrail Type 1 where a crash-tested terminal is not needed. Use the Type 5 anchor with the Weak Post Intersection Design (see [1610.06\(6\)\(b\)](#), Cases 12 and 13). Use the Type 7 anchor to develop tensile strength in the middle of a guardrail run when the guardrail curves and weak posts are used (see [1610.06\(6\)\(b\)](#), Cases 9, 12, and 13).

The old Type 3 anchor was primarily used at bridge ends (see [Exhibit 1610-5](#)). This anchor consisted of a steel pipe mounted vertically in a concrete foundation. Bridge approach guardrail was then mounted on the steel pipe.

- On one-way highways, these anchors were usually positioned so that neither the anchor nor the bridge rail posed a snagging potential. When these cases are encountered, the anchor may remain in place if a stiffened transition section is provided at the connection to the post.
- On two-way highways, the anchor may present a snagging potential. In these cases, install a connection from the anchor to the bridge rail if the offset from the bridge rail to the face of the guardrail is 1-foot 6-inches or less. If the offset is greater than 1-foot 6-inches, remove the anchor and install a new transition and connection.

Exhibit 1610-5 Old Type 3 Anchor

Locations where crossroads and driveways cause gaps in the guardrail create situations for special consideration. Elimination of the need for the barrier is the preferred solution. Otherwise, a barrier flare might be needed to provide sight distance. If the slope is 2H:1V or flatter and there are no fixed features on or at the bottom of the slope, a terminal can be used to end the rail (see Chapters [1310](#) and [1340](#) for additional sight distance guidance). Place the anchor of this installation as close as possible to the road approach radius PC.

1610.06(5) Transitions and Connections

When there is an abrupt change from one barrier type to a more rigid barrier type, a vehicle hitting the more flexible barrier is likely to be caught in the deflected barrier pocket and directed into the more rigid barrier. This is commonly referred to as “pocketing.” A transition stiffens the more flexible barrier by decreasing the post spacing, increasing the post size, and using stiffer beam elements to eliminate the possibility of pocketing.

When connecting beam guardrail to a more rigid barrier or a structure, or when a rigid object is within the deflection distance of the barrier, use the transitions and connections that are shown in Exhibits [1610-6](#) and [1610-9](#) and detailed in the *Standard Plans*. The transition pay item includes the connection.

Exhibit 1610-6 Guardrail Connections

Condition	Connection
Unrestrained concrete barrier	A
Rigid, rigid anchored, untapered safety shape bridge rails or barriers[1]	B
Bridge rails with curbs 9 inches or less in width	B
Bridge rails with curbs between 9 and 18 inches wide	C
Vertical walls, single slope, or tapered safety shape barrier[1]	D
Note:	
[1] New single slope and safety shape bridge rails are designed with the toe of the barrier tapered so that it does not project past the face of the approach guardrail.	

1610.06(6) Guardrail Placement Cases

The Standard Plans contains placement cases that show beam guardrail elements needed for typical situations. For some applications, the Standard Plans provides options for both Type 1 and Type 31 guardrail for similar installations. For new installations, use the appropriate Type 31 placement option. Additional placement cases incorporate other combinations of barrier types.

1610.06(6)(a) Beam Guardrail Type 31 Placements (for new installations)

- **Case 1-31** is used where there is one-way traffic. It uses a crash-tested terminal on the approach end and a Type 10 anchor on the trailing end.
- **Case 2-31** is used where there is two-way traffic. A crash-tested terminal is used on both ends.
- **Case 3-31** is used at railroad signal supports on one-way or two-way roadways. A terminal is used on the approach end, but usually cannot be used on the trailing end because of its proximity to the railroad tracks. If there is a history of crossover collisions, consider additional protection such as an impact attenuator.
- **Case 4-31** is used where guardrail on the approach to a bridge is to be shifted laterally to connect with the bridge rail. A terminal is used on the approach end and a transition is needed at the bridge end. A curve in the guardrail is shown to shift it to the bridge rail. However, the length of the curve is not critical. The criterion is to provide a smooth curve that is not more abrupt than the allowable flare rate (see [Exhibit 1610-3](#)).
- **Case 5-31** is a typical bridge approach where a terminal and a transition are needed.
- **Case 6** is used on bridge approaches where opposing traffic is separated by a median that is 36 feet or wider. This case is designed so that the end of the guardrail will be outside the Design Clear Zone for the opposing traffic.
- **Case 10 (A-31, B-31, and C-31)** is used at roadside fixed features (such as bridge piers) when 3 or more feet are available from the face of the guardrail to the feature. The approach end is the same for one-way or two-way traffic. Case 10A-31 is used with two-way traffic; therefore, a terminal is needed on the trailing end. Case 10B-31 is used for one-way traffic when there is no need to extend guardrail past the bridge pier and a

Type 10 anchor is used to end the guardrail. Case 10C-31 is used for one-way traffic when the guardrail will extend for a distance past the bridge pier.

- **Case 11 (A-31, B-31, and C-31)** is used at roadside fixed features (such as bridge piers) when the guardrail is to be placed within 3 feet of the feature. Since there is no room for deflection, the rail in front of the feature is to be considered a rigid system and a transition is needed. The trailing end cases are the same as described for Case 10.
- **Beam Guardrail Type 31 (12'6", 18'9", or 25' Span)** is used when it is necessary to omit one, two, or three posts. This application is typically used when guardrail is installed over drainage structures but may have other applications if adequate deflection distance is present. Three CRT posts are provided on each end of the omitted post(s).
- **Guardrail Placement Strong Post – Type 31** is the “Strong Post Intersection Design for Type 31 barrier” that provides a stiff barrier. This design is used at crossroads or road approaches where a barrier is needed and where the length of need cannot be achieved using standard components such as standard longitudinal barrier runs, transitions, and terminals.

Note: Some placement cases for use with Beam Guardrail Type 31 are currently under development. As plans become available, they will be housed in the HQ Design Standards (Plan Sheet Library) until they become Standard Plans

(www.wsdot.wa.gov/design/standards/plansheet).

1610.06(6)(b) Additional Placement Cases (typically, for existing installations)

- **Case 1** is used where there is one-way traffic. It uses a crash-tested terminal on the approach end and a Type 4 anchor on the trailing end.
- **Case 2** is used where there is two-way traffic. A crash-tested terminal is used on both ends. When flared terminals are used on both ends, use a minimum of 25 feet of guardrail between the terminal limits when feasible.
- **Case 3** is used at railroad signal supports on one-way or two-way roadways. A terminal is used on the approach end, but usually cannot be used on the trailing end because of its proximity to the railroad tracks. If there is a history of crossover collisions, consider additional protection such as an impact attenuator.
- **Case 4** is used where guardrail on the approach to a bridge is to be shifted laterally to connect with the bridge rail. A terminal is used on the approach end and a transition is needed at the bridge end. A curve in the guardrail is shown to shift it to the bridge rail. However, the length of the curve is not critical. The criterion is to provide a smooth curve that is not more abrupt than the allowable flare rate (see [Exhibit 1610-3](#)).
- **Case 5** is a typical bridge approach where a terminal and a transition are needed.
- **Case 6** is used on bridge approaches where opposing traffic is separated by a median that is 36 feet or wider. This case is designed so that the end of the guardrail will be outside the Design Clear Zone for the opposing traffic.
- **Cases 7 and 8** are used with beam guardrail median barrier when median fixed features such as bridge piers are encountered. A transition is needed on the approach end for each direction, and the flare rate is not to be more abrupt than the allowable flare rate (see [Exhibit 1610-3](#)).

- **Case 9 (A, B, and C)** is used on bridge approaches where opposing traffic is separated by a median less than 36 feet wide. This design, called a “Bullnose Terminal,” treats both bridge ends and the opening between the bridges. The “nose” is designed to collapse when struck head on, and the ribbon strength of the rail brings the vehicle to a controlled stop. Type 7 anchors are installed on each side of the nose to develop the ribbon strength. Since an impacting vehicle might penetrate into the system, it is critical that no fixed feature be located within the first 65 feet of the system.
- **Case 10 (A, B, and C)** is used at roadside fixed features (such as bridge piers) when 3 or more feet are available from the face of the guardrail to the object. The approach end is the same for one-way or two-way traffic. Case 10A is used with two-way traffic; therefore, a terminal is needed on the trailing end. Case 10B is used for one-way traffic when there is no need to extend guardrail past the bridge pier and a Type 4 anchor is used to end the guardrail. Case 10C is used for one-way traffic when the guardrail will extend for a distance past the bridge pier.
- **Case 11 (A, B, and C)** is used at roadside fixed features (such as bridge piers) when the guardrail is to be placed within 3 feet of the object. Since there is no room for deflection, the rail in front of the feature is to be considered a rigid system and a transition is needed. The trailing end cases are the same as described for Case 10.
- **Cases 12 and 13** are called “Weak Post Intersection Designs.” They are used where an intersection design needs a gap in the guardrail or there is not adequate space for a bridge approach installation that includes a transition, a terminal, or both. These placements are designed to collapse when hit at the nose, and the ribbon strength of the rail brings the vehicle to a stop. A Type 7 anchor is used to develop the ribbon strength. These designs include a Type 5 transition for connection with bridge rail and a Type 5 anchor at the other end of the rail. The Type 5 anchor is not a breakaway anchor and therefore can typically be used only in situations where a crash-tested terminal is not needed; for example, where slow-moving vehicles are anticipated, such as some side roads and driveways.

Since an impacting vehicle might penetrate into the system, it is critical that no fixed feature be located within the clear area shown in the [Standard Plans](#). The 25 feet of barrier length beyond the PC along the side road are critical for the operation of this system.

These designs were developed for intersections that are approximately perpendicular. Evaluate installation on skewed intersections on a case-by-case basis. Use the Case 22 placement if it is not feasible to install this design according to the [Standard Plans](#).

- **Case 14** shows the approach rail layout for a Service Level 1 bridge rail system. Type 20 guardrail is used on the approach and no transition is needed between the Type 20 guardrail and the Service Level 1 bridge rail since they are both weak post systems. A Type 6 transition is used when connecting the Type 20 to a strong post guardrail or a terminal.
- **Case 15** is used to carry guardrail across a box culvert where there is insufficient depth to install standard posts for more than 17 feet 8 inches. This design uses steel posts anchored to the box culvert to support the rail. Newer designs—Cases 19, 20, and 21—have replaced this design for shorter spans.
- **Cases 16 and 17** are similar to Cases 1 and 2, except that they flare the rail and terminal as far from the road as possible and reduce the length of need.

- **Case 18** is used on the trailing end of bridge rail on a one-way roadway. No transition is needed.
- **Case 19 (A and B)** is used where it is not possible to install a post at the 6-foot 3-inch spacing. This design omits one post (resulting in a span of 11 feet 6 inches, which is consistent with a post spacing of 12 feet 6 inches) and uses nested W-beam to stiffen the rail. The cases differ by the location of the splice. No cutting of the rail or offsetting of the splices is needed or desirable.
- **Case 20** is similar to Cases 19A and 19B, except that it allows for two posts to be omitted, which results in a span consistent with post spacing of 18 feet 9 inches.
- **Case 21** has a similar intent as Cases 19A, 19B, and 20 in that it allows for the omission of posts to span an obstruction. This design uses CRT posts with additional post blocks for three posts before and after the omitted posts. The design allows for three posts to be omitted, which results in a span consistent with a post spacing of 25 feet.
- **Case 22** is the “Strong Post Intersection Design” that provides a stiff barrier. This design is to be used as a last resort at crossroads or road approaches where a barrier is needed and there isn’t a clear area behind the nose or minimum distances for a “Weak Post Intersection Design” (see Cases 12 and 13).

Note: Some placement cases for use with Beam Guardrail Type 31 are currently under development. As plans become available, they will be housed in the HQ Design Standards (Plan Sheet Library) until they become Standard Plans

(www.wsdot.wa.gov/design/standards/plansheet).

1610.07 Cable Barrier

Cable barrier is a flexible barrier system that can be used on a roadside or as a median barrier. It is used primarily in medians and is preferred for many installations due in part to its high benefit-to-cost ratio. Some of the advantages of cable barrier are:

- It provides effective vehicle containment and redirection while imposing the lowest deceleration forces on the vehicle’s occupant(s).
- It may reduce the severity of crashes, which is of significant importance on high-speed facilities.
- After it is struck, it has a tendency not to redirect vehicles back into traffic, which can help reduce the frequency of secondary crashes.
- It can often be placed on existing facilities without the delay of extended environmental permitting and the expense of complex highway reconstruction that might be needed for other barrier system choices.
- It has advantages in heavy snowfall areas because it has minimal potential to create snowdrifts.
- In crucial wildlife habitats, it can aid in some types of animal movements.
- It does not present a visual barrier, which may make it desirable on Scenic Byways (see [1610.05](#)).
- The effort (time and materials) needed to maintain and repair cable barrier systems is much less than the effort needed for a W-beam system.

Deflection is a consideration in narrower median areas and in many urban and other limited-width situations. Use of cable barrier in these situations may not be possible or may require special designs.

For new installations, use four-cable high-tension cable barrier systems, which are available from several manufacturers.

1610.07(1) High-Tension Cable Barrier Placement

For typical median applications with slopes between 10H:1V and 6H:1V, the following apply when using single runs of cable barrier (see [Exhibit 1610-13a](#)):

- Cable barrier may be installed in the centerline of the ditch.
- Cable barrier can be offset from the ditch centerline no more than 1-foot (left or right).
- Avoid installing cable barrier within a 1-foot to 8-foot offset from the ditch centerline.
- When locating cable barrier between an 8-foot offset from the ditch centerline and the slope breakpoint, place the cable barrier as far from the edge of traveled way as practicable. Provide a minimum placement distance of 8 feet to the edge of traveled way to allow vehicles to use this area for refuge (see [Exhibit 1610 13a](#)).
- For median shoulder applications, place the cable barrier as far from the edge of traveled way as practicable. Maintain a minimum of 8 feet of usable width between the edge of traveled way and the face of the cable barrier system (see [Exhibit 1610 13a](#)).

Note: [Exhibit 1610-13a](#) shows typical median placement criteria for single runs of cable barrier. Additional placement cases are shown in the WSDOT Standard Plans. For non-typical installations, such as double runs of cable barrier or median ditch cross sections that differ significantly from those shown, contact the HQ Design Office for guidance.

- In some situations with cable barrier installations in medians, it is advantageous to terminate a run on one side of the median and begin an adjacent run on the opposite side. In this type of application, it is important to provide adequate cable barrier overlap distance between the two runs. For placement guidance, see [Exhibit 1610-13c](#).

Narrow medians provide little space for maintenance crews to repair or reposition the barrier. Wherever site conditions permit, provide at least 14 feet of clearance from the adjacent lane edge to the cable barrier.

For typical non-median shoulder applications (see [Exhibit 1610-13b](#)), the following apply:

- Place the cable barrier as far from the edge of traveled way as practicable.
- For shoulder widths less than 8 feet, see [1610.05\(2\)](#) for further guidance.
- Install cable between slope breakpoints as shown in [Exhibit 1610-13b](#).
- Install cable barrier on slopes that are 6H:1V or flatter.
- Cable barrier can be installed up to 1 foot in front of slope breakpoints as steep as 2H:1V.

Note: There are approved high-tension cable barrier systems that can be placed on slopes as steep as 4H:1V. The use of these systems requires special placement considerations. Contact the HQ Design Office for guidance when selecting these systems.

1610.07(2) **High-Tension Cable Barrier Deflection Distances**

Depending on the system and post spacing, deflection distances for high-tension barrier systems may range from approximately 6 to 12 feet. Specify the maximum allowable deflection distance in the contract documents. (See Exhibits [1610-13a](#) and [13b](#) for placement details.)

Note: There are new high-tension cable barrier systems under development that may change selection and placement criteria. The HQ Design Office will circulate guidance on these new developments as they are adopted as WSDOT policy.

1610.07(3) **High-Tension Cable Barrier Termination**

- It is possible to terminate high-tension cable barrier systems by connecting directly to beam guardrail runs that are rigidly anchored (such as transitions to bridge rails) and also to a separate anchorage system. Designers should review field conditions, check local maintenance personnel needs, and then specify the required connection option in the contract documents. If a separate anchorage system is used, refer to [Exhibit 1610-13c](#) for placement guidance.
- When cable barrier is to be connected to a more rigid barrier, a transition section is typically needed. Contact the HQ Design Office for further details.

1610.07(4) **High-Tension Cable Barrier Height Criteria**

Select a high-tension four-cable barrier system with a height to the center of the top cable of not less than 35 inches and a height to the center of the bottom cable not greater than 19 inches.

1610.07(5) **High-Tension Cable Barrier Curb Placement**

Avoid the placement of curb in conjunction with high-tension cable barrier systems. Currently, there are no known acceptable cable barrier systems that have been successfully crash tested with this feature present.

Note: There are high-tension cable barrier systems under development that may change selection and placement criteria. The HQ Design Office will circulate guidance on these new developments as they are adopted as WSDOT policy.

1610.08 **Concrete Barrier**

General Considerations:

- Concrete barriers are rigid, rigid anchored, or unrestrained rigid systems. Commonly used in medians, they are also used as shoulder barriers. These systems are stiffer than beam guardrail or cable barrier, and impacts with these barriers tend to be more severe.
- Light standards mounted on top of concrete median barrier must not have breakaway features. (See the concrete barrier light standard section in the [Standard Plans](#).)
- When concrete barrier is considered for use in areas where drainage and environmental issues (such as stormwater, wildlife, or endangered species) might be adversely impacted, contact the HQ Hydraulics Office and the appropriate environmental offices for guidance.

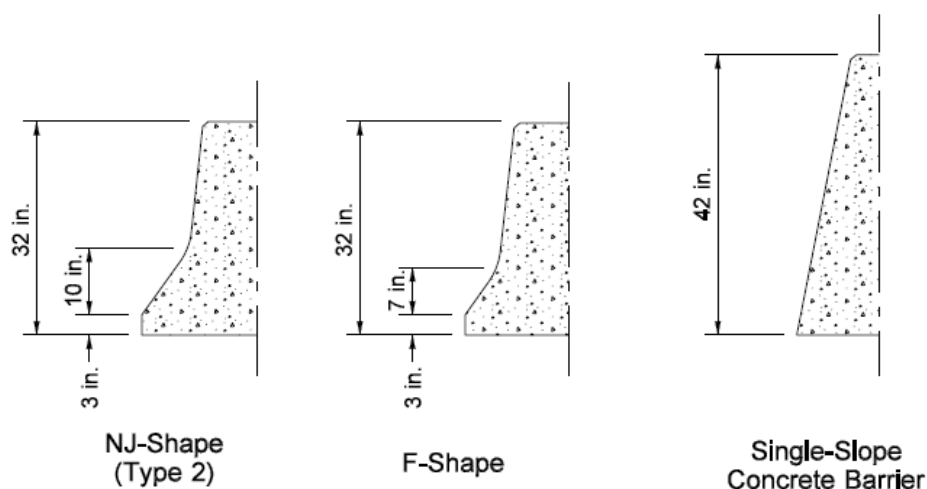
1610.08(1) Concrete Barrier Shapes

Concrete barriers use a single-slope or safety shape (New Jersey or F-Shape) to redirect vehicles while minimizing vehicle vaulting, rolling, and snagging. A comparison of these barrier shapes is shown in [Exhibit 1610-7](#).

The single-slope barrier face is the recommended option for embedded rigid concrete barrier applications.

Note: There are new precast concrete barrier systems under development that may change future selection and placement criteria. The HQ Design Office will circulate guidance on these new developments as they are adopted as WSDOT policy.

Exhibit 1610-7 Concrete Barrier Shapes



When the single-slope or F-Shape face is used on structures, and precast barrier is selected for use on the approaches, a cast-in-place transition section is needed so that no vertical edges of the barrier are exposed to oncoming traffic. For details on bridge rail designs, see the [Bridge Design Manual](#).

For aesthetic reasons, avoid changes in the shape of the barrier face within a project or corridor.

The New Jersey shape and F-shape barriers are commonly referred to as “safety shapes.” The New Jersey shape and F-shape have an initial overall height of 32 inches. This height includes provision for up to a 3-inch future pavement overlay that can reduce the barrier height to 29 inches minimum.

1610.08(1)(a) New Jersey Shape Barrier

The New Jersey shape face is primarily used on precast concrete barrier.

Concrete barrier Type 2 (see the [Standard Plans](#)) is a precast barrier that has the New Jersey shape on two sides and can be used for both median and shoulder installations.

The cost of precast Type 2 barrier is significantly less than the cost of the cast-in-place barriers. Therefore, consider the length of the barrier run and the deflection needs to determine whether transitioning to precast Type 2 barrier is desirable. If precast Type 2 barrier is used for the majority of a project, use the New Jersey face for small sections that need cast-in-place barrier, such as for a light standard section, [see the *Standard Plans* for additional details](#).

Concrete barrier Type 4 is also a precast, single-faced New Jersey shape barrier. These units are not freestanding and are to be placed against a rigid structure or anchored to the pavement. If Type 4 barriers are used back to back, consider filling any gap between them to prevent tipping.

Concrete barrier Type 5 is a precast barrier that has a single New Jersey face and is intended for use at bridge ends where the flat side is highly visible.

Both Type 2 and Type 5 designs are freestanding, unanchored units connected with steel pins through wire rope loops. For permanent installation, this barrier is placed on a paved surface and a 2-foot-wide paved surface is provided beyond the barrier for its displacement during impact (see [Chapter 1230](#)).

Precast barrier can be anchored where a more rigid barrier is needed. (Anchoring methods are shown in the [Standard Plans](#).) The Type 1 and Type 2 anchors are for temporary installations on a rigid pavement. Type 3 anchors can be used in temporary or permanent installations on an asphalt pavement. Consult the HQ Bridge and Structures Office for details when anchoring permanent precast concrete barrier to a rigid pavement.

Precast barrier used on the approach to bridge rail is to be connected to the bridge rail by installing wire rope loops embedded 1-foot 3-inches into the bridge rail with epoxy resin.

Place unrestrained (unanchored) precast concrete barrier on foundation slopes of 5% ([20H:1V](#)) or flatter. In difficult situations, a maximum slope of 8% may be used. Keep the slope of the area between the edge of the shoulder and the face of the traffic barrier as flat as possible. The maximum slope is 10H:1V (10%).

1610.08(1)(b) Single-Slope Barrier

The single-slope concrete barrier can be cast in place, slipformed, or precast. The most common construction technique for this barrier has been slipforming, but some precast single-slope barrier has been installed. The primary benefit of using precast single-slope barrier is that it can be used as temporary barrier during construction and then reset into a permanent location. In temporary applications, the single-slope barrier may also offer the added benefits of reducing headlight glare and providing reduced deflection characteristics over some other barrier types.

Single-slope barrier is considered a rigid system regardless of the construction method used. For new installations, the minimum height of the barrier above the roadway is 2 feet 10 inches, which allows a 2-inch tolerance for future overlays. The minimum total height of the barrier section is 3 feet 6 inches, with a minimum of 3 inches embedded in the roadway wearing surface. This allows for use of the 3-foot-6-inch barrier between roadways with grade separations of up to 5 inches. A grade separation of up to 10 inches is allowed when using a 4-foot-6-inch barrier section, as shown in the [Standard Plans](#). The barrier is to have a depth of embedment equal to or greater than the grade separation. Contact the HQ Bridge and Structures Office for grade separations greater than 10 inches.

1610.08(1)(c) Low-Profile Barrier

Low-profile barrier designs are available for median applications where the posted speed is 45 mph or below. These barriers are normally used in urban areas. They are typically 18 to 20 inches high and offer sight distance benefits. For barrier designs, terminals, and further details, contact the HQ Design Office.

1610.08(2) High-Performance Concrete Barrier

High-Performance Concrete Barrier (HP Barrier) is a rigid barrier with a minimum height of 42 inches above the roadway surface. This barrier is designed to function more effectively during heavy-vehicle crashes. This taller barrier may also offer the added benefits of reducing headlight glare and reducing noise in surrounding environments. HP Barrier is generally considered single-slope barrier. (See the [Standard Plans](#) for barrier details.) For additional available shapes, contact the HQ Design Office.

For new/reconstruction, use HP Barrier in freeway medians of 22 feet or less. Also, use HP Barrier on Interstate or freeway routes where [collision](#) history suggests a need or where roadway geometrics increase the possibility of larger trucks hitting the barrier at a high angle (for example, on-ramps for freeway-to-freeway connections with sharp curvature in the alignment).

Consider the use of HP Barrier at other locations such as nonfreeway narrow medians, near highly sensitive environmental areas, near densely populated areas, over or near mass transit facilities, or on vertically divided highways.

1610.08(3) Concrete Barrier Terminals

Whenever possible, bury the end of the concrete barrier in the backslope. The backslope needed to bury the end is to be 3H:1V or steeper and at least 4 feet in height above the roadway. Flare the concrete barrier into the backslope using a flare rate that meets the criteria in [1610.05\(4\)](#). Provide a 10H:1V or flatter foreslope into the face of the barrier and maintain the full barrier height to the foreslope/backslope intersection. This might create the need to fill ditches and install culverts in front of the barrier face.

The 7-foot-long precast concrete terminal end section for concrete barrier Type 2 and the 10- to 12-foot single-slope barrier terminal (precast or cast-in-place) may be used:

- Outside the Design Clear Zone.
- On the trailing end of the barrier when it is outside the Design Clear Zone for opposing traffic.
- On the trailing end of one-way traffic.
- Where the posted speed is 25 mph or below.

Another available end treatment for Type 2 barriers is a precast or cast-in-place tapered terminal section with a minimum length of 48 feet and a maximum length of 80 feet. It is used infrequently for special applications and is designed to be used for posted speeds of 35 mph or below. For details, contact the HQ Design Office or refer to the Plan Sheet Library:

www.wsdot.wa.gov/design/standards/plansheet/

Replace existing sloped-down concrete terminals that are within the Design Clear Zone when they do not meet the above criteria.

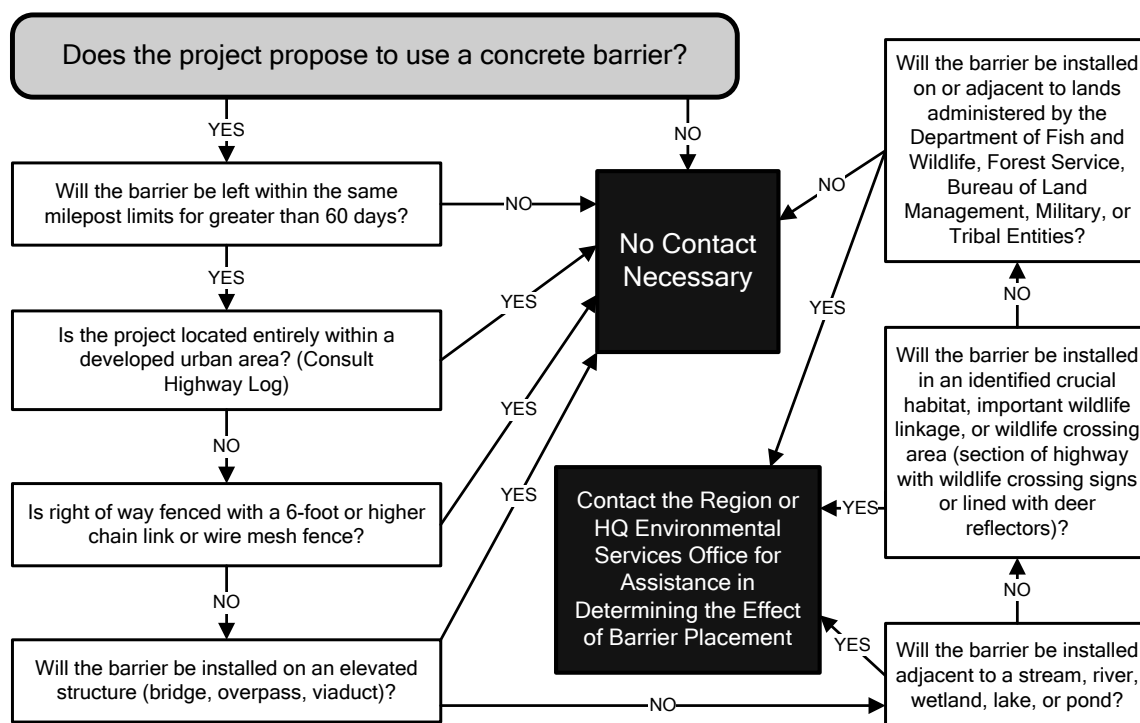
When the end of a concrete barrier cannot be buried in a backslope or terminated as described above, terminate the barrier using a guardrail terminal and transition or an impact attenuator (see [Chapter 1620](#)).

1610.08(4) Assessing Impacts to Wildlife

The placement of concrete barriers in locations where wildlife frequently cross the highway can influence traffic safety and wildlife mortality. When wildlife encounter physical barriers that are difficult to cross, they often travel parallel to those barriers. With traffic barriers, this means that they often remain on the highway for a longer period, increasing the risk of wildlife/vehicle crashes or vehicle/vehicle crashes as motorists attempt avoidance.

Traffic-related wildlife mortality may play a role in the decline of some species listed under the Endangered Species Act. To address public safety and wildlife concerns, see [Exhibit 1610-8](#) to assess whether concrete barrier placement needs to have an evaluation by the HQ Environmental Services Office to determine its effect on wildlife. Conduct this evaluation early in the project development process to allow adequate time for discussion of options.

Exhibit 1610-8 Concrete Barrier Placement Guidance: Assessing Impacts to Wildlife



1610.08(5) Assessing Impacts to Stormwater and Wetlands

In locations where medians or roadsides are used for drainage, the retention of stormwater or the existence of wetlands can influence the choice and use of barrier systems. For example, the placement of concrete barrier and beam guardrail in many of these cases may create the need for additional impervious material, which can result in complete retrofit and reconstruction of the existing systems. When water is drained, stored, or treated, and where wetlands exist, the

ability to provide alternative facilities that replace the functions of the existing ones may be nonexistent or prohibitively expensive to provide elsewhere.

To address public safety, stormwater, and wetland concerns, assess whether concrete barrier or beam guardrail placement will cause the need for an evaluation by the HQ Environmental Services Office. Conduct this evaluation early in the project development process to allow adequate time for discussion of options.

1610.09 Special-Use Barriers

The following barriers may be used on designated Scenic Byway and Heritage Tour routes if funding can be arranged (see [1610.05](#)).

1610.09(1) *Steel-Backed Timber Guardrail*

Steel-backed timber guardrails consist of a timber rail with a steel plate attached to the back to increase its tensile strength. There are several variations of this system that have passed crash tests. The nonproprietary systems use a beam with a rectangular cross section that is supported by either wood or steel posts. A proprietary (patented) system called the Ironwood Guardrail is also available. This system uses a beam with a round cross section and is supported by steel posts with a wood covering to give the appearance of an all-wood system from the roadway.

The Ironwood Guardrail can be allowed as an alternative to the nonproprietary system. However, specifying this system exclusively needs approval by an Assistant State Design Engineer of a public interest finding for the use of a sole source proprietary item.

The most desirable method of terminating the steel-backed timber guardrail is to bury the end in a backslope, as described in [1610.06\(4\)](#). When this type of terminal is not possible, use of the barrier is limited to highways with a posted speed of 45 mph or below. On these lower-speed highways, the barriers can be flared away from the traveled way and terminated in a berm outside the Design Clear Zone.

For details on these systems, contact the HQ Design Office.

1610.09(2) *Stone Guardwalls*

Stone guardwalls function like rigid concrete barriers but have the appearance of natural stone. These walls can be constructed of stone masonry over a reinforced concrete core wall or of simulated stone concrete. These types of barriers are designed to have a limited projection of the stones to help aid in the redirection characteristics of the barrier. The most desirable method of terminating this barrier is to bury the end in a backslope, as described in [1610.08\(3\)](#). When this type of terminal is not possible, use of the barrier is limited to highways with a posted speed of 45 mph or below. On these lower-speed highways, the barrier can be flared away from the traveled way and terminated in a berm outside the Design Clear Zone.

For details on these systems, contact the HQ Design Office.

1610.10 Bridge Traffic Barriers

Bridge traffic barriers redirect errant vehicles and help to keep them from going over the side of the structure. (See the [Bridge Design Manual](#) for information regarding bridge barrier on new bridges and replacement bridge barrier on existing bridges.)

For new bridge rail installations, use a 2-foot 10-inch-high single-slope or a 2-foot 8-inch-high safety shape (F Shape) bridge barrier. A transition is available to connect the New Jersey shape (Type 2 concrete barrier) and the F-Shape bridge barrier. (See the [Standard Plans](#) for further details.)

Use taller 3-foot 6-inch single-slope or safety shape bridge barriers on Interstate or freeway routes where [collision](#) history suggests a need or where taller barrier is required on approaching roadways with narrow medians, as defined in [1610.08\(2\)](#). Also, consider taller 3-foot 6-inch barrier when geometrics increase the possibility of larger trucks hitting the barrier at a high angle (such as on-ramps for freeway-to-freeway connections with sharp curvature in the alignment).

For further guidance on bridges where high volumes of pedestrian traffic are anticipated, see Chapters [720](#), [1510](#), [1515](#), and [1520](#).

Approach barriers, transitions, and connections are usually needed on all four corners of bridges carrying two-way traffic and on both corners of the approach end for one-way traffic. (See [1610.06\(5\)](#) for guidance on transitions.)

If the bridge barrier system does not meet the criteria for strength and geometrics, modifications to improve its redirection characteristics and its strength may be needed. The modifications can be made using one of the retrofit methods described in [1610.10\(1\)](#) and [1610.10\(2\)](#).

1610.10(1) Concrete Safety Shape

Retrofitting with a new concrete bridge barrier is costly and needs to have justification when no widening is proposed. Consult the HQ Bridge and Structures Office for design details and to determine whether the existing bridge deck and other superstructure elements are of sufficient strength to accommodate this bridge barrier system.

1610.10(2) Thrie Beam Retrofit

Retrofitting with thrie beam is an economical way to improve the strength and redirection performance of bridge barriers. The thrie beam can be mounted to steel posts or the existing bridge barrier, depending on the structural adequacy of the bridge deck, the existing bridge barrier type, the width of curb (if any), and the curb-to-curb roadway width carried across the structure.

The HQ Bridge and Structures Office is responsible for the design of thrie beam bridge barrier. [Exhibit 1610-14](#) shows typical retrofit criteria. Contact the HQ Bridge and Structures Office for assistance with thrie beam retrofit design.

Consider the Service Level 1 (SL-1) system on bridges with wooden decks and for bridges with concrete decks that do not have the needed strength to accommodate the thrie beam system. Contact the HQ Bridge and Structures Office for information needed for the design of the SL-1 system.

If a thrie beam retrofit results in reduction in sidewalk width see [Chapter 1510](#).

The funding source for retrofit of existing bridge rail is dependent on the length of the structure. Bridge rail retrofit, for bridges less than 250 feet in length, or a total bridge rail length of 500 feet, is funded by the project (Guardrail Preservation or Improvement). For longer bridges, the

retrofit will be included in the I-2 Bridge Rail upgrades program. Contact the HQ Program Development Office to determine whether funding is available.

1610.11 Other Barriers

1610.11(1) *Dragnet*

The Dragnet Vehicle Arresting Barrier consists of chain link or fiber net that is attached to energy absorbing units. When a vehicle hits the system, the Dragnet brings the vehicle to a controlled stop with limited damage. Possible uses for this device include the following:

- Reversible lane entrances and exits
- Railroad crossings
- Truck escape ramps (instead of arrester beds—see Chapter 1270)
- T-intersections
- Work zones
- Swing span bridges

For permanent installations, this system can be installed between towers that lower the unit into position when needed and lift it out of the way when it is no longer needed. Provide deflection space for stopping the vehicle between the system and the object or work zone. For additional information on the Dragnet, contact the HQ Design Office.

1610.12 Documentation

Refer to Chapter 300 for design documentation requirements.

Exhibit 1610-9 Transitions and Connections

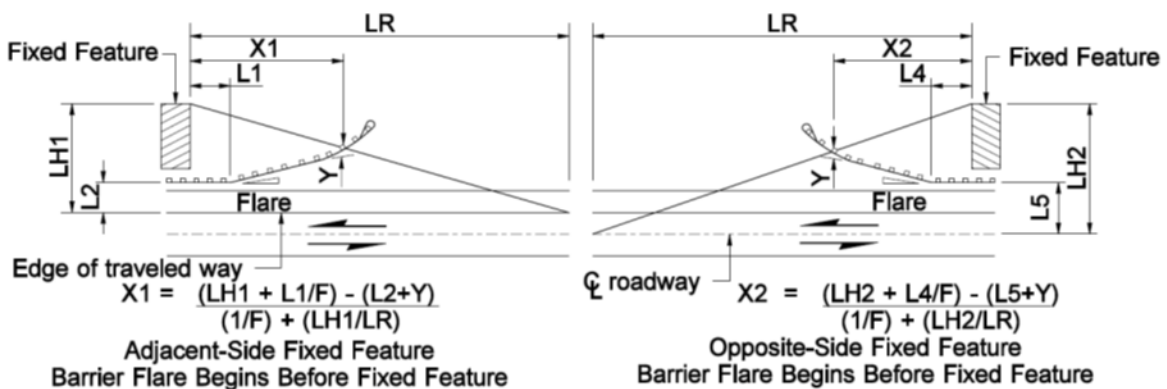
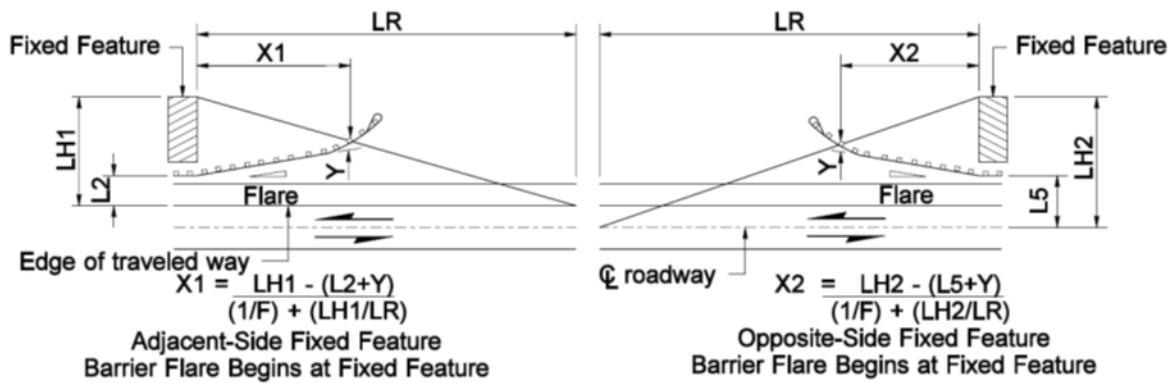
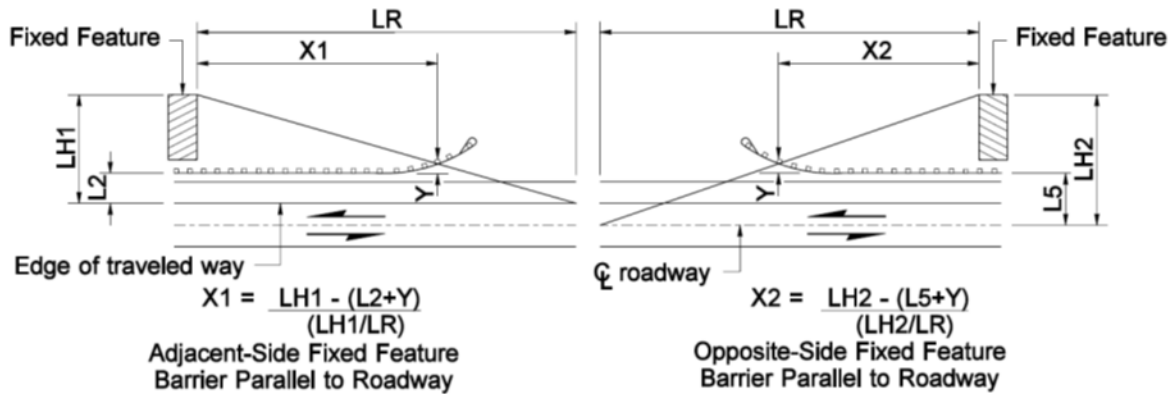
Connecting W-Beam Guardrail to: Transitions and Connections		Transition Type*	Connection	
Bridge Rail	New Installation	20, 21	D	
	Existing Concrete	Concrete Parapet > 20 inches	20, 21, 4 ^[4]	Exhibit 1610-6 ^[6]
		Concrete Parapet < 20 inches	20, 21, 2, 4 ^[4]	Exhibit 1610-6 ^[6]
		Existing W-Beam Transition	2 ^{[1][5]} , 4 ^[4]	[1]
	Thrie Beam at Face of Curb ^[3]	Approach End	23	n/a
		Trailing End (two-way traffic only)	23	n/a
	Thrie Beam at Bridge Rail (curb exposed) ^[3]	Approach End	22	n/a
		Trailing End (two-way traffic only)	22	n/a
	Weak Post Intersection Design (see 1610.06(6)(b), Cases 12 & 13)		5	Exhibit 1610-6
	Concrete Barrier	Rigid & Rigid Anchored	21	Exhibit 1610-6
Unrestrained		21, 2, 4 ^[4]	A	
Weak Post Barrier Systems (Type 20 and 21)		6	n/a	
Rigid Structures such as Bridge Piers	New Installation (see Cases 11–31)	21	n/a	
	Existing W-Beam Transition	[2]	n/a	
Connecting Thrie Beam Guardrail to:		Transition Type*	Connection	
Bridge Rail or Concrete Barrier	New Installation (example: used with thrie beam bull nose)	1B	Exhibit 1610-6	

*Consult Section C of the *Standard Plans* for details on transition types.

Notes:

- [1] If work creates the need for reconstruction or resetting of the transition, upgrade as shown above. Raising the guardrail is not considered reconstruction. If the transition is not being reconstructed, the existing connection may remain in place. When Type 3 anchors are encountered, see 1610.06(4)(e) for guidance.
- [2] For new/reconstruction, use Case 11 (thrie beam). For existing Case 11 with W-beam, add a second W beam rail element.
- [3] For Service Level 1 bridge rail, see 1610.06(6)(b), Case 14.
- [4] Use on highways with speeds 45 mph or below.
- [5] If existing transition has the needed guardrail height—three 10" x 10" (nominal) posts and three 6" x 8" (nominal) posts spaced 3'-1.5" apart—it is acceptable to nest existing single W-beam element transitions.
- [6] When connecting a Type 20 or Type 21 Transition to an existing bridge rail, a special connection plate may be required. Contact the WSDOT Bridge and Structures Office for details.

Exhibit 1610-10a Barrier Length of Need on Tangent Sections



Note:

For supporting length of need equation factors, see [Exhibit 1610-10b](#).

Exhibit 1610-10b Barrier Length of Need

Posted Speed (mph)	Design Parameters						
	ADT				Barrier Type		
	Over 10,000	5,000 to 10,000	1,000 to 4,999	Under 1,000	Rigid & Rigid Anchored Barrier	Rigid Unrestrained Barrier	Semirigid Barrier
	LR (ft)	LR (ft)	LR (ft)	LR (ft)	F	F	F
70	360	330	290	250	20	18	15
65	330	290	250	225	20	18	15
60	300	250	210	200	18	16	14
55	265	220	185	175	16	14	12
50	230	190	160	150	14	12	11
45	195	160	135	125	12	11	10
40	160	130	110	100	11	10	9
35	135	110	95	85	11	10	9
30	110	90	80	70	11	10	9
25	110	90	80	70	11	10	9

L1 = Length of barrier parallel to roadway from adjacent-side fixed feature to beginning of barrier flare. This is used if a portion of the barrier cannot be flared (such as a bridge rail and the transition).

L2 = Distance from adjacent edge of traveled way to portion of barrier parallel to roadway.

L4 = Length of barrier parallel to roadway from opposite-side fixed feature to beginning of barrier flare.

L5 = Distance from centerline of roadway to portion of barrier parallel to roadway. **Note:** If the fixed feature is outside the Design Clear Zone when measured from the centerline, it may only be necessary to provide a crash-tested end treatment for the barrier.

LH1 = Distance from outside edge of traveled way to back side of adjacent-side fixed feature. **Note:** If a fixed feature extends past the Design Clear Zone, the Design Clear Zone can be used as LH1.

LH2 = Distance from centerline of roadway to back side of opposite-side fixed feature. **Note:** If a fixed feature extends past the Design Clear Zone, the Design Clear Zone can be used as LH2.

LR = Runout length, measured parallel to roadway.

X1 = Length of need for barrier to shield an adjacent-side fixed feature.

X2 = Length of need for barrier to shield an opposite-side fixed feature.

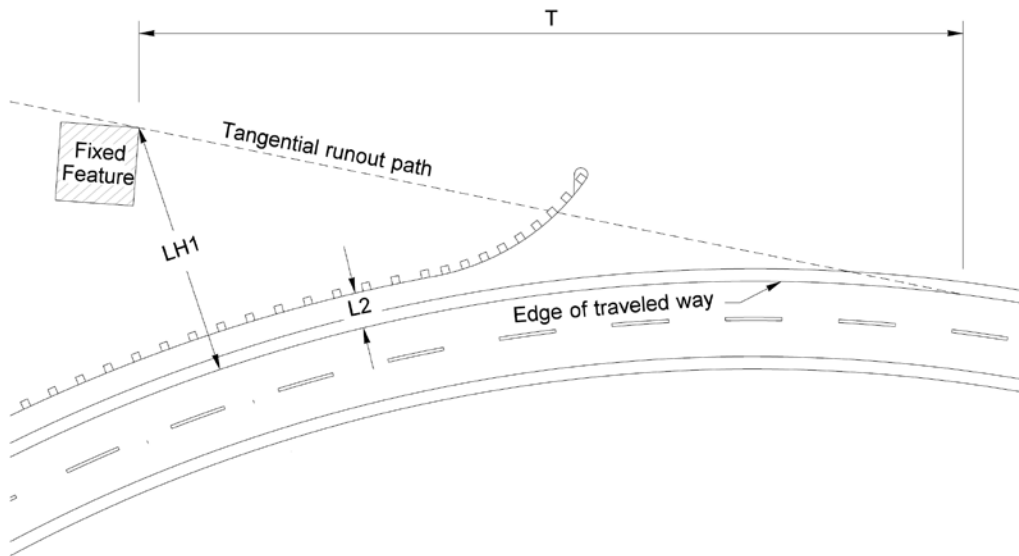
F = Flare rate value.

Y = Offset distance needed at the beginning of the length of need.

Different end treatments need different offsets:

- For the SRT 350 and FLEAT 350, use Y = 1.8 feet.
- For evaluating existing BCTs, use Y = 1.8 feet.
- For the FLEAT TL-2, use Y = 0.8 feet.
- No offset is needed for the non-flared terminals or impact attenuator systems. Use Y = 0.

Exhibit 1610-10c Barrier Length of Need on Curves



Notes:

- This is a graphical method for determining the length of need for barrier on the outside of a curve.
- On a scale drawing, draw a tangent from the curve to the back of the fixed feature. Compare T to LR from [Exhibit 1610-10b](#) and use the shorter value.
- If using LR, follow Exhibits [1610-10a](#) and [10b](#).
- If using T, draw the intersecting barrier run to scale and measure the length of need.

Exhibit 1610-10d W-Beam Guardrail Trailing End Placement for Divided Highways

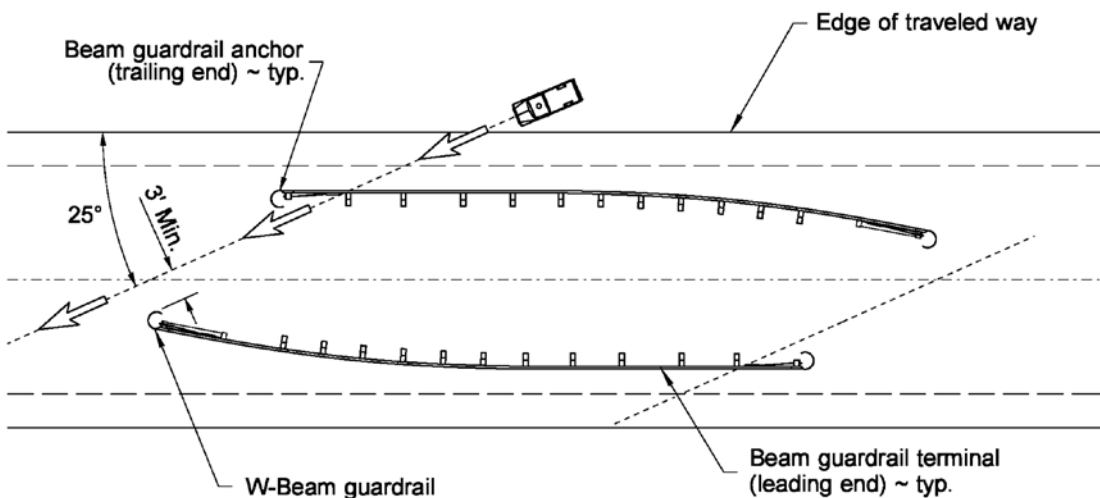
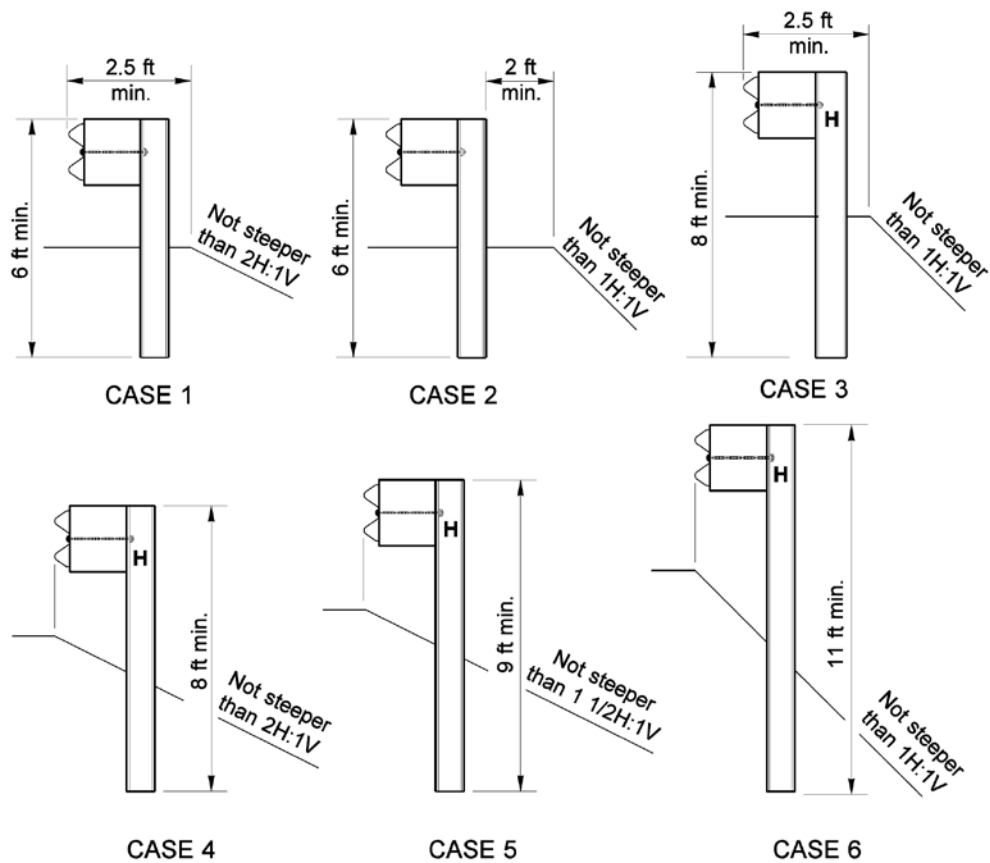


Exhibit 1610-11 Beam Guardrail Post Installation



Type 31 Shown

Notes:

- Use Cases 1 and 3 when there is a 2.5-foot or greater shoulder widening from face of guardrail to the breakpoint.
- Use Case 2 when there is a 4.0-foot or greater shoulder widening from the face of the guardrail to the breakpoint.
- Use Cases 4, 5, and 6 when there is less than a 2.5-foot shoulder widening from face of guardrail to the breakpoint.

Exhibit 1610-12a Examples of Non-Flared Beam Guardrail Terminals

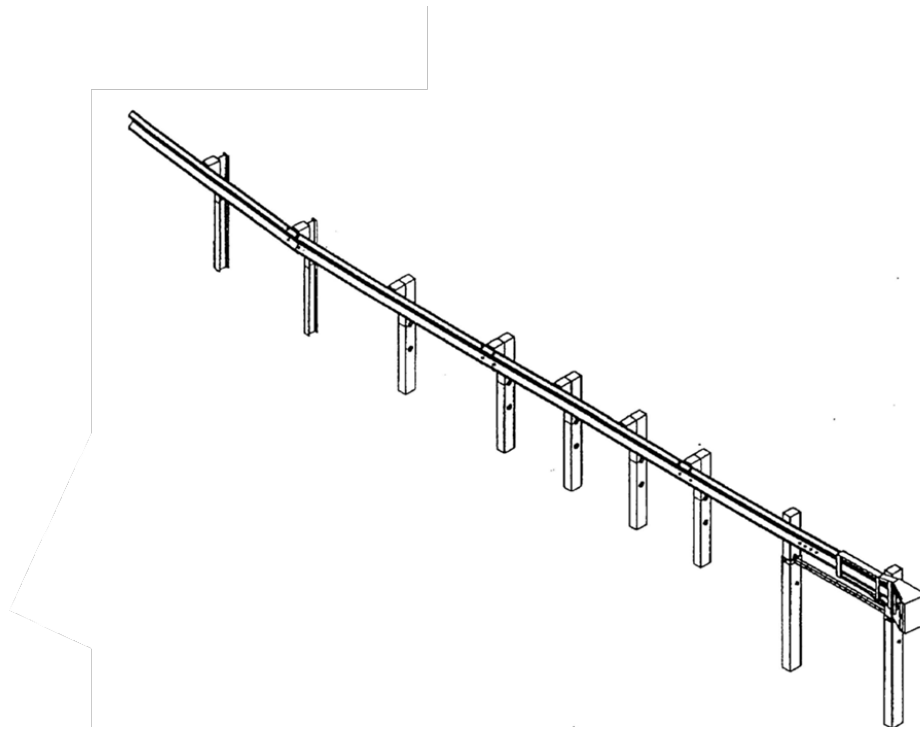


*SKT Non-flared Terminal
(SKT-MGS, SKT-350)*

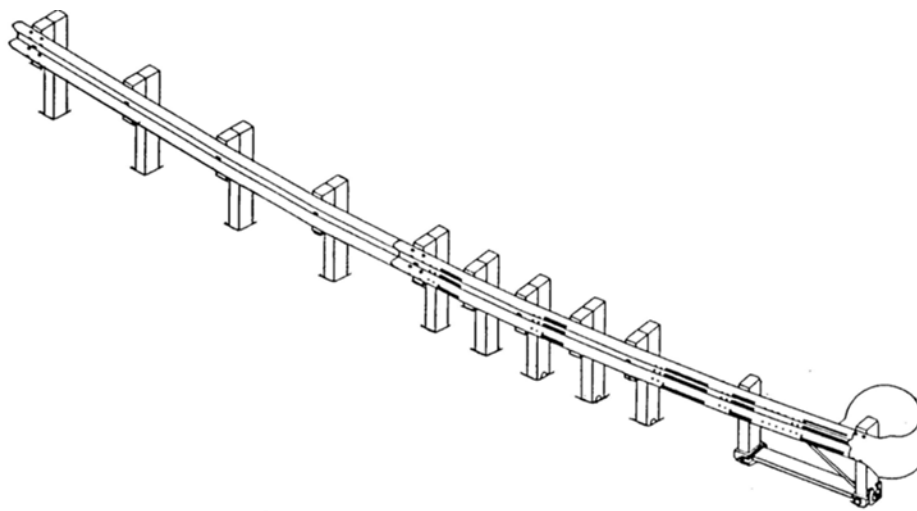


*SoftStop
Non-flared Terminal*

Exhibit 1610-12b Flared Beam Guardrail Terminals

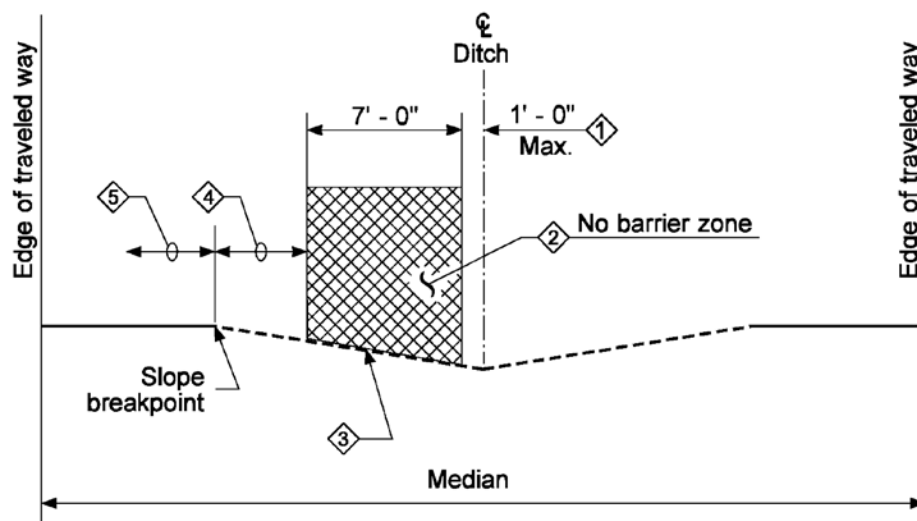


FLEAT
Flared Terminal

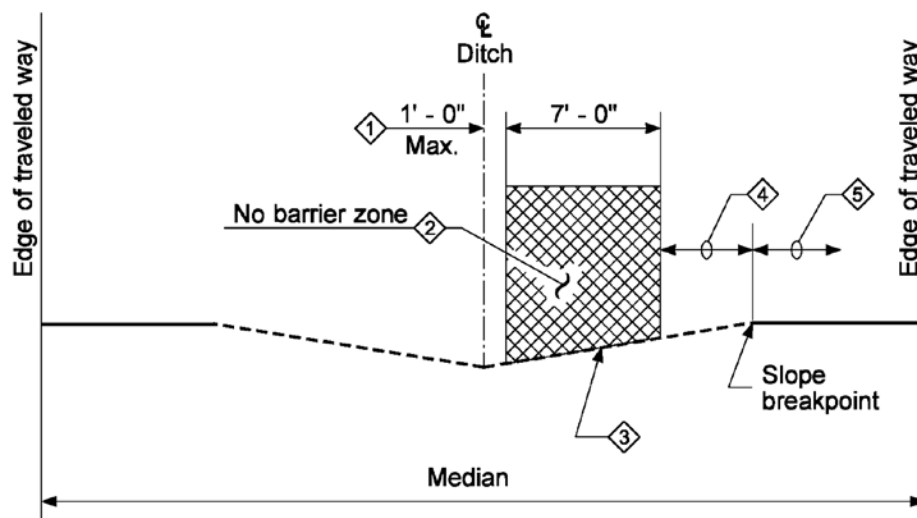


SRT
Flared Terminal

Exhibit 1610-13a Single Cable Barrier Placement Locations on Median Slopes



Median Placement - Left

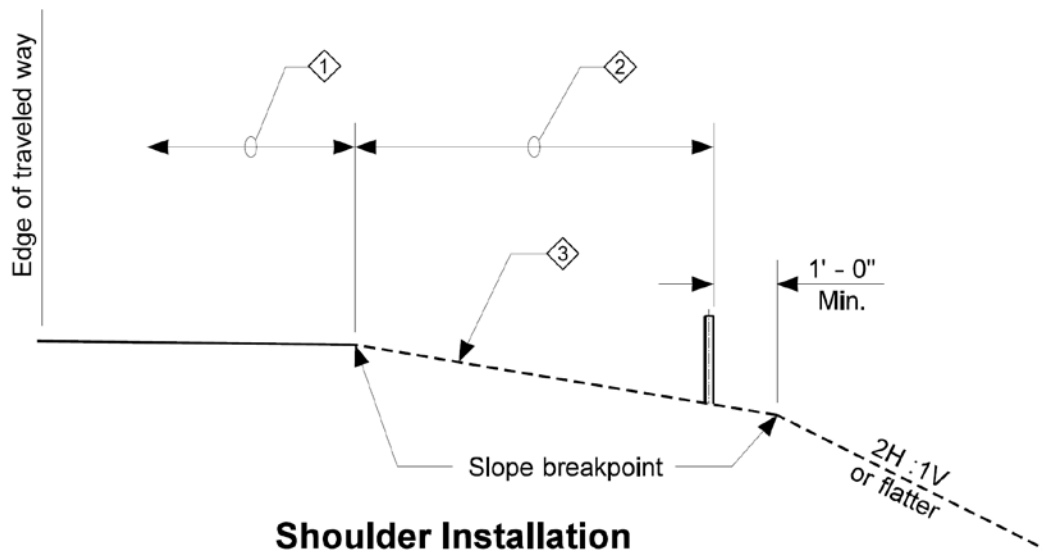


Median Placement - Right

Notes:

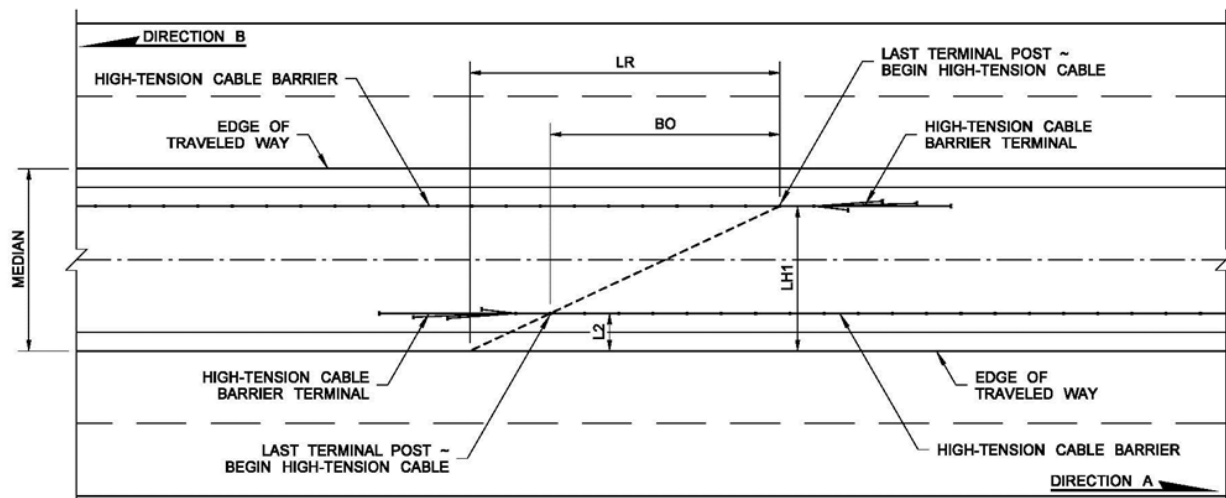
- ① Cable barrier may be installed in the center of the ditch and from the ditch centerline a maximum of 1 foot (left or right).
- ② Avoid installing cable barrier within a 1-foot to 8-foot offset from the ditch centerline.
- ③ Applies to slopes between 10H:1V and 6H:1V.
- ④ Slope Installation: Install cable barrier between an 8-foot offset from the ditch centerline and the slope breakpoint. Provide a maximum deflection distance of 8 feet to the edge of traveled way.
- ⑤ Shoulder Installation: For median shoulder applications, maintain a minimum of 8 feet of usable shoulder width between the edge of traveled way and the face of the cable barrier system.

Exhibit 1610-13b Cable Barrier Locations on Shoulder Slopes

**Notes:**

- ① For shoulder widths less than 8 feet, see [1610.05\(2\)](#) for further guidance.
- ② Slope Installation: Install cable barrier relative to the slope breakpoints within the limits shown.
- ③ Applies to slopes that are 6H:1V or flatter.

Exhibit 1610-13c Cable Barrier Placement for Divided Highways

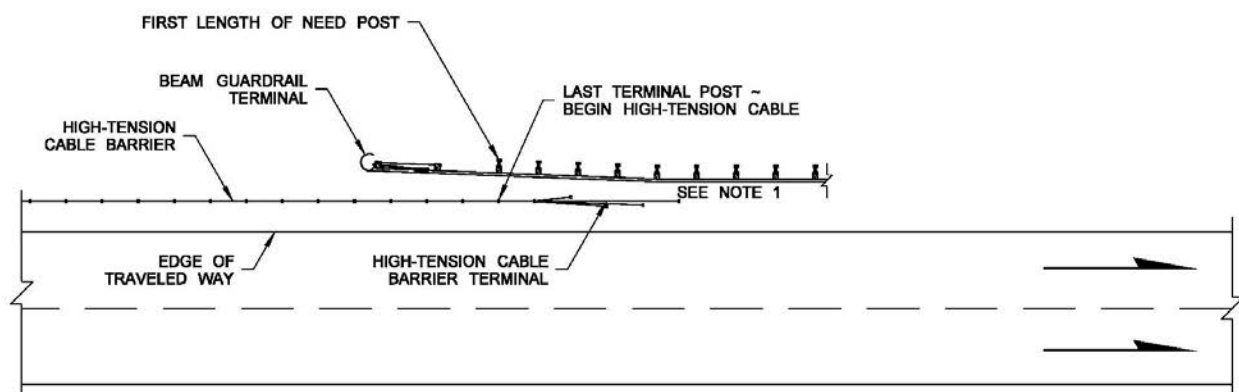


Cable Barrier Median Overlap

$$BO = \frac{LH1 - L2}{(LH1/LR)} \quad (\text{Direction A shown})$$

Note:

Calculate barrier overlap (BO) from both directions of travel. Use the greatest value of BO obtained.



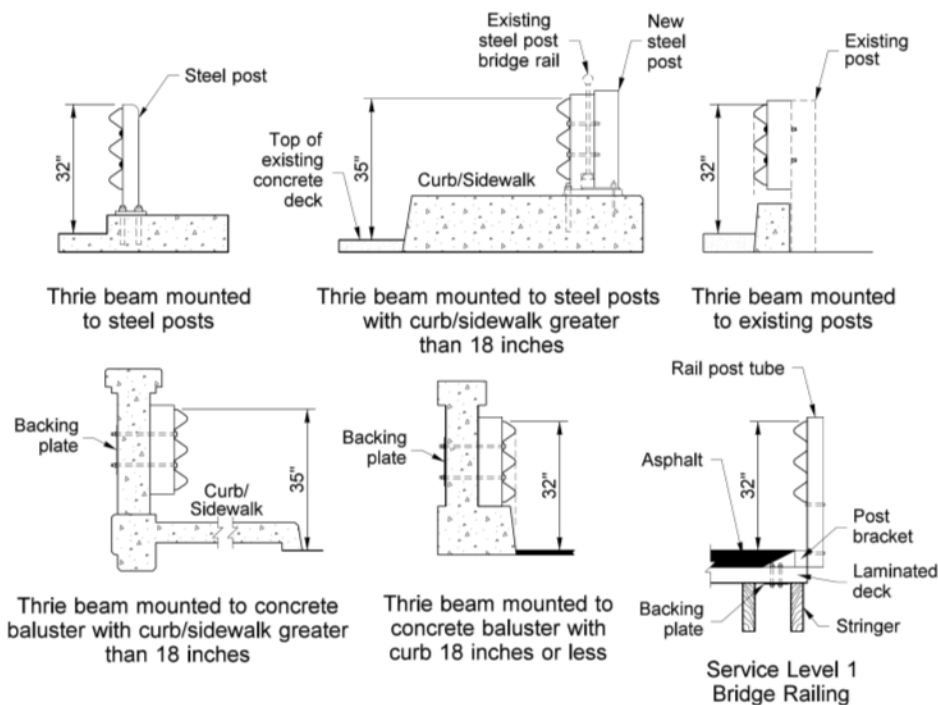
Cable Barrier Overlap With Beam Guardrails

Notes:

- [1] The beam guardrail may need to be extended and flared to maintain adequate barrier overlap and shoulder width.
- [2] Typical applications may be at bridge transitions or where high-tension cable and beam guardrail systems end or begin.
- [3] For supporting length of need equation factors, see [Exhibit 1610-10b](#).

Exhibit 1610-14 Thrie Beam Rail Retrofit Criteria

Curb Width	Bridge Width	Concrete Bridge Deck		Wood Bridge Deck or Low-Strength Concrete Deck
		Concrete Bridge Rail (existing)	Steel or Wood Post Bridge Rail (existing)	
<18 inches		Thrie beam mounted to existing bridge rail ^[2] and blocked out to the face of curb. Height = 32 inches	Thrie beam mounted to steel posts ^[2] at the face of curb. Height = 32 inches	<ul style="list-style-type: none"> • Service Level 1 Bridge Rail ^[2] • Height = 32 inches
>18 inches	> 28 ft (curb to curb)	Thrie beam mounted to steel posts ^[2] at the face of curb. ^[1] Height = 32 inches		<ul style="list-style-type: none"> • Curb or wheel guard needs to be removed
>18 inches	< 28 ft (curb to curb)	Thrie beam mounted to existing bridge rail. ^[2] Height = 35 inches	Thrie beam mounted to steel posts ^[2] in line with existing rail. Height = 35 inches	



Notes:

[1] To maximize available curb/sidewalk width for pedestrian use, thrie beam may be mounted to the bridge rail at a height of 35 inches.

[2] Contact the HQ Bridge and Structures Office for design details on bridge rail retrofit projects.

- 1710.01 General
- 1710.02 References
- 1710.03 Definitions
- 1710.04 Safety Rest Area Project Team
- 1710.05 Location, Access, and Site Design
- 1710.06 Buildings
- 1710.07 Utilities
- 1710.08 Documentation

1710.01 General

The Washington State Department of Transportation (WSDOT) has developed a statewide system of traveler stopping opportunities along Interstate highways and state routes. This system includes safety rest areas (see [Exhibit 1710-1](#)), roadside parks, and viewpoints. These services provide universal access for rest, traveler information, and restroom facilities. Benefits include improved safety by reducing driver fatigue and the number of vehicles parked on the shoulders of state routes, refuge from adverse driving conditions, and increased tourism promotion.

Safety rest areas (SRAs) are spaced approximately every 60 miles on the National Highway System and on Scenic and Recreational Highways. Use the Safety Rest Area Program Strategic Plan as a guide when selecting a site location. The link to the SRA Strategic Plan can be found in the SRA Section of the Capital Facilities Office internal web page at: <http://wwwi.wsdot.wa.gov/operations/facilities/>

Safety rest areas are planned and designed by a multidisciplinary team lead through the Facilities Administrator in the Capital Facilities Office, a branch of Maintenance Operations. (See [1710.04](#) for an expanded discussion on team roles and membership.)



Photo: Keith Anderson, VERG

WSDOT Safety Rest Area

Exhibit 1710-1

1710.02 References

(1) Federal/State Laws and Codes

[23 Code of Federal Regulations \(CFR\) 1.23](#), Rights-of-way
[23 CFR 635](#), Construction and Maintenance
[23 CFR 752](#), Landscape and roadside development
[23 CFR 771](#), Environmental impact and related procedures
[42 United States Code \(USC\) Chapter 126, Section 12101](#) et seq., Americans with Disabilities Act of 1990
[20 USC Chapter 6A, Section 107](#), The Randolph-Sheppard Act
[Revised Code of Washington \(RCW\) 46.17.375](#), Recreational vehicle sanitary disposal fee
[RCW 46.68.170](#), RV account – Use for sanitary disposal systems
[RCW 47.01.460](#), Adjustments to recreational vehicle fees
[RCW 47.06.040](#), Statewide multimodal transportation plan
[RCW 47.28.030](#), Contracts – State forces
[RCW 47.38](#), Roadside areas – Safety rest areas
[RCW 47.39](#), Scenic and Recreational Highway Act of 1967
[RCW 47.42](#), Scenic Vistas Act
[Washington Administrative Code \(WAC\) 246-290](#), Group A public water supplies
[WAC 468-66](#), Highway Advertising Control Act

(2) Design Guidance

As the lead WSDOT organization for SRA project teams, the Capital Facilities Office coordinates design details and standards for SRA-related items.

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

www.access-board.gov/adaag/html/adaag.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)

www.wsdot.wa.gov/publications/manuals/mutcd.htm

Highway Runoff Manual, M 31-16, WSDOT

Hydraulics Manual, M 23-03, WSDOT

Plans Preparation Manual, M 22-31, WSDOT

Maintenance Manual, M 51-01, WSDOT

Right of Way Manual, M 26-01, WSDOT

[Roadside Manual](#), M 25-30, WSDOT

[Roadside Policy Manual](#), M3110, WSDOT

[Acronyms](#)

[ADA / Pedestrian Terms](#)

[Main Glossary of Terms](#)

Acronyms

AADT	Annual average daily traffic	IHSDM	Interactive Highway Safety Design Model
ACT	Alternatives Comparison Table	IJR	Interchange Justification Report
ADA	Americans with Disabilities Act of 1990	ITS	Intelligent transportation systems
ADT	Annual daily traffic	L/A	Limited access
ALJ	Administrative law judge	LOS	Level of service
AOS	Apparent opening size	MAISA	Multi Agency, Interdisciplinary, and Stakeholder Advisory (Team)
APS	Accessible pedestrian signal	MEF	Maximum extent feasible
AWDVTE	Average weekday vehicle trip ends	MOU	Memorandum of Understanding
BAT	Business access transit	MPO	Metropolitan Planning Organization
B/C	Benefit / cost	MTIP	Metropolitan Transportation Improvement Program
BLM	Bureau of Land Management	MUTCD	Manual on Uniform Traffic Control Devices
BOD	Basis of Design	NEPA	National Environmental Policy Act
BRT	Bus rapid transit	NHS	National Highway System
BST	Bituminous surface treatment	PAR	Pedestrian access route
CAR	Collision Analysis Report	PATS	Priority Array Tracking System
CE	Categorical Exemption (SEPA)	PC&R	Project Control and Reporting
CE	Categorical Exclusion (NEPA)	PCPH	Passenger cars per hour
CFA	Contributing Factors Analysis	PDMSG	Project Delivery Method Selection Guidance
CFR	Code of Federal Regulations	PE	Preliminary engineering
CIPP	Capital Improvement and Preservation Program	PEL	Planning and Environmental Linkage
CLB	Current Law Budget	PF	Project File
CMP	Corridor Management Plan	PoDI	Project of Division Interest (FHWA)
CPMS	Capital Program Management System	PPH	Persons per hour
CRT	Controlled releasing terminal post	PS	Project Summary
CSS	Context sensitive solutions	PS&E	Plans, Specifications, and Estimates
CTR	Commute Trip Reduction	RCW	Revised Code of Washington
CVISN	Commercial Vehicle Inf. System and Networks	RFP	Request for Proposal
DDHV	Directional design hour volume	ROD	Record of Decision
DDP	Design Documentation Package	RTIP	Regional Transportation Improvement Program
DHV	Design hourly volume	RTPO	Regional Transportation Planning Organization
DNS	Determination of Nonsignificance (SEPA)	RV	Recreational vehicle
DS	Determination of Significance (SEPA)	R/W	Right of way
DVIS	Design Variance Inventory System	SEPA	[Washington] State Environmental Policy Act
EA	Environmental Assessment (NEPA)	SHS	Sustainable Highway Safety
E&EP	Environmental & Engineering Programs Division	SIMMS	Signal Maintenance Management System
EIS	Environmental Impact Statement	SOV	Single-occupant vehicle
ERS	Environmental Review Summary	SRA	Safety rest area
FAST	Freight Action Strategy	STIP	Statewide Transportation Improvement Program
FGTS	Freight and Goods Transportation System	STP	Surface Transportation Program
FHWA	Federal Highway Administration	TIP	Transportation Improvement Program
FONSI	Finding of No Significant Impact (NEPA)	TMA	Transportation Management Area
FTA	Federal Transit Administration	TMP	Transportation management plan
GIS	Geographic Information System	TRIPS	Transportation Information and Planning Support
GLO	General Land Office	TWLT	Two-way left-turn lane
GMA	Growth Management Act	UPO	[Central Puget Sound] Urban Planning Office
HCM	Highway Capacity Manual	USC	United States Code
HCP	Highway Construction Program	VE	Value engineering
HMA	Hot mix asphalt	VECP	Value Engineering Change Proposal
HOT	High-occupancy toll	VIC	Visitor Information Center
HOV	High-occupancy vehicle	VPH	Vehicles per hour
HQ	WSDOT's Headquarters in Olympia	WAC	Washington Administrative Code
HSM	Highway Safety Manual	WIM	Weigh in motion
HSP	Highway System Plan (also SHSP)	WSDOT	Washington State Department of Transportation
HSS	Highways of Statewide Significance	WSPMS	Washington State Pavement Management System
ICA	Intersection Control Analysis	WTP	Washington Transportation Plan
ICD	Inscribed circle diameter		

Main Glossary of Terms

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Z
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A

access A means of entering or leaving a public road, street, or highway with respect to abutting property or another public road, street, or highway.

access break Any point from inside or outside the state limited access right of way limited access hachures that crosses over, under, or physically through the plane of the limited access, is an access break or “break in access,” including, but not limited to, locked gates and temporary construction access breaks.

access connection An access point, other than a public road/street, that permits access to or from a managed access highway on the state highway system.

access connection permit A written authorization issued by the permitting authority for a specifically designed access connection to a managed access highway at a specific location; for a specific type and intensity of property use; and for a specific volume of traffic for the access connection based on the final stage of the development of the applicant’s property. The actual form used for this authorization is determined by the permitting authority.

access control The limiting and regulating of public and private access to Washington State’s highways, as required by state law. A *design control* (see [Chapter 1103](#)) – there are two categories of controlling access to state highways *limited access* and *managed access*.

Access Control Tracking System Limited Access and Managed Access Master Plan A database list, related to highway route numbers and mileposts, that identifies either the level of limited access or the class of managed access: www.wsdot.wa.gov/design/accessandhearings

access density the number of access points (driveways) per mile.

access design analysis A *design analysis* (see Chapter 300) that authorizes deferring or staging acquisition of limited access control, falling short of a 300-foot requirement, or allowing an existing access point to stay within 130 feet of an intersection on a limited access highway. Approval by the Director & State Design Engineer, Development Division, or *designee*, is required (see Chapter 530).

access hearing plan A limited access plan prepared for presentation at an access hearing.

access management The programmatic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.

access point Any point that allows private or public entrance to or exit from the traveled way of a state highway, including “locked gate” access and maintenance access points.

access point revision A new access point or a revision of an existing interchange/ intersection configuration. Locked gates and temporary construction breaks are also access point revisions.

access point spacing On a managed access highway, the distance between two adjacent access points on one side of the highway, measured along the edge of the traveled way from one access point to the next (see also corner clearance).

access report plan A limited access plan prepared for presentation to local governmental officials at preliminary meetings before preparation of the access hearing plan.

access rights Property rights that allow an abutting property owner to enter and leave the public roadway system.

adaptive lighting system A lighting system with a control system connected, allowing for dimming, on/off operation by time of night, and independent scheduling of individual lights for select hours of operation during nighttime hours.

affidavit of publication A notarized written declaration stating that a notice of hearing (or notice of opportunity for a hearing) was published in the legally prescribed manner.

affidavit of service by mailing A notarized written declaration stating that the limited access hearing packet was mailed at least 15 days prior to the hearing and entered into the record at the hearing.

alternative(s) Possible solutions to accomplish a defined purpose and need. These include local and state transportation system mode and design options, locations, and travel demand management and transportation system management-type improvements such as ramp metering, mass transit, and high-occupancy vehicle (HOV) facilities.

Alternatives Comparison Table (ACT) A table that documents and presents the tradeoffs among those performance metrics identified for each alternative under consideration on a project. The ACT is used to assist in analyzing the baseline and contextual performance tradeoffs and ultimately to select an alternative. It is a supplemental document to the “Alternatives Analysis” section of the [Basis of Design](#).

ancillary services Those secondary services, also considered amenities, provided at safety rest areas that include, but are not limited to, vending machines, picnic areas, interpretive signing, telephones, recreational vehicle (RV) sanitary disposal facilities, trails, scenic viewpoints, commercial and public information displays, and visitor information centers.

annual average daily traffic (AADT) The total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year.

annual daily traffic (ADT) The volume of traffic passing a point or segment of a highway, in both directions, during a period of time, divided by the number of days in the period, and factored to represent an estimate of traffic volume for an average day of the year.

application for an access connection An application provided by the permitting authority to be completed by the applicant for access to a managed access highway.

aesthetic, historic, and environmental resources while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist.

contiguous parcels Two or more pieces of real property, under the same ownership, with one or more boundaries that touch and have similarity of use.

continuous load The electrical load on a circuit that lasts for a duration of three or more hours on any day.

contributing factors Those operational conditions, human factors, context conditions, design elements, design controls, or actions identified by data, engineering judgment, or the community that contribute to a performance need under evaluation.

controlled releasing terminal (CRT) post A standard-length guardrail post that has two holes drilled through it so it might break away when struck.

conventional traffic signal A permanent or temporary installation providing alternating right of way assignments for conflicting traffic movements. At least two identical displays are required for the predominant movement on each approach.

corner clearance On a managed access highway, the distance from an intersection of a public road or street to the nearest access connection along the same side of the highway. The minimum corner clearance distance (see [Chapter 540](#)) is measured from the closest edge of the intersecting road or street to the closest edge of the traveled way of the access connection, measured along one side of the traveled way (through lanes) (see also [access point spacing](#)).

corridor sketch an information source that describes the attributes of a state highway corridor, its current and future function, as well as its performance expectations. It will ultimately identify cost-effective strategies for future consideration. A completed corridor sketch may have information that is valuable at the project level in determining contextual performance needs, and project alternatives. A corridor sketch is not a substitute for detailed planning and analysis, nor is it a list of investments or projects.

corridor vision The future transportation context from a regional perspective. Practical Design considers and accounts for the contextual needs of the longer section of highway in the development and evaluation of alternatives to ensure a favorable outcome for the greater system.

countermeasure an action taken to counteract an existing or anticipated condition.

court reporter A person with a license to write and issue official accounts of judicial or legislative proceedings.

crash-accepted device A feature that has been proven acceptable for use under specified conditions, either through crash testing or in-service performance.

Crash Analysis Report (CAR) A template that is the basis for all crash analyses for all types of design documentation that need crash analyses, as described in [Chapter 321](#).

crash rate Crashes per one million vehicle miles traveled and fatal rates per one hundred million vehicle miles.

critical fill slope A slope on which a vehicle is likely to overturn. Slopes steeper than 3H:1V are considered critical fill slopes.

crossroad The minor roadway at an intersection. At a stop-controlled intersection, the crossroad has the stop.

curb section A roadway cross section with curb and sidewalk.

D

decision sight distance The distance needed for a driver to detect an unexpected or difficult-to-perceive condition, recognize the condition, select an appropriate maneuver, and complete the maneuver based on design conditions and design speed.

deflection (in respect to roundabouts) The change in the path of a vehicle imposed by the geometric features of a roundabout resulting in a slowing of vehicles.

delineation Any method of defining the roadway operating area for the driver.

deliverable Any unique and verifiable product, result or capability to perform a service that must be produced to complete a process, phase, or project.

departure lanes The lane or set of lanes for traffic leaving the roundabout (see Chapter 1320).

Design Analysis a process and tool to record design element changes where the dimensions chosen do not meet the value, or lie within the range of values, provided for that element in the *Design Manual*. (see Chapters [300](#) and [1106](#)).

Design Approval Documented approval of the design at this early milestone locks in design policy for three years. Design approval becomes part of the Design Documentation Package (see [Chapter 300](#).)

design-bid-build The project delivery method where design and construction are sequential steps in the project development process ([23 CFR 636.103](#)).

design-build contract An agreement that provides for design and construction of improvements by a consultant/contractor team. The term encompasses design-build-maintain, design-build-operate, design-build-finance, and other contracts that include services in addition to design and construction. Franchise and concession agreements are included in the term if they provide for the franchisee or concessionaire to develop the project that is the subject of the agreement ([23 CFR 636.103](#)).

design-builder The firm, partnership, joint venture, or organization that contracts with WSDOT to perform the work.

design controls key parameters that critically shape design decisions and effect calculated dimensions for some design elements. Design controls are conscientiously selected and work together with the context characteristics to achieve a particular outcome (see [Chapter 1103](#))

Design Clear Zone The minimum clear zone target value used in highway design.

highest from the p.m. The peak hour correlates to the DHV, but is not the same. However, it is close enough on items such as intersection plans for approval to be considered equivalent.

performance-based decisions Decisions that are made based on performance, performance metrics, performance targets, and performance gaps. Also, decisions made using performance evaluation tools, such as Highway Safety Manual methodology for evaluating safety performance.

performance category Any broad area of performance important to an organization, project, or place. WSDOT's six performance categories: Economic Vitality, Preservation, Safety, Mobility, Environment, and Stewardship are a product of legislative policy.

performance evaluation tools Quantitative tools used to measure performance. Examples of these tools currently being used by WSDOT are Highway Safety Manual methodology (for safety performance) and Highway Capacity Manual (for mobility performance).

performance gap The difference between the measured and targeted performance unit for a performance metric. This gap is another way of describing the performance need(s) at a location.

performance metric Any measurable indicator used to assess the achievement of outcomes.

performance need See [baseline performance need](#) and [contextual performance need](#)

performance target(s) An outcome or desired state intended for a project. Performance targets are identified as either baseline or contextual (see [Chapter 1101](#)).

permit holder The abutting property owner or other legally authorized person to whom an access connection permit is issued by the permitting authority.

permitted access connection A connection for which an access connection permit has been issued by a permitting authority.

permitting authority The agency that has legal authority to issue managed access connection permits. For access connections in unincorporated areas, the permitting authority is WSDOT; for access connections within corporate limits, the permitting authority is a city or town.

physical nose The point, upstream of the gore, with a separation between the roadways of 16 to 22 feet (see [Chapter 1360](#)).

planning Transportation planning is a decision-making process required by federal and state law used to solve complex, interrelated transportation and land use problems.

Planning and Environmental Linkage (PEL) A collaborative and integrated approach to transportation decision-making that (1) considers environmental, community, and economic goals early in the planning process, and (2) uses the information, analysis, and products developed during planning to inform the environmental review process.

Plans, Specifications, and Estimates (PS&E) The project development activity that follows Project Definition and culminates in the completion of contract-ready documents and the engineer's cost estimate.

pole height (H1) The vertical distance from the light source to the pole base. This distance is specified in contracts and used by the pole manufacturers to fabricate the light standard.

policy point There are eight policy points addressed in the IJR:

- Need for the Access Point Revision
- Reasonable Alternatives
- Operational & Crash Analyses
- Access Connections & Design
- Land Use & Transportation Plans
- Future Interchanges
- Coordination
- Environmental Processes

portable traffic signal A type of conventional traffic signal used in work zones to control traffic. This signal is most commonly used on two-way two-lane highways where one lane has been closed for roadwork. This signal is most commonly operated in pairs, with one signal at each end of the work zone. This eliminates the need for 24-hour flagger control. The traffic signal provides alternating right of way assignments for conflicting traffic movements. The signal has an adjustable vertical support with two three-section signal displays and is mounted on a mobile trailer with its own power source.

positive illumination Lighting the surface of the object as the driver views it.

posted speed The maximum legal speed as posted on a section of highway using regulatory signs.

Practical Design/Practical Solutions An approach to making project decisions that focuses on the specific problem the project is intended to address. This performance-based approach looks for lower cost solutions that meet outcomes that WSDOT, partnering agencies, communities and stakeholders have identified. Practical design is a fundamental component to the vision, mission, values, goals, and reforms identified in [Results WSDOT- WSDOT's Strategic Plan](#). With practical solutions, decision-making focuses on maximum benefit to the system, rather than maximum benefit to the project. Focusing on the specific project need minimizes the scope of work for each project so that system-wide needs can be optimized.

prehearing packet A concise, organized collection of all necessary prehearing data, prepared by the region and approved by the HQ Development Services & Access Manager prior to the hearing (see [Chapter 210](#)).

preliminary engineering (PE) A term used to describe the Project Delivery process from project scoping through PS&E review.

principal arterial system A connected network of rural arterial routes with appropriate extensions into and through urban areas, including routes designated as part of the Interstate System, that serves corridor movements with travel characteristics indicative of substantial statewide and interstate travel ([RCW 47.05.021](#)).

priority array A collection of similar needs identified in the HSP, prioritized based on the methodology adopted by WSDOT to meet the requirements of [RCW 47.05](#).