

- 100.01 Purpose
- 100.02 Presentation and Revisions
- 100.03 Manual Applications
- 100.04 Manual Use
- 100.05 Manual Organization

100.01 Purpose

The Washington State Department of Transportation (WSDOT) has developed the *Design Manual* to reflect policy, outline a uniformity of methods and procedures, and communicate vital information to its employees and others who develop projects on state highways. When properly used, the manual will facilitate the development of a highway system consistent with the needs of the traveling public.

WSDOT designers are required to comply with the *Design Manual*. The Federal Highway Administration (FHWA) has agreed to approve designs that follow guidance in the *Design Manual*; therefore, adherence to the guidance presented is not optional for state highway projects.

The information, guidance, and references contained herein are not intended as a substitute for sound engineering judgment. The *Design Manual* is not a comprehensive textbook on highway engineering, nor does it attempt to cover all the possible scenarios Washington's highways present. It is recognized that some situations encountered are beyond the scope of this presentation.

If you have design questions not answered by the *Design Manual*, contact the Headquarters (HQ) Design Office.

100.02 Presentation and Revisions

The *Design Manual* is available on the Internet and in print. It can be accessed electronically through the:

- WSDOT Home Page:
www.wsdot.wa.gov/
- Design Policy Web Page:
www.wsdot.wa.gov/design/policy/
- Engineering Publications Web Page:
www.wsdot.wa.gov/publications/manuals/index.htm

The online version of the manual enables you to conduct a word search of the entire manual. Opening an individual chapter is faster, but a word search is limited to that chapter. Hard-copy editions are available on a department cost-recovery basis (they are free to WSDOT employees).

The *Design Manual* is continually revised to reflect changing processes, procedures, regulations, policies, and organizations. Feedback from users is encouraged to improve the manual for everyone. Comments may be submitted by any method that is convenient for you. There is a comment form in the front of the manual, or comments may be made via the contact names on the Design Policy Internet page (see link above). Note that the Design Policy Internet page includes a link to an errata page, which provides a list of known technical errors in the manual. Manual users are encouraged to view this page on a regular basis.

A contents section lists all chapters and the major headings of the sections/pages. The exhibits section lists all the exhibits in the manual and provides their page numbers.

Most chapters include a list of references, including laws, administrative codes, manuals, and other publications, which are the basis for the information in the chapter. Most chapters also include definitions for the specialized vocabulary used in the chapter; some words or phrases have more than one dictionary meaning.

100.03 Manual Applications

Design Manual guidance is provided to encourage the statewide uniform application of design details under normal conditions. It also guides designers through the project development process used by WSDOT. The *Design Manual* is used by the department to:

- Interpret current design principles, including American Association of State Highway and Transportation Officials (AASHTO) policy and federal and state laws.
- Develop projects that meet drivers' expectations.
- Balance the benefits and costs of highway construction projects.

The *Design Manual* is designed to allow for flexibility in design for specific and unusual situations. For unusual circumstances, the manual provides mechanisms for documenting the reasons for the choices made.

The *Design Manual* is developed for use on state highways and may not be suitable for projects on county roads or city streets.

100.04 Manual Use

The WSDOT *Design Manual* is intended to be used for design of department-owned facilities, especially the transportation facilities associated with state highways as designated by RCW 47.17.

For state highway routes, all projects must be designed using the *Design Manual* geometric control criteria (see Chapter 1100 and Division 11). If WSDOT guidance is not used on a project, appropriate documentation and approvals are required (see Chapters 300 and 1100).

When WSDOT designs facilities that will be turned over to local jurisdictions, those facilities are to be designed using appropriate local geometric design criteria.

When local jurisdictions design any element of state highway facilities, the *Design Manual* must be used. Local jurisdictions are free to adopt this manual for their local criteria or to develop their own specialized guidance for facilities not on state highway routes.

100.05 Manual Organization

The *Design Manual* is split into the following two volumes:

- Volume 1 contains *procedural topics*, including project documentation, permitting and hearings, site data, project investigation, and guidance for coordination with specialty group functions such as traffic, right of way, bridge and structures, and geotechnical design.
- Volume 2 addresses *design criteria and geometrics*. The design matrices are included in this volume because they communicate expectations for which elements are included in projects.

Each volume is divided into a series of divisions that address a portion of the project development and design processes. The divisions are comprised of chapters that address the general topic in detail and are, in some cases, specific to a particular discipline. Both volumes contain a complete Contents section and a complete Index.

(1) Volume 1: Procedures

Division 1 – General Information: Presents general background on planning, managing project delivery, project development, and programming.

- **Chapter 100 – Manual Description:** Chapter content and resources within the *Design Manual*.
- **Chapter 110 – Design-Build Projects:** How the *Design Manual* applies to design-build projects: includes terminology and reference to design-build contract documents.
- **Chapter 120 – Planning:** Critical information, such as corridor studies and route development plans, relating to the corridor in which the project resides.
- **Chapter 130 – Project Development Sequence:** The project development sequence from the Washington Transportation Plan through the contract document: emphasizes the Project Summary and Change Management process.

Division 2 – Hearings, Environmental, and Permits: Provides the designer with information about the public involvement and hearings process, the environmental documentation process, and the permit process.

- **Chapter 210 – Public Involvement and Hearings:** Developing a project-specific public involvement plan; the ingredients of an effective public involvement plan; and methods for public involvement.
- **Chapter 220 – Project Environmental Documentation:** An elementary background on the environmental documentation process and its requirements.
- **Chapter 230 – Environmental Permits and Approvals:** Permits that may be required for highway and bridge projects.

Division 3 – Project Documentation: Provides designers with information on value engineering, traffic analysis, design documentation, and approvals.

- **Chapter 300 – Design Documentation, Approval, and Process Review:** Building the Project File (PF) and the Design Documentation Package (DDP) and recording the recommendations and decisions that lead to a project by preserving the documents from the planning, scoping, programming, and design phases (includes permits, approvals, contracts, utility relocation, right of way, advertisement and award, and construction).
- **Chapter 310 – Value Engineering:** A systematic, multidisciplinary process study early in the project design stage to provide recommendations to improve scope, functional design, constructibility, environmental impacts, or project cost—required by federal law for high-cost, complex projects.
- **Chapter 320 – Traffic Analysis:** Procedural guidance and general requirements for conducting traffic analyses.

Division 4 – Surveying: Includes criteria for surveying, mapping, and monumentation requirements.

- **Chapter 400 – Surveying and Mapping:** The procedures within WSDOT for project surveying.
- **Chapter 410 – Monumentation:** The requirements and procedures for Monumentation.

Division 5 – Right of Way and Access Control: Provides guidance on right of way considerations; interchange justification reports; limited/managed access; and fencing.

- **Chapter 510 – Right of Way Considerations:** The right of way and easement acquisition process.
- **Chapter 520 – Access Control:** WSDOT Access Control program information.
- **Chapter 530 – Limited Access Control:** Clarification on full, partial, and modified limited access control.
- **Chapter 540 – Managed Access Control:** The classes of managed access highways and the access connection permitting process.
- **Chapter 550 – Interchange Justification Report:** The process for access point revisions on limited access controlled highways and the steps for producing an interchange justification report.
- **Chapter 560 – Fencing:** The purpose of fencing, types of fencing, and fencing design criteria.

Division 6 – Soils and Paving: Presents guidance for investigating soils, rock, and surfacing materials; estimating tables; and guidance and criteria for the use of geosynthetics.

- **Chapter 610 – Investigation of Soils, Rock, and Surfacing Materials:** The requirements for qualifying a materials source, geotechnical investigations, and the documentation to be included in the Project File.
- **Chapter 620 – Design of Pavement Structures:** Estimating tables for the design of pavement structures.
- **Chapter 630 – Geosynthetics:** The types/applications of geosynthetic drainage, earthwork, erosion control, and soil reinforcement materials.

Division 7 – Structures: Provides guidance for the design of structures for highway projects, including site data for structures, bridges, retaining walls, and noise walls.

- **Chapter 700 – Project Development Roles and Responsibilities for Projects With Structures:** WSDOT’s project development process: roles and responsibilities for projects with structures during the project development phase of a project.
- **Chapter 710 – Site Data for Structures:** Information required by the HQ Bridge and Structures Office to provide structural design services.
- **Chapter 720 – Bridges:** Basic design considerations for developing preliminary bridge plans and guidelines on basic bridge geometric features.
- **Chapter 730 – Retaining Walls and Steep Reinforced Slopes:** Design principles, requirements, and guidelines for retaining walls and steep reinforced slopes.
- **Chapter 740 – Noise Barriers:** Factors considered when designing a noise barrier.

Division 8 – Hydraulics: Addresses the issue of hydraulics and serves as a guide to highway designers to identify and consider hydraulic-related factors that may impact the design.

- **Chapter 800 – Hydraulic Design:** Hydraulic considerations for highway projects involving flood plains, stream crossings, channel changes, and groundwater.

Division 9 – Roadside Development: Provides guidance on the portion of state highways between the traveled way and the right of way boundary.

- **Chapter 900 – Roadside Development:** Managing the roadside environment, including the area between the traveled way and the right of way boundary, unpaved median strips, and auxiliary facilities such as rest areas, wetlands, and stormwater treatment facilities.
- **Chapter 910 – Contour Grading:** Contour grading to achieve operational, environmental, and visual functions.
- **Chapter 920 – Vegetation:** The use of vegetation in the roadside environment and when to contact the Landscape Architect.
- **Chapter 930 – Irrigation:** Design considerations for irrigation on highway projects.
- **Chapter 940 – Soil Bioengineering:** Design considerations for the use of bioengineering techniques on highway projects.
- **Chapter 950 – Public Art:** Policies and procedures for including public art in state transportation corridors.

Division 10 – Traffic Safety Elements: Introduces the designer to traffic safety elements such as work zone traffic control, signing, delineation, illumination, traffic control signals, and Intelligent Transportation Systems (ITS).

- **Chapter 1010 – Work Zone Safety and Mobility:** Planning, design, and preparation of highway project plans that address work zone safety and mobility requirements.
- **Chapter 1020 – Signing:** The use of signing to regulate, warn, and guide motorists.
- **Chapter 1030 – Delineation:** The use of pavement markings to designate safe traffic movement.
- **Chapter 1040 – Illumination:** Illumination design on state highway construction projects.
- **Chapter 1050 – Intelligent Transportation Systems (ITS):** Applying computer and communication technology to optimize the safety and efficiency of the highway system.

(2) Volume 2: Design Criteria

Division 11 – Project Design Criteria: Provides design criteria guidance for basic design, modified design, and full design that are part of the design matrices in Chapter 1100.

- **Chapter 1100 – Design Matrix Procedures:** Includes design matrices that provide consistency across projects according to funding type and highway system. Each design matrix sets forth the design levels for a given type of need, which would be automatically approved by the department and FHWA. The chapter also discusses deviation approvals and how to apply the appropriate design level for the majority of Improvement and Preservation projects.
- **Chapter 1110 – Minor Operational Enhancement Projects:** Design matrices for low-cost, quick-fix projects that improve the operation of a state highway facility.
- **Chapter 1120 – Basic Design Level:** The required basic safety work and minor preservation and safety work included in the preservation of pavement structures and pavement service life while maintaining safe operation of the highway.
- **Chapter 1130 – Modified Design Level:** Design guidance unique to the modified design level of preserving and improving existing roadway geometrics and safety and operational elements.
- **Chapter 1140 – Full Design Level:** Guidance for the highest level of highway design, used on new and reconstructed highways to improve roadway geometrics and safety and operational elements.

Division 12 – Geometrics: Covers geometric plan elements; horizontal alignment; lane configurations and pavement transitions; geometric profile elements; vertical alignment; geometric cross sections; and sight distance.

- **Chapter 1210 – Geometric Plan Elements:** The design of horizontal alignment, lane configuration, and pavement transitions.
- **Chapter 1220 – Geometric Profile Elements:** The design of vertical alignment.
- **Chapter 1230 – Geometric Cross Section:** Roadway width and roadside slope design.
- **Chapter 1240 – Turning Roadways:** Widening curves to make the operating conditions comparable to those on tangent sections.
- **Chapter 1250 – Superelevation:** Superelevating curves and ramps so design speeds can be maintained.
- **Chapter 1260 – Sight Distance:** Stopping, passing, and decision sight distance design elements.
- **Chapter 1270 – Auxiliary Lanes:** Auxiliary facilities such as climbing lanes, passing lanes, slow-vehicle turnouts, shoulder driving for slow vehicles, emergency escape ramps, and chain-up areas.

Division 13 – Intersections and Interchanges: Addresses the design considerations of at-grade intersections, roundabouts, road approaches, railroad grade crossings, and traffic interchanges.

- **Chapter 1310 – Intersections at Grade:** Designing intersections at grade, including at-grade ramp terminals.
- **Chapter 1320 – Roundabouts:** Guidance on the design of roundabouts.
- **Chapter 1330 – Traffic Control Signals:** The use of power-operated traffic control devices that warn or direct traffic.
- **Chapter 1340 – Road Approaches:** The application and design of road approaches on state highways.
- **Chapter 1350 – Railroad Grade Crossings:** The requirements for highways that cross railroads.
- **Chapter 1360 – Traffic Interchanges:** The design of interchanges on interstate highways, freeways, and other multilane divided routes.
- **Chapter 1370 – Median Crossovers:** Guidance on locating and designing median crossovers for use by maintenance, traffic service, emergency, and law enforcement vehicles.

Division 14 – HOV and Transit: Provides design guidance on HOV lanes and transit facilities.

- **Chapter 1410 – High-Occupancy Vehicle Facilities:** Evaluating and designing high-occupancy vehicle (HOV) facilities.
- **Chapter 1420 – HOV Direct Access:** Design guidance on left-side direct access to HOV lanes and transit facilities.
- **Chapter 1430 – Transit Benefit Facilities:** Operational guidance and information for designing transit facilities such as park & ride lots, transfer/transit centers, and bus stops and pullouts.

Division 15 – Pedestrian and Bicycle Facilities: Provides guidance on pedestrian and bicycle facility design.

- **Chapter 1510 – Pedestrian Design Considerations:** Designing facilities that encourage efficient pedestrian access that meets ADA.
- **Chapter 1520 – Bicycle Facilities:** Selecting and designing useful and cost-effective bicycle facilities.

Division 16 – Roadside Safety Elements: Addresses design considerations for the area outside the roadway, and includes clear zone, roadside hazards, safety mitigation, traffic barriers, and impact attenuator systems.

- **Chapter 1600 – Roadside Safety:** Clear zone design, roadside hazards to consider for mitigation, and some roadside safety features.
- **Chapter 1610 – Traffic Barriers:** Design of traffic barriers based on the design levels identified in the design matrices.
- **Chapter 1620 – Impact Attenuator Systems:** Permanent and work zone impact attenuator systems.

Division 17 – Roadside Facilities: Provides design guidance for the area outside the roadway, including rest areas and truck weigh sites.

- **Chapter 1710 – Safety Rest Areas and Traveler Services:** Typical layouts for safety rest areas.
- **Chapter 1720 – Weigh Sites:** Guidance on designing permanent, portable, and shoulder-sited weigh sites.