Local Project Administration Manual & Reference Guide

Project Design

MaineDOT

Integrity - Competence - Service

2016 Edition

Section 3

Project Design

Successful projects begin with practical designs that reflect sound engineering judgment. Well-developed construction plans and specifications enable contractors to understand what they are to build and how the work should be done, minimizing change orders in the field. Most municipalities and other local agencies hire engineering consultants. Larger communities, such as Bangor and Lewiston, use their municipal engineering staffs.

As this section will show, the design process carries milestones to mark progress, initiate design checks, and make sure that a project is on track. Included in this section are:

- Expectations for Preliminary Design Report and Plan Impacts Complete (page 3-2);
- Design exception process (page 3-3);
- Public process, environment, utilities, and traffic (pages 3-4 and 3-5);
- Quality-control design check requirements (page 3-6);
- Appendix 3A: Communications (page 3-7);
- Appendix 3B: Practical design guidance (page 3-11);
- Appendix 3C: Controlling design criteria (page 3-14);
- Appendix 3D: Design submittal guidance (page 3-20).

➲ MaineDOT engineering and design guidance is found online: **www.maine.gov/mdot/edi/**

3.1 Design Standards

Engineering design work on a locally administered project must be supervised by an engineer licensed in Maine. If a highway, bridge or bicycle/pedestrian project has federal or state money, MaineDOT expects the design to reflect appropriate sections of its *Engineering Instructions*, *Highway Design Guide*, *Standard Specifications*, and *Standard Details*. Designers also may consult MaineDOT's practical design philosophy, found in Appendix 3B (page 3-11).

Additionally, MaineDOT encourages use of the following standard references:

- AASHTO "Green Book": A Policy on Geometric Design of Highways and Streets.
- AASHTO: Guide for the Planning, Design, and Operation of Pedestrian Facilities.
- AASHTO: Guide for the Development of Bicycle Facilities.
- AASHTO: LRFD Bridge Design Specifications.
- Federal Highway Administration: Manual on Uniform Traffic Control Devices.

3.2 Preliminary Design Report

Early in development of projects involving highways, bridges and bicycle/pedestrian improvements, a designer prepares preliminary plans (50-60 percent complete) and identifies utility, environmental and right-of-way impacts. The principal product at this stage is the preliminary design report, or "PDR," submitted to Maine DOT with Communication 8 (page 3-8) for review and comment.

A checklist is included in Appendix 3D, starting on page 3-21. In general, a PDR provides the following, as appropriate for the scope of work for a project:

- ☐ Project location, with a map and photographs;
- ☐ A description of the existing conditions – including traffic volumes, if applicable;
- ☐ Preliminary design with plan views, profiles and drainage scheme;
- ☐ Typical sections with pavement depth, based type and depth, and curb type;
- ☐ Preliminary identification of impacts, obstacles and site constraints;
- ☐ Proposed exceptions to controlling design standards;
- ☐ Results of meetings and other public involvement activities; and
- ☐ A preliminary estimate of the construction cost, using MaineDOT bid item numbers.

➲ MaineDOT's standard PDR form is online: **www.maine.gov/mdot/cpo/highway/**

3.3 Plan Impacts Complete

Once MaineDOT signs off on a PDR, a project moves to final design. The key milestone at this point is Plan Impacts Complete, when all environmental, utility and property impacts are identified. Plan Impacts must be submitted for review to MaineDOT with Communication 9 (page 3-9).

A checklist is included in Appendix 3D, starting on page 3-25. MaineDOT considers design to have reached Plan Impacts Complete when the plans show these details:

- ☐ Plan views with cut/fill lines;
- ☐ Cross-sections every 50 feet showing proposed limits of slopes and new construction;
- ☐ Beginning and end of project stations;
- ☐ Locations and limits of driveways and entrances to be constructed;
- ☐ Type of surface treatment on drives and entrances;
- ☐ Locations of curbing, sidewalks and islands, including their geometrics;
- ☐ Drainage scheme showing under-drain, basins, culverts, ditches and outlet locations;
- ☐ Calculated drainage flows;
- ☐ Clearing limits and individual trees/shrubs to be removed, regardless of size;
- ☐ Locations of structures to be installed, such as retaining walls;
- ☐ Locations of all signal poles, special street lighting, conduits and junction boxes;
- ☐ Existing utilities on plans and cross sections with proposed new locations; and
- ☐ Proposed guard rail.

3.4 Design Exceptions

Designers and engineers often face tradeoffs. A good design balances cost, safety, mobility, social and environmental impacts, and the needs of a variety of users. When it isn't possible to meet standard design criteria, an appropriate solution may be to use a design value outside the standard range – as long as the designer has analyzed the potential effects upon safety and operations.

A design exception is a documented decision to design an element of the transportation system to criteria outside of established guidelines. For projects along state highways, exceptions to the criteria in the matrix below and in Appendix 3C (page 3-14) must be highlighted on the design plans, with a memo describing the controlling values and the nature of each proposed exception.

➲ Download the design exception request form: **www.maine.gov/mdot/lpa/lpadocuments/**

Requests for design exceptions on locally administered projects must go initially to the manager of the MaineDOT Multimodal Program. From there, a design exception request may be elevated to the MaineDOT Engineering Council, as warranted and shown below.

Scope	Controlling Criteria	Approval Level
Preservation	CS, GR, LW, SE, SW, VC	MaineDOT Program Manager
Rehabilitation	BR, BW, CS, CZ, DS, GR, HA, LO, LW, MG, SC, SE, SSD, SW, VA, VC	MaineDOT Program Manager
New Construction, Reconstruction	BR, BW, CS, CZ, DS, GR, HA, LO, LW, MG, SC, SE, SSD, SW, VA, VC	MaineDOT Engineering Council

- BR Bridge Rail
- BW Bridge Width
- CS Cross Slopes (Crown)
- CZ Clear Zone
- DS Design Speed
- GR Guardrail
- HA Horizontal Alignment
- LO Lateral Offset (to structures)
- LW Lane Width
- MG Maximum Gradient
- SC Structural Capacity
- SE Superelevation
- SSD Stopping Sight Distance
- SW Shoulder Width
- VA Vertical Alignment
- VC Vertical Clearance

3.5 Design Reviews

Quality-control (QC) checks are vital to the design process. Accordingly, MaineDOT requires consultants and municipal engineers working on locally administered projects to perform and document QC design checks at the following stages:

- At 50 percent plans complete – with the preliminary design report (PDR); and
- At 95 percent plans complete – with final plans, specifications & estimate (PS&E).

The QC process will consist of checking all calculations and design assumptions, and reviewing the PDR, contract provisions, plan set, cost estimates and all other relevant documents. The design checker shall be a qualified individual other than the originator of the documents.

The established QC design checks should include the following items:

- ☐ Summarizing the design-checking process. This will include the checklists used, the standard checking and back-checking processes, and other QC tools that were utilized.
- ☐ Documenting all design checks: initials of the checker, the date on which checks were performed, comments by the checker, and any other documentation.

- ☐ Checking all documents and calculations developed for each design element.
- ☐ Complying with all legal, regulatory and contractual requirements, including but not limited to the Americans with Disabilities Act (ADA) and the Manual on Uniform Traffic Control Devises (MUTCD).
- ☐ Assuring both that the design is of high quality and that it conforms to all applicable MaineDOT standards, policies and practices.
- ☐ Reviewing the cost estimate, including quantity and unit price analysis with comparison to established budget and project scope.
- ☐ Analyzing constructability and maintainability if the proposed design.
- ☐ Risk assessment (based on public safety, funding, scope, site specific conditions, and/or other project specific condition that could elevate risk level.)

MaineDOT will verify the design checks through its quality-assurance reviews of project plans at 50 percent complete (PDR) and 95 percent complete (PS&E). MaineDOT personnel will not review plan submittals that lack evidence of design checks until such documentation is received.

- *If a community will use an engineering consultant, a quality-control element must be a scope item in each consultant's technical proposal and subsequent contract.*

3.6 Public Involvement

During preliminary design for a locally administered project, a municipality or other local agency must provide abutters and the general public with opportunity to learn about potential impacts and comment on the project. An agency should determine the appropriate level of public involvement based on a project's size and its effect on the surrounding community and the natural environment. A planned road resurfacing, for example, will require a less extensive public process than a highway reconstruction or planned shared-use path with multiple impacts.

Public meetings are the primary means of informing people about proposed projects. An agency overseeing a project should notify all abutters by registered mail and publicize meetings using its standard public notification procedures. Newspaper advertisements usually are required. Sample notifications are found on MaineDOT's website under Public Participation: **http://www.maine.gov/mdot/lpa/lpadocuments/**

Additional events outside of traditional public meetings may be appropriate for complicated or controversial projects – including outreach to affected community populations with limited ability to read, speak, write or understand English.

After the public process, the agency managing a project must review all comments and include a summary in the preliminary design report, covered in Section 3.2. Additionally, the agency must provide MaineDOT with Communication 10 (page 3-10) certifying that public involvement was conducted and noting significant comments or opposition.

➲ **Businesses** potentially affected by planned construction projects must be **notified** and given opportunity to express concerns during the preliminary phases of project design.

3.7 Environmental Review

During design, all locally administered projects with federal money must be reviewed for possible impacts to natural and cultural resources such as wetlands, wildlife habitats, historic properties, and public parks and recreation areas. Federal laws – notably the landmark National Environmental Policy Act (NEPA) – mandate such reviews.

Survey and other field work should identify environmentally sensitive areas along the proposed route of a project, along with public parks or recreation areas. Further research will determine if a project may affect historic properties or habitat for endangered species, such as the Atlantic salmon and the northern long-eared bat, as covered in Section 4 of this manual, "Environmental Review."

MaineDOT's Environmental Office handles the NEPA process on locally administered projects. Municipalities and other local agencies must provide MaineDOT with Communication 11 and the NEPA Documentation Checklist, answering a series of questions necessary to complete NEPA. A project cannot proceed to right-of-way or to final plans, specifications & estimate (PS&E) – the last stage before advertise – until NEPA is completed.

3.8 Utility Coordination

Early and continuing coordination with utilities is critical to keeping things on schedule. Utility facilities consist of public or private lines or equipment, such as utility poles, power lines, telephone lines, cable television lines, underground water, sewer and gas lines, and railroad tracks. Utility companies often will need extensive lead time to schedule their work and obtain materials needed to move lines and other equipment.

As design work begins, a project engineer or designer should consider the following questions:

- What utility facilities exist in the right of way?
- How much room is there for clearing?
- Is the project abutting another project? What was done there?
- Can relocations be reduced and still meet the project need?
- What are the concerns of the utilities?

The designer or utility coordinator should take the preliminary alignment to an initial meeting with the utilities. If utilities cannot be accommodated without severely affecting the scope of a project, this needs to be explained early. *(Utility coordination is covered in Section 6 of this manual.)*

3.9 Traffic Analysis and Management Evaluation (TAME)

MaineDOT uses a system known as Traffic Analysis Management and Evaluation (TAME) to address traffic delays from construction projects. During the TAME process, traffic engineers analyze traffic counts and other data to establish appropriate lane closures in work zones.

Upon completing a preliminary design report (see Section 3.2), a municipality or other local agency must fill out and submit to the MaineDOT project manager a TAME Request Form, which can be downloaded using the link below. The form provides basic information such as average daily traffic volumes and known traffic generators near a project that MaineDOT will evaluate to determine whether to restrict some lane closures during construction.

Guidance on TAME process is available on MaineDOT's engineering and design website:
www.maine.gov/mdot/edi/docs/Guidelines%20for%20taming%20of%20PD%20projects.docx

MaineDOT's work zone safety engineer will consider the potential traffic impacts and develop draft TAME criteria. Proposed restrictions may require review by MaineDOT's full TAME Committee. At the end of the TAME review, MaineDOT may issue a special provision for the contract book for a project stipulating restrictions on lane closures. MaineDOT will not approve the final plans, specifications and estimate package (PS&E) for a project without a signed certification from the State Traffic Engineer that the TAME process was completed.

Most projects on roads with average daily traffic volumes of less than 10,000 are unlikely to cause traffic issues. However, municipalities with projects on roads with average daily traffic volumes of greater than 10,000 or with heavy seasonal traffic should expect some restrictions on lane closures.

Appendix 3A: Communications

Communication 8: Submittal of Preliminary Design Report

***NOTE**: THIS MAY BE SENT AS AN E-MAIL*

Date

_____, Project Manager
Maine Department of Transportation
Bureau of Project Development, Multimodal Program
16 State House Station
Augusta, ME 04333-0016

Subject: Preliminary Design Report (PDR) Submittal
MaineDOT WIN_____

Dear _____:

Attached for your review and comment is the draft preliminary design report for *[insert project scope, WIN]* in the Municipality of _____**.** Quality-control design checks were performed by_____.

The design was developed in accordance with appropriate sections of MaineDOT's Engineering Instructions, Highway Design Guide and Standard Details. The following publications also were used: *[list any additional publications; otherwise, delete this sentence.]*

If design exceptions:
The following design exceptions were approved by MaineDOT on *[Date]* and are noted on the plans:

If no design exceptions:
This project will not require exceptions to controlling standards for project design.

If you would like to visit the project site, please notify me and I will make the arrangements. Please let me know if you need additional information.

Sincerely,

Local Project Administrator
Municipality of

Enclosure: Draft Preliminary Design Report

Communication 9: Submittal of Design Plan Impacts

***NOTE**: THIS MAY BE SENT AS AN E-MAIL*

Date

_____, Project Manager
Maine Department of Transportation
Bureau of Project Development, Multimodal Program
16 State House Station
Augusta, ME 04333-0016

Subject: Plan Impacts
MaineDOT WIN_____

Dear _____:

Attached for your review and comment are the draft design plan impacts for *[insert project scope, WIN]* in the Municipality of _____. Quality-control design checks were performed by _____.

The plans show all impacts to utilities and abutting properties, as well as cross-sections with proposed limits of slopes and new construction. These plans meet standards specified in the MaineDOT Right of Way Manual (December 2015), specifically Table 2-3, "Design Plan Impacts Complete," found on page 2-6(6).

If you would like to visit the project site, please notify me and I will make the arrangements. Please let me know if you need additional information.

Sincerely,

Local Project Administrator
Municipality of

Enclosure: Plan Impacts

Communication 10: Public Process Certification

INSTRUCTIONS*: This must be submitted on letterhead upon conclusion of the public process.*

Date

_____, Project Manager
Maine Department of Transportation
Bureau of Project Development, Multimodal Program
16 State House Station
Augusta, ME 04333-0016

Subject: Public Process Certification
MaineDOT WIN_____

Dear _____:

This letter is the official certification that the public process required for *[insert project scope, WIN]* in the Municipality of _____ was done in accordance with requirements identified in the executed Project Agreement with MaineDOT dated *[execution date]*.

DESCRIBE ANY PUBLIC OPPOSITION HERE, IF APPLICABLE.

I have attached for your information the notification that was sent to abutters by registered mail, the public notice, the meeting minutes and sign-in sheet. If you need any additional information, please let me know.

Sincerely,

Local Project Administrator
Municipality of

Enclosure: Meeting minutes

Appendix 3B: Practical Design

MaineDOT

ENGINEERING INSTRUCTION

Practical Design Guidance

MaineDOT has introduced the concept of Highway Corridor Priorities to highlight the hierarchy of road needs. Those highway corridor design needs must be further refined within the context setting of the specific location. It is clear that one size does not fit all. When properly evaluated, an acceptable range of solutions will be available. This is the backdrop of MaineDOT's Practical Design philosophy.

With the advent of Corridor Prioritization, identifying the relative roadway importance from a regional/statewide perspective, there is a parallel need to develop the MaineDOT's approach to addressing specific needs along any particular corridor. A change in overall philosophy is needed allowing the MaineDOT to focus on the most cost effective way to spend its money whatever that amount may be.

The Practical Design philosophy is one that has been successfully implemented in Missouri. The fundamental basis for this model is to structure a project on its purposes and need – getting the best value for the least cost. By considering the surroundings of each project, sensitivity is encouraged. Be it the interstate or a low volume local road, the surrounding context helps determine the design criteria. There are several tenets that need to be adhered to in order to succeed.

1. **Safety**: Every project that is completed with the Practical Design philosophy must get safer.
2. **Quality**: The purpose and need must be achieved and the burden should not be shifted to Maintenance.
3. **Communication**: Communication must be frequent and open. Collaboration is required to reach the solution.

Practical Design places an emphasis on the available flexibility that exists within the standards and even takes this approach a step further by de-emphasizing the standards and focusing on good engineering judgment. Project decisions such as lane and shoulder widths, clear zone offsets, horizontal and vertical alignment and cross-slopes are driven by the given context of the particular roadway or bridge and the true purpose and need of the project.

MaineDOT's design guides, Engineering Instructions and Design Guidance are resources for the designers to shape some of these decisions. These publications are not meant to be a strict set of standards but rather tools to create a level consistency with our designs and corridors. **Deviations from these resources are encouraged and expected.** When a decision is made to deviate from the design resources is made based on sound engineering judgment, MaineDOT has a formal Design Exception process that utilizes our Engineering Council or delegated authority for approval.

For example, if a bridge over a stream can no longer convey traffic safely, the purpose and need is to provide for that crossing. In the past, however, design standards would dictate that the new structure be wider, higher, and longer than the existing. There was also a tendency to upgrade other highway aspects in the general vicinity just because we were there.

Practical Design points out that, in many cases, that existing bridge had functioned fine for decades. As such, investing in additional structure, incurring additional impacts, and inflating the cost are not prudent when the only deficiency is the poor structural condition. This philosophy allows for good solutions over a broader range of the system rather than ideal solutions for isolated sections.

Appendix 3C:
Controlling Design Criteria

Federal Highway Administration: The Thirteen Controlling Criteria

*The Federal Highway Administration (FHWA) has identified **13 controlling criteria** with such substantial importance to the operational and safety performance of any highway that special attention should be paid to them in design decisions.*

1. Design Speed (DS)

Design speed is a selected speed used to determine the various geometric features of the roadway. The assumed design speed should be logical with respect to the topography, anticipated operating speed, adjacent land use, and the functional classification of the highway. Design speed is different from the other controlling criteria in that it is a design control, rather than a specific design element. In other words, the selected design speed establishes the range of design values for many of the other geometric elements of the highway.

2. Lane Width (LW)

Lane-width criteria describe design values for travel lanes, auxiliary lanes, ramps, and turning roadways, as well as special-purpose lanes such as continuous two-way left-turn lanes. The American Association of State Highway and Transportation Officials (AASHTO) provides guidance for widening lanes through horizontal curves to accommodate the off-tracking requirements of large trucks. Lane width excludes shoulders, curbs, and on-street parking.

3. Shoulder Width (SW)

Shoulders provide important functions that, if compromised, can affect safety and traffic operations:

- Shoulders provide for emergency storage of disabled vehicles. Particularly on high-speed, high-volume highways such as urban freeways, the ability to move a disabled vehicle off the travel lanes reduces the risk of rear-end crashes and can prevent a lane from being closed, which can cause severe congestion and safety problems.
- Shoulders provide space for law-enforcement activities. This is particularly important for the outside (right) shoulder because law-enforcement officers prefer to conduct enforcement activities in this location. Shoulder widths of about 8 feet or greater are normally required for this function.
- Shoulders provide space for maintenance activities. If routine maintenance can be conducted without closing a travel lane, safety and operations will be improved. Shoulder widths of about 8 feet or greater are normally required for this function. In northern regions, shoulders also provide space for storing snow that has been cleared from the travel lanes.
- Shoulders improve stopping sight distance at horizontal curves by providing an offset to objects such as barrier and bridge piers.
- On highways with curb and enclosed drainage systems, shoulders store and carry water during storms, preventing water from spreading onto the travel lanes.

- Shoulders provide space for drivers to maneuver to avoid crashes. This is particularly important on high-speed, high-volume highways or in areas with limited stopping sight distance. Shoulder widths of about 8 feet or greater are normally required for this function.
- Shoulders improve bicycle accommodation. On most roads, it is legal for cyclists to ride on the travel lanes. A paved or partially paved shoulder, however, offers cyclists some separation from vehicular traffic. This type of shoulder can also reduce risky passing maneuvers by drivers.
- Shoulders provide a stable, clear recovery area for drivers who have left the travel lane. If a driver inadvertently leaves the lane or attempts to avoid a crash or an object in the lane ahead, a firm and stable shoulder increases the chance of safe recovery. Areas where the pavement edge drops off, however, can pose a significant safety risk. Drop-offs occur where gravel or earth material is next to the paved lane or shoulder. This material can settle or erode at the pavement edge, creating a drop-off that can make it difficult for a driver to safely recover after driving off the paved portion of the roadway.
- On high-speed roadways, shoulders improve capacity by increasing driver comfort.

4. Bridge Width (BW)

Bridge width is the width of all lanes and shoulders on a bridge, measured between the points on the bridge rail, curb, or other elements that project the farthest onto the roadway. A bridge width that meets adopted criteria maintains the minimum acceptable lane and shoulder width as defined by area, functional class, design speed, and traffic volume. A design exception is required when a bridge is proposed to be constructed with narrower lanes, shoulders, or both.

5. Superelevation (SE)

Superelevation is the rotation of the pavement on the approach to and through a horizontal curve. Superelevation assists the driver by counteracting the lateral acceleration produced by tracking the curve. Superelevation is expressed as a decimal, representing the ratio of the pavement slope to width, ranging from 0 to 0.12 foot/feet. Maximum superelevation rates for design range from 0.04 to 0.12. They are established by policy by each state.

6. Horizontal Alignment (HA)

The adopted design criteria specify a minimum radius for the selected design speed, which is calculated from the maximum rate of superelevation (set by policy from a range of options) and the side friction factor (established by policy through research).

7. Vertical Alignment (VA)

In terms of the 13 controlling criteria, vertical alignment includes both grade and vertical curvature (crest and sag). Vertical curvature influences another controlling criterion: stopping sight distance. The geometric design basis for minimum length of crest vertical curvature is to provide the minimum stopping sight distance for the combination of grades and design speed.

8. Maximum Gradient (MG)

Grade is the rate of change of the vertical alignment. Grade affects speed and control, particularly for large trucks. The adopted criteria express values for both maximum and minimum grade. The inability to meet either a maximum or minimum value may produce operational or safety problems.

9. Stopping Sight Distance (SSD)

Stopping sight distance is the space needed for drivers to see an object ahead and stop their vehicles before colliding with it. Distances are derived for various design speeds based on assumptions for driver reaction time, braking ability of most vehicles on wet pavement, and the friction provided by most pavement surfaces for vehicles with good tires. A roadway designed to criteria provides at least the minimum stopping sight distance through the entire facility.

Vertical and horizontal alignment influences stopping sight distance. For vertical stopping sight distance, this includes sight distance at crest vertical curves, headlight sight distance at sag vertical curves, and sight distance at undercrossing.

For crest vertical curves, the roadway alignment limits stopping sight distance. Sag vertical curves provide greater stopping sight distance during daylight conditions, but very short sag vertical curves will limit the effective distance of a vehicle's headlights at night. If lighting is provided at sag vertical curves, a design to the driver comfort criteria may be adequate. The length of sag vertical curves needed to satisfy the comfort criteria, over the typical design speed range, results in minimum curve lengths that are about half those that are based on headlight criteria.

For horizontal curves, obstructions can limit stopping sight distance. Examples include bridge piers, barrier, walls, back slopes, and vegetation.

10. Cross Slope (CS)

Pavement cross slope is an important cross-sectional design element. The cross slope drains water from the roadway laterally and helps minimize ponding of water on the pavement. This prevents maintenance problems and also minimizes icing from occurring on poorly drained pavement. On roadways with curbed cross sections, the cross slope moves water to a narrower channel adjacent to the curb, away from the travel lanes, where it can be removed. Cross slopes that are too steep can cause vehicles to drift, skid laterally when braking, and become unstable when crossing over the crown to change lanes. These conditions are exacerbated by icy, snowy, or windy conditions. Both maximum and minimum criteria exist for cross slope. A formal design exception is required wherever either cannot be met.

11. Vertical Clearance (VC)

The adopted criteria provide vertical clearance values for the various highway functional classifications. These criteria are set to provide at least a 1-foot differential between the maximum legal vehicle height and the roadway, with additional allowances for future resurfacing. These clearances apply to the entire roadway width (traveled way and shoulders). A formal design exception is required whenever these criteria are not met for the applicable functional classification.

12. Lateral Offset to Obstruction (LO)

Lateral offset to obstruction is the distance from the edge of traveled way, shoulder, or other designated point to a vertical roadside element. Examples are curbs, walls, barriers, bridge piers, sign and signal supports, trees, and utility poles.

Lateral offset can be thought of as an operational offset; vertical roadside elements offset to the extent that they do not affect a driver's speed or lane position. Adequate clearance from these elements should be provided for mirrors on trucks and buses and for opening curbside doors where on-street parking is provided.

The adopted criteria specify a minimum operational offset for all roadway conditions and classifications of 1.5 feet.

13. Structural Capacity (SC)

The thirteenth controlling criterion is structural capacity, which refers to the load-carrying capacity of a bridge. Designers should be aware that the inability to design for the designated structural capacity requires a design exception. There is also information in the AASHTO "Green Book" on conditions under which existing bridges may remain in place.

❑ MaineDOT Supplemental Controlling Criteria

Note: *These definitions are intended to supplement the 13 controlling criteria.*

Bridge Rail (BR)

Bridge railings, although technically classified as longitudinal barriers, are listed separately here because they have been previously tested under criteria different from roadside barriers and have not generally been accepted for use on the NHS on an individual basis. Since August 28, 1986, the FHWA has required that bridge railings used on Federal-aid projects meet full-scale crash-test criteria and has provided listings of the types of railings meeting these requirements.

Clear Zone (CZ)

The clear zone is an unobstructed, traversable area provided beyond the edge of the traveled way for the recovery of errant vehicles. Clear zone widths are most affected by the traffic's speed, volume, and alignment along with the slope of the area adjacent to the travel way

Guardrail (GR)

The primary purpose of all roadside barriers is to reduce the probability of an errant vehicle striking a fixed object or terrain feature off the traveled way that is less forgiving than striking the barrier itself. Containing and redirecting the impacting vehicle using a barrier system accomplishes this.

Clarification: Cross Slope Criteria

Cross slope criteria apply to typical tangent alignments. On high-speed roadways, normal cross slope is 1.5 percent to 2.0 percent, with the cross-slope break (the algebraic difference in slopes between the lanes) at the centerline not exceeding 4 percent. In areas of intense rainfall and where there are three or more lanes in each direction, additional cross slope may be necessary for adequate drainage. Accomplishing other design features (superelevation transitions, pavement warping at intersections, etc.) will inevitably require removal of cross slope in spot locations. These cases are routine and necessary in design and a design exception is <u>not</u> required.

Besides the cross-slope of the lanes, the cross-slope break on the high side of superelevated curves should not exceed 8 percent. *A formal design exception is required when this condition is not met.*

Appendix 3D:
Design Submittal Guidance

Online: ***http://www.maine.gov/mdot/cpo/highway/***

DESIGN SUBMITTAL FORM

Project Name: _____ ***WIN:*** _____

PRELIMINARY DESIGN REPORT (PDR)

■ SUBMITTALS

- ☐ Completed draft PDR, including Highway Design Report Form, if this is a highway project
- ☐ PDR Estimate, including calculations and MaineDOT item numbers
- ☐ Approved Pavement Design
- ☐ Design Exceptions approved by MaineDOT
- ☐ 1 Half Size set of plans including:
  - o Preliminary Typical Sections
  - o Plans
  - o Profiles
  - o Cross-sections (include critical drive sections)
  - o Preliminary Drainage Scheme
    - ▪ Under-drain, Basins, Culverts, Ditches, Outlet locations
  - o Guardrail and Retaining Wall locations

■ TYPICAL SECTION

HMA Depth	
Base Type	
Base Depth	
Sub-base Type	
Sub-base Depth	
Curb Type	
Loam Depth	

COMMENTS:

■ TRAFFIC

Turning Movements

Location	***Signal (Y/N)***	***Design Vehicle***	***Encroachment (Y/N)***

COMMENTS:

Turning Lanes

Location	*Design Speed*	*Lane Width*	*Taper Length*	*Storage Length*

COMMENTS:

Other Auxiliary Lanes

Location	*Design Speed*	*Shift Width*	*Taper Length Out*	*Shift Length*	*Taper Length In*

COMMENTS:

■ ADA

Indicate existing or new pedestrian facilities. The ADA section in the PDR should be completed.

	Sidewalks (Y/N)	*Ramps (Y/N)*	*Crosswalks (Y/N)*	*Pedestrian Signals (Y/N)*
Existing Facility				
Proposed Facility				

COMMENTS:

■ CLEAR ZONE

The required clear zone should be listed in the HDR form.

COMMENTS:

■ GUARDRAIL

Location	*Obstacle within Clear Zone (Y/N)*	*Embankment steeper than 3H:1V (Y/N)*

COMMENTS:

■ DRAINAGE

Provide drainage scheme as indicated in Submittals section.

COMMENTS:

■ DRIVES AND ENTRANCES

List critical drive locations and whether Design Exceptions will be needed.

Location	*Existing Grade*	*Proposed Grade*	*Design Exception (Y/N)*

COMMENTS:

■ RETAINING WALLS

Provide locations as indicated in Submittals section.

COMMENTS:

PLAN IMPACTS COMPLETE (PIC)

■ SUBMITTALS

- ☐ Design Submittal Form Checklist, with supporting documentation
- ☐ Approved Pavement Design (if not submitted at PDR)
- ☐ Approved Design Exceptions (if not submitted at PDR)
- ☐ Retaining Wall Design approved by Geotechnical Engineer
- ☐ Guardrail Length of Need Worksheets (if applicable)
- ☐ Half-size set of plans (.pdf format) including:
    - Typical Sections
    - Plans
    - Profiles
    - Cross-sections
    - Final Drainage Design

■ TYPICAL SECTION

COMMENTS:

■ GUARDRAIL

Identify areas where guardrail is warranted and what hazard is. Provide guardrail length of need worksheets as indicated in Submittals section.

Location	***Obstacle within Clear Zone (Y/N)***	***Embankment steeper than 3H:1V (Y/N)***

COMMENTS:

■ DRAINAGE

Provide Final Drainage Design as indicated in Submittals section.

COMMENTS:

■ DRIVES AND ENTRANCES

List critical drive locations and Design Exception Approval date if applicable.

Location	***Existing Grade***	***Proposed Grade***	***Design Exception Date***

COMMENTS – provide additional discussion to help the review/check team.

■ RETAINING WALLS

Provide design as indicated in Submittals section.

COMMENTS – provide additional discussion to help the review/check team.

PLANS, SPECIFICATIONS, & ESTIMATE (PS&E)

SUBMITTALS

- ☐ Half-size set of plans (.pdf format) including:
  - Title Sheet
  - Typical Sections
  - Earthworks Summary, if applicable to the project
  - General Notes
  - Plans
  - Profiles
  - Cross-sections
  - All supplemental sheets (Drainage, Geometric, Grading, Striping, etc.)
- ☐ Engineer's Estimate (including calculations)
- ☐ Special provisions