For each project, include the Project Design Criteria worksheet (Section 1C-1) in the project file, as well as the written documentation defined below.

**Variance from the Department’s Guidelines**

The design criteria tables in Section 1C-1 show preferred values based upon departmental decisions and acceptable values that conform to criteria listed in AASHTO documents. The Office Director or ADE responsible for the design may approve variances from the criteria tables, provided they are appropriate and meet the documentation requirements. For these situations, the Designer responsible for the design should send an email to the Office Director or ADE explaining the variance and why it is necessary.

Documenting variances is necessary to track Departmental decisions and to document project constraints that influenced the design.

**Variance from Controlling FHWA Standards**

On NHS projects, federal law requires formal design exceptions when certain design guidelines are not met. These design guidelines are listed in the Code of Federal Regulations (23 CFR Sec 625.4). These values are highlighted yellow in the design criteria tables in Section 1C-1. The key documents impacting design of “Roadway and Appurtenances” are:

- **A Policy on Design Standards Interstate System**.
- **3R Agreement**.
- **A Policy on Geometric Design of Highways and Streets**. Because this manual covers so many aspects of roadway design, FHWA distributed a memo limiting design exception requirements to the following 13 controlling criteria.

1. Design speed
2. Grade
3. Lane width
4. Stopping sight distance
5. Shoulder width
6. Cross slope
7. Bridge width
8. Superelevation
9. Structural capacity
10. Vertical clearance
11. Horizontal alignment
12. Vertical alignment
13. Horizontal clearance (not including clear zone)

- **Erosion and Sediment Control on Highway Construction Projects** ([23 CFR 650, subpart B](#)).
- **Location and Hydraulic Design of Encroachments on Flood Plains** ([23 CFR 650, subpart A](#)).
- Accommodation of Utilities (23 CFR 645, subpart B).
- Pavement Design (23 CFR 626).

Formal design exceptions for variances from the 13 controlling criteria are required on NHS routes only. On other routes, follow the **Variance from Department’s Guidelines** above.

Formal design exceptions require NEPA clearance. Design exceptions should be identified early in the development of project to avoid the project being delayed. The Designer needs to contact the **NEPA Coordinator** and **Location Engineer** in the Office of Location and Environment when a design exception is identified.

The key documents impacting design of “Bridges and Structures” are:

- Standard Specifications for Highway Bridges, AASHTO.
- AASHTO LRFD Bridge Design Specifications, AASHTO.
- Standard Specifications for Movable Highway Bridges, AASHTO.
- Bridge Welding Code, ANSI/AASHTO/AWS D1.5, AASHTO.
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, AASHTO.
- Navigational Clearances for Bridges, refer to 23 CFR part 650, subpart H.

**Writing Design Exceptions**

Include the following information when writing a design exception.

**Project Information**

Include a brief description of the project. Identify the route, location, functional classification, current and design year ADT, percent trucks, and all other basic project information that is relevant for evaluating the design exception. Note that the design meets minimums and maximums for the type of project and for this classification of highway, except as noted. Clearly explain why the design exception is necessary.

**Identification of the Design Exception**

Identify and describe the design element(s) that do not meet the recommended design criteria. State what the minimum or maximum value is and the resource from which that information was obtained. Include the specific location(s), limits, or length of the alternate design element. If it will help the reviewer better understand the design exception, a profile view, a drawing, an aerial photo, or similar information may be included in the design exception.

**Supporting Information**

Include information that supports the decision to make a design exception. This may include cost information, crash data analysis, a benefit/cost analysis, or a discussion of consequences associated with bringing the design up to the recommended design criteria.

Generally, a crash data analysis is performed to determine the impact of the design elements on safety. Usually the latest 5 years of available crash data are evaluated. During the evaluation, look beyond the numbers and, at a minimum, examine the specific types of crashes (run-off-the-road, rear-end, sideswipe, head-on, etc.). Examine what affect the design exception may have on specific types of crashes. Crashes that would not have been impacted by the proposed improvement may be eliminated from the analysis. For example if you are reviewing crash data for an area that would require foreslope flattening, you may want to eliminate any crashes that aren’t directly related to the...
steep foreslopes. Animal in the roadway crashes are commonly eliminated from analysis. If crash data is not available, examine data from routes with similar features.

A cost analysis can be performed to determine the costs required to achieve the suggested minimums or maximums. Use the total project cost. Additional costs could include items such as additional grading or paving, updating or replacing structures, acquiring additional right of way, wetland mitigation, etc. An updated Summary of Costs per mile of Road Construction can be obtained from the Pre-Design Section to assist with the cost analysis.

Once the crash data and the correction costs have been compiled, a benefit to cost (B/C) analysis can be performed. This involves comparing the safety benefit of correcting the deficiency to the cost of the corrections. A spreadsheet has been developed to determine the benefit to cost ratio and can be obtained from the Methods Section. The updated loss reduction values for spot locations and rural sections used in the B/C analysis can be obtained from the Traffic and Safety Internet page at http://www.iowadot.gov/tsip.htm. If different types of alternate design elements have been identified on a project, a separate B/C analysis should be developed for each. An example B/C analysis is included at the end of this section.

Mitigating Measures

Discuss practical alternatives (e.g. delineation, milled rumble strips, signing, lighting) along with associated costs. Consider these alternatives prior to requesting an exception. If none of the alternatives are chosen, provide sufficient information on costs versus benefits, right of way and environmental impacts, and any other factors to explain why. Describe any measures that were considered for mitigating the potential adverse impacts of the design exception. Identify any mitigating measures that will be taken.

A list of possible mitigation strategies is included in Chapter 4 of Mitigation Strategies for Design Exceptions at http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/index.htm

Conclusion/Recommendation

Clearly state a recommendation.

Signature Lines

Include signature and datelines for all those required to approve the design exception. All projects will require approval of the office director of the office completing the design and the Director of the Office of Design. For non-Interstate projects, the District Engineer's approval is also required. In addition, projects with FHWA oversight and projects on Interstate routes require approval from the FHWA Division Administrator.

Submitting a Design Exception

Submit design exceptions for approval as early as possible in the design process—first to the District Engineer, then to the Director of the office responsible for the design, the Director of the Office of Design, and lastly to FHWA if required. Thoroughly document design exceptions and include in the project file.

Design Exception Examples

Example 1: Design Exception for Corridor Improvements

Example 2: Design Exception for Reduced Shoulder Widths
Example 3: **Benefit\Cost Spreadsheet**

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Chronology of Changes to Design Manual Section:

**001C-008 Documenting Design Decisions**

7/18/2013 Revised
Added link to Section 1C-1 for criteria tables. Added designer sealing design is responsible for documenting and submitting variances. Added NEPA clearance is required for design exceptions. Revised Example 2 design exception to remove ADE signature.

9/13/2012 Revised
Clarify Districts do not have to sign design exceptions for Interstate projects.

8/31/2010 Revised
Key documents impacting design of bridges and structures have been updated.

4/15/2010 Revised
Clarification of when a formal design decision is required.