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VIRGINIA DEPARTMENT OF TRANSPORTATION

# LOCATION AND DESIGN DIVISION

## INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: DESIGN EXCEPTIONS / WAIVERS		NUMBER: IIM-LD-227.5 IIM-S&B-70.3
SPECIFIC SUBJECT: DESIGN EXCEPTION REQUEST FORM LD-440  DESIGN WAIVER REQUEST FORM LD-448		DATE: MARCH 7, 2011
		SUPERSEDES: IIM-LD-227.4 IIM-S&B-70.2
LOCATION AND DESIGN DIVISION APPROVAL:  Mohammad Mirshahi, P.E. State Location and Design Engineer Approved March 3, 2011	STRUCTURE AND BRIDGE DIVISION APPROVAL:  Kendal Walus, P.E. State Structure and Bridge Engineer Approved March 7, 2011	

Changes are shaded.

### CURRENT REVISIONS

- This memorandum has been revised to indicate that the FHWA publication "Mitigation Strategies for Design Exceptions" shall be followed for mitigation efforts when processing design exceptions.

### EFFECTIVE DATE

- This memorandum is effective upon receipt.

### DESIGN EXCEPTION BACKGROUND ANALYSIS

- In 2001 the FHWA, in conjunction with the Location and Design Division, reviewed the Design Exception Review Process. The primary purpose of this review was to streamline VDOT's Design Exception Request Process and to evaluate the effectiveness of VDOT's procedures for identifying, justifying, and documenting design exceptions. In addition, previously approved design exceptions were reviewed to determine the adequacy of the justifications, as well as the number and type of exceptions reviewed.

- The study team reviewed the design exceptions on all federal oversight and non-federal oversight projects requested in the previous five years. The study team used the following factors to assess the adequacy of the justification and documentation:
    1. Amount and character of traffic
    2. Type of project/description of project
    3. Accident history
    4. Cost of attaining full standards
    5. Resultant environmental impacts
    6. Future improvements
    7. Effect of the exception on the safety and operation of the facility
    8. The degree to which a standard is being reduced
    9. Affect of exception on other standards
    10. Any additional features being introduced that would mitigate the deviation
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## DESIGN EXCEPTION REQUEST RECOMMENDATIONS

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- The study team concluded that the format of design exception requests were not consistent. Recommendations were as follows:
    - All design exceptions should have an adequate justification and project description regardless of the funding source.
    - An estimate of the cost to attain full standards should always be discussed to determine safety benefits for the dollars invested.
    - The mitigation measures that would minimize the affects of the deviation should be considered.
    - An accident analysis should always be performed to determine what affects the design exception would have on safety.
    - Future improvements that would mitigate the affects of the design exception should be addressed.
    - In order to streamline and simplify design exception requests, Form LD-440 was developed for all design exception requests.
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## FEDERAL REQUIREMENTS

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- Under Title 23, United States Code (USC) 109, the Secretary of Transportation approves design and construction standards for the National Highway System (NHS) including Interstates. The 23 CFR 625 designates those standards, specifications, policies, guides, and references that are acceptable to the Federal Highway Administration (FHWA) for use on the NHS.

- Title 23 CFR 625 provides that exceptions may be given on a project basis to designs which do not conform to the minimum criteria as set forth in the standards, policies, and standard specifications. For National Highway System (NHS) Projects, the full list of standards can be found in 23 CFR 625.4, which includes the AASHTO “Green Book.” These standards are to be used regardless of the funding source.
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## DESIGN EXCEPTION POLICY

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- The geometric design standards approved for use are contained in AASHTO's Policy on Geometric Design of Highways and Streets. This publication, commonly referred to as the “Green Book” is published by the American Association of State Highway and Transportation Officials (AASHTO). In addition, AASHTO's Policy on Design Standards—Interstate System is applicable to the Interstate System. For the Interstate System, the current editions of AASHTO's A Policy on Geometric Design of Highways and Streets and the Standard Specifications for Highway Bridges shall be used as design **standards** where they do not conflict with AASHTO's Policy on Design Standards—Interstate System.
- VDOT recognizes the FHWA publication, “Mitigation Strategies for Design Exceptions” as providing mitigation efforts that shall be followed when processing design exceptions. This publication is available at:  
[http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/fhwa\\_sa\\_07011.pdf](http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/fhwa_sa_07011.pdf)
- Changes to posted speed limits of highways need to be evaluated by considering applicable design standards. Design exceptions are required whenever the change causes the design features of the roadway to not conform to the minimum criteria for the new speed limit. Isolated changes in design speeds to eliminate a possible design exception are not to be made. Instead, consistency in the design speed for the facility needs be considered. Design exceptions caused by proposed changes in the posted speed that adversely affect the design features of the roadway will not be considered.
- In a number of instances, ranges of specific values of minimum, maximum, and desirable are contained in AASHTO policies and guides. The designer should strive to meet the highest standard. Any design feature that does not meet AASHTO minimum criteria requires a design exception. Note that the Interstate System and NHS have no RRR standards. Design exceptions granted as part of a previous project must be resubmitted to the Federal Highway Administration for approval when new work is proposed in the area, regardless of funding source.
- The determination to approve a design exception should only be made after thoroughly reviewing project elements such as maximum service and safety benefits for dollar invested, compatibility with adjacent section of the roadway, and probable time before reconstruction would take place due to increased traffic demand or changed conditions at which time the appropriate standard would be met.

## FHWA'S THIRTEEN CONTROLLING FACTORS

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- Although all exceptions from accepted standards and policies need to be justified and documented, the FHWA has established 13 controlling criterion requiring formal approval. A Design Exception Request Form, LD-440, shall be submitted with appropriate documentation addressing the design exception and any related criteria:
    - Design speed
    - Lane width
    - Shoulder width
    - Bridge width
    - Structural Capacity
    - Horizontal alignment
    - Vertical alignment
    - Grade
    - Stopping Sight Distance
    - Cross slope
    - Superelevation
    - Horizontal clearance (not clear zone)
    - Vertical Clearance
  - In addition, the FHWA's Virginia Division Office has established access control along the Interstate as the 14<sup>th</sup> controlling criteria. Per memorandum dated January 15, 2003 between VDOT and FHWA, a design exception must be prepared for FHWA review and approval for any break in access control within:
    - Rural areas: 300 feet of a ramp terminal (as defined by the Green Book)
    - Urban areas: 100 feet of a ramp terminal (as defined by the Green Book)
  - Existing access points are not subject to the Access Control for Interstate Interchanges Agreement between FHWA and VDOT.
  - Design criteria for new or totally reconstructed interchanges will be that which is developed from an operational analysis, but not less than the minimum values of 300 feet for rural and 100 feet for urban areas.
  - Project boundaries for design exception determination shall be at logical termini points. Example: Ramp Termini to Ramp Termini. An exception to this would be any transitional work that results from mainline improvements.
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## VDOT GEOMETRIC DESIGN CRITERIA

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- VDOT's Geometric Design Guidelines in Appendix A of the Road Design Manual are based on established design criteria and are generally consistent with AASHTO minimums. Allowances, however, have been provided for some design features such as guardrail, etc. AASHTO's A Policy on Geometric Design of Highways and Streets provides the minimum standards that should be used for development of VDOT projects. (For RRR projects, see Section A-4 of the Road Design Manual)

- VDOT's Geometric Design Guidelines present basic practical guidelines compatible with traffic, topography and safety; however, due to the restrictive format, all variables cannot be included. The designer is urged to refer to AASHTO's A Policy on Geometric Design of Highways and Streets, and related chapters in the Road Design Manual, for further discussion of design considerations before selecting the proper design criteria for a project.
- The application of the criteria provided in the Geometric Design Guidelines must be made in conjunction with sound engineering judgment to affect a proper design. The economic, environmental and social factors involved in highway design shall also be considered. The designer should always attempt to provide for the highest degree of safety and best level of service that is economically feasible. "Minimum" design criteria should be used only when overriding economic or environmental considerations preclude a feasible design using values greater than the minimum design criteria.
- When impractical to obtain the minimum design criteria in AASHTO's A Policy on Geometric Design of Highways and Streets (Green Book), or when a waiver to RRR Guidelines is necessary, an exception shall be secured from the State Location and Design Engineer, and/or the State Structure and Bridge Engineer. **This is applicable to both State and Federally funded projects, with and without federal oversight, and bond-funded or other funded projects that VDOT will maintain and later improve.**
- FHWA Approval
  - All interstate projects (regardless of oversight) require design exception approval from FHWA for design standards below AASHTO minimum.
  - Non-interstate projects with VDOT oversight do not require FHWA design exception approval.
  - Non-interstate projects with FHWA oversight require FHWA design exception approval.
- On State funded rural projects where design constraints require that the overall design speed selected for the project is less than the design speed which would normally be selected based on terrain, a design exception is not required if the speed falls within the range of design speeds shown in VDOT's Road Design Manual for that class of roadway. The designer must fully document the necessity for the use of a reduced design speed, or any design exception, and have it approved in accordance with Design Exception Request Form LD-440. The designer should exercise care to avoid selecting a speed which may be lower than the speed the average driver would expect because of impacts on traffic operations and safety which may result.
- Whenever controlling design factors (FHWA 13 controlling criteria; 14 for Interstate) are selected that are below minimum on any of the following standards and guidelines, the District Location and Design Engineer must request approval of these design exceptions from the State Location and Design Engineer and/or the State Structure and Bridge Engineer (all projects) and FHWA approval on all Interstate projects regardless of funding source and Federally funded projects with FHWA oversight:

- AASHTO's A Policy on Geometric Design of Highways and Streets
- AASHTO's A Policy on Design Standards—Interstate System
- AASHTO's Roadside Design Guide
- AASHTO's Standard Specifications for Highway Bridges  
(including Interim specifications and VDOT modifications)
  
- Design criteria provided in the following sources is to be met whenever practical.
  - VDOT's Road Design Manual
  - VDOT's Road and Bridge Standards
  - VDOT's Structure and Bridge Division Manuals
  
- Approval from FHWA is necessary only when design does not meet AASHTO minimum criteria for Federally funded projects and projects on the NHS. However, when AASHTO has provided desirable criteria, it shall be documented why minimums were used.
  
- Design exceptions for bridge width, structural capacity, horizontal clearance (other than clear zone) and vertical clearance are typically requested by the bridge designer to the State Structure and Bridge Engineer. Form LD-440 shall be utilized for the request. The cover letter by the Design Supervisor or the District Structure and Bridge Engineer (for district designs) shall indicate concurrence in the request.
  
- For requests, other than the above by the bridge designer, Form LD-440 shall be used indicating "Design Exception Request For: \_\_\_\_\_" and the appropriate documentation shall be attached. Concurrence as indicated above shall also be noted. Also see the Structure and Bridge Division's IIM's.
  
- Design exceptions for roadway geometrics approved by the State Location and Design Engineer do not necessarily indicate that the bridge geometrics are automatically approved by the State Structure and Bridge Engineer since present and future costs for bridge widening, etc. may have to be considered. Normally, the roadway designer's, and bridge designer's, request will be transmitted separately.
  
- For projects designed by localities, requests for design exceptions must be submitted to the VDOT Project Manager/Coordinator under the criteria and format described in this IIM.

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## TIMING OF DESIGN EXCEPTION REQUEST

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- The Federal Highway Administration's participation in communications and plan reviews is vital throughout the design process. Design Exceptions should be identified at the Preliminary Field Inspection and requested shortly thereafter. Plans at the Public Hearing Stage of development should reflect approved design exceptions design elements or features.

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## DESIGN EXCEPTION REQUEST FORM LD-440

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- Design Exception requests shall utilize Design Exception Request Form LD-440 and document all supplemental information necessary and appropriate for the comprehensive review of the engineering details of the exception request.
  - Any time there is a deviation from published and accepted standards, the designer should clearly document that the deviation is to be made on the basis of an engineering analysis and that the methods of operation chosen are sufficiently protective of persons and property. The approach must incorporate reasons for the decision and approved documentation based on sound engineering judgment.
  - Location & Design Division maintains Form LD-440 at the following website:  
<http://www.extranet.vdot.state.va.us/forms/>.
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## DOCUMENTING DESIGN EXCEPTIONS ON PROJECT TITLE SHEET

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- All design exceptions shall be shown on the project title sheet.
  - Whenever a project design element(s) does not meet AASHTO minimum design criteria (for example, design speed) the location(s) and reason for difference(s) are to be noted on the project title sheet. In order to alert everyone concerned, it will be necessary to identify these locations from the earliest stages of plan development. If changes are made during plan development that would alter the situation, then the title sheet must be corrected to reflect the new design. The following methods will be used to show design exceptions:

Plans with Functional Classification block:

EXAMPLE:

EXCEPTIONS TO MAINLINE DESIGN SPEED			
Sta. To Sta.	Design Speed (mph)	Reasons for Exception	Approval Date
102+75 to 104+75	50	Crest Vertical Curve	October 28, 2010
621+00 to 624+50	60	Horizontal Alignment	October 28, 2010

The data as indicated in the previous example is to be shown directly below the Functional Classification block.



Plans without Functional Classification block: Exceptions should be noted inside the title sheet borderlines immediately following the design speed classification as follows:

EXAMPLE:

V = 60 mph Exceptions: 102 + 75 - 104 + 75 (40 mph) Crest Vertical Curve 621 + 00 - 624 + 00 (35 mph) Horizontal Alignment
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## DESIGN EXCEPTION SUPPORTING DOCUMENTATION

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- Supporting documentation for all design exceptions is to be submitted to the State Location and Design Engineer and/or the State Structure and Bridge Engineer for filing with a copy kept by the Project Manager in the project file. Any documentation regarding why AASHTO minimums were used when higher standards were recommended is to be made available to FHWA upon request.

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## DESIGN WAIVER POLICY (APPLICABLE TO VDOT OWNED AND MAINTAINED ROADWAYS ONLY)

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- Design Waivers are required when deviations from VDOT's design criteria occur on VDOT owned and maintained roadways only. When design criteria meet or exceed AASHTO and ADA minimum design standards, but fall short of VDOT's minimum design standards, a Design Waiver shall be required. Design Waivers will be applicable to all projects regardless of functional classification and funding and shall be documented and approved in accordance with the Design Waiver Request Form LD-448.
- Items requiring a Design Waiver include, but are not limited to, the following:
  - Clear Zone
  - Paved Shoulder Width
  - Curb and Gutter
  - Minimum Radius
  - Pedestrian Accessibility Compliance (See IIM-LD-55)
  - Ditch Width
  - Lane Tapers
  - Buffer Strip Width
  - Superelevation
  - Intersection Sight Distance
  - Total Shoulder Width
- In addition, any applicable proposed drainage facilities (i.e. ditches, culverts, storm sewer, etc.) not meeting VDOT's minimum design requirements shall be processed as a Design Waiver. (See the VDOT Drainage Manual, IIM-LD-11 and Hydraulic Design Advisory HDA 09-01)

- Requests for a Design Waiver must contain the following:
  - Established design criteria versus proposed criteria.
  - Reason the appropriate design criteria cannot be met.
  - Justification for the proposed criteria.
  - Any background information which documents or justifies the request.
  - Any mitigation that will be provided to further support or justify the waiver request.
  - Cost to meet design criteria.
  
- Submittal Process
  - Design Waiver requests shall be prepared by the Location & Design Project Designer and submitted to the District Location and Design Engineer.
  
  - For roadway projects designed by localities that are VDOT owned and maintained, requests for design waivers shall be submitted to the VDOT Project Manager/Coordinator under the criteria and format described in this IIM.
  
- Approval Authority
  - Location and Design Division Waivers shall be reviewed and approved by the appropriate District Location & Design Engineer.
  
  - Approval authority shall not be sub-delegated to a lower position without the approval of the State Location & Design Engineer.
  
  - Complete documentation should be retained by the Project Manager in the project file and a copy of the approved waiver sent to the appropriate Assistant State Location & Design Engineer and QMAC Section Manager for means of compliancy and oversight purposes.
  
  - **L&D Design Waivers directly impacting a structure and/or bridge shall be coordinated with the District Structure and Bridge Engineer. The structure and bridge designer will determine the impact and provide guidance and recommendations to the Location and Design Project Designer and coordinate the necessary approval from the State Structure and Bridge Engineer for all resulting S&B Design Waivers.**
  
- Project Title Sheet
  - Design Waivers are **not** to be shown on the Project Title Sheet.

## DESIGN WAIVER POLICY (APPLICABLE TO VDOT STRUCTURES & BRIDGES)

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- Design Waivers shall be requested for all structures and/or bridges on the Interstate, Primary and Secondary System that do **not** meet VDOT minimum design standards regardless of who owns and maintains the structure and/or bridge.
  - For additional information on Design Waivers with regard to structures and/or bridges, see Manual of Structure and Bridge Division, Volume V, Part 2.
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## DESIGN WAIVER REQUEST FORM LD-448

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- L&D Design Waiver requests shall utilize Design Waiver Request Form LD-448 and document all supplemental information necessary and appropriate for the comprehensive review of the engineering details of the waiver request.
- Any time there is a deviation from published and accepted standards, the designer should clearly document that the deviation is to be made on the basis of an engineering analysis and that the methods of operation chosen are sufficiently protective of persons and property. The approach must incorporate reasons for the decision and approved documentation based on sound engineering judgment.
- Location and Design Division maintains Form LD-448 at the following website:  
<http://www.extranet.vdot.state.va.us/forms/>