

VIRGINIA DEPARTMENT OF TRANSPORTATION

# LOCATION AND DESIGN DIVISION

## INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Design Exceptions / Waivers		NUMBER: IIM-LD-227.11 IIM-S&B-70.9
SPECIFIC SUBJECT: Design Exception Request Form LD-440 Design Waiver Request Form LD-448 Design Waiver Request Form LD-452		DATE: January 3, 2017
		SUPERSEDES: IIM-LD-227.10 IIM-S&B-70.8
LOCATION AND DESIGN DIVISION APPROVAL: B. A. Thrasher, P.E. State Location and Design Engineer Approved December 12, 2016	STRUCTURE AND BRIDGE DIVISION APPROVAL: Kendal R. Walus, P.E. State Structure and Bridge Engineer Approved December 12, 2016	

Changes are shaded.

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### CURRENT REVISION

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- This memorandum was revised to replace Regional Traffic Engineer with “responsible District Traffic Engineer”, effective January 25, 2017.
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### EFFECTIVE DATE

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- This memorandum is effective upon receipt.
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### DESIGN EXCEPTION REQUEST RECOMMENDATIONS

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- 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 effects 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 effects 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, which 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.”
- On October 7, 2015, the FHWA published a notice in the Federal Register soliciting comments on proposed changes to the 1985 policy that established thirteen (13) controlling criteria for design. Based on the comments received in response to FHWA's proposal, combined with FHWA's own experience and the findings of National Cooperative Highway Research Program (NCHRP) Report 783 “Evaluation of the 13 Controlling Criteria for Geometric Design” (2014), FHWA has updated its 1985 policy regarding controlling criteria for design, applicable to projects on the NHS, thus reducing the number of controlling criteria from thirteen (13) to ten (10), and applying only two (2) of these criteria to low speed roadways. The FHWA also issued guidance clarifying when design exceptions are needed and the level of support documentation that is required. Please see the May 5, 2016 FHWA Memorandum at the following location: <http://www.fhwa.dot.gov/design/standards/160505.pdf>
- The Federal Register was also updated to reflect the controlling criteria changes: <https://www.federalregister.gov/articles/2016/05/05/2016-10299/revision-of-thirteen-controlling-criteria-for-design-and-documentation-of-design-exceptions>
- The FHWA's participation in plan reviews is vital throughout the design process and may be required on Projects of Divisional Interest (PODI) and Projects of Corporate Interest (POCI).

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## FHWA'S CONTROLLING CRITERIA

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- Although all deviations from accepted standards and policies need to be justified and documented, the FHWA has established ten (10) controlling criteria for high speed design. All ten (10) controlling criteria apply to high-speed (design speed  $\geq 50$  mph) roadways on the NHS, as defined by FHWA mapping:  
[http://www.fhwa.dot.gov/planning/national\\_highway\\_system/nhs\\_maps/virginia/index.cfm](http://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/virginia/index.cfm)

The FHWA requires a Design Exception whenever the following controlling criteria are not met.

- Design speed
  - Lane width
  - Shoulder width
  - Design Loading  
Structural Capacity
  - Horizontal Curve Radius
  - Maximum Grade
  - Stopping Sight Distance
  - Cross slope
  - Superelevation Rate
  - Vertical Clearance
- On low-speed roadways (i.e., non-freeways with design speed  $< 50$  mph) on the NHS, only the following two controlling criteria apply:
    - Design Loading Structural Capacity
    - Design Speed
  - The FHWA Virginia Division Office has established access control along the Interstate as the 11<sup>th</sup> controlling criterion. 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)
- Please reference AASHTO's most recent VDOT adopted version of *A Policy on Design Standards – Interstate System*
- Existing access points are not subject to the Access Control for Interstate Interchanges Agreement between FHWA and VDOT.

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## VDOT DESIGN EXCEPTION POLICY (APPLICABLE TO ROADWAYS)

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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 LRFD Bridge Design Specifications shall be used as design **standards** where they do not conflict with AASHTO's Policy on Design Standards—Interstate System.

- In light of the FHWA's policy change, VDOT is reestablishing its policy that a Design Exception shall be required whenever any of the ten (10) controlling criteria are not met regardless of design speed, functional class or whether the roadway is NHS or non-NHS; or when Minimum Acceleration and Deceleration Lane Lengths for Grade Separations and Interchanges are not met on the NHS System (Interstates, Freeways and Arterials). See AASHTO Green Book, Chapter 10.
- The State Location and Design Engineer approves **all** design exceptions regardless of who designs the project (VDOT or LAP), funding type (State, Federal or Local) and ownership/maintenance responsibility (VDOT/Locality). For bridge-related design exceptions (e.g. bridge shoulder width), approval by the State Structure and Bridge Engineer is also required, except as noted below for bicycle facilities.
- VDOT recognizes the FHWA publication, "Mitigation Strategies for Design Exceptions" as providing mitigation efforts that should 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)
- FHWA approval of Design Exceptions is required in accordance with the most recent FHWA Stewardship and Oversight Agreement.
- Changes to the 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.
- 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.
- Design criteria for access control for new or totally reconstructed interchanges will be that which is developed from an operational analysis, but shall not be less than the minimum values of 300 feet for rural and 100 feet for urban areas shown above.
- 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. (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 as outlined in IIM-LD-255.
  - VDOT Design criteria is provided in the following sources:
    - VDOT's Road Design Manual
    - VDOT's Road and Bridge Standards
    - VDOT's Manual of the Structure and Bridge Division and Structure and Bridge Division Instructional and Informational Memoranda.
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## TIMING OF DESIGN EXCEPTION REQUEST

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- Project Managers or Design Engineers should discuss potential design criteria that may require the need for an exception with the appropriate Assistant State Location and Design Engineer prior to detailed development of the exception or providing a design exception request to the District L & D Engineer (or equivalent Structure and Bridge positions for bridge-related items).
- Design Exceptions should be identified at the Preliminary Field Inspection and requested shortly thereafter. Plans at the Public Hearing Development Stage and the Structure and Bridge Preliminary Plan Development Stage should reflect approved design exceptions for those key design elements or features. Design approval following the Location and Design / Design Public Hearing may be delayed if known or discovered design exceptions or design waivers have not been approved.
- 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. Location and Design Division exceptions 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 Structure and Bridge Design Exceptions.

## DESIGN EXCEPTION REQUEST FORM LD-440

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- All requests for design exceptions shall document all supplemental information necessary and appropriate for the comprehensive review of the engineering details of the exception request. The request shall be submitted via Form LD-440 to the District Location & Design Engineer and/or the District Structure and Bridge Engineer for review and recommendation for submission to the Central Office.
  - 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.
  - The Responsible Person preparing the design exception request shall electronically seal and digitally sign the request in the seal and sign block provided above "Prepared By:"
  - Location & Design Division maintains Form LD-440 at the following website:  
<http://vdotforms.vdot.virginia.gov/>
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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.
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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, shoulder width, horizontal curve radius) the location(s) and criteria 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:

DESIGN EXCEPTIONS			
Sta. To Sta.	Design Speed (mph)	Exception for:	Approval Date
102+75 to 104+75		Shoulder Width	October 28, 2010
621+00 to 624+50	60	Horizontal Curve Radius	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 Shoulder Width (Approval Date) 621 + 00 - 624 + 00 ( 35 mph) Horizontal Curve Radius (Approval Date)
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- For information on the placement of approved design exceptions on the Structure & Bridge title sheet, see Manual of Structure and Bridge Division, Part 2.

EXAMPLES OF WHEN A DESIGN EXCEPTION IS **NOT** REQUIRED

- 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 for that class of roadway shown in the AASHTO Green Book.
- A Design Exception is not required for Design Speed within the functional area of a Roundabout in accordance with the FHWA Roundabout Informational Guide (NCHRP 672) Chapter 6, available at:  
[http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_rpt\\_672.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf)
- When approaching a stop control intersection, deceleration length to the intersection should be calculated based on the entering taper length (L2) the deceleration length (L3) and the storage length (L4) found in the 2011 AASHTO Green Book, page 9-125, Section 9.7.2 Deceleration Lanes. A design exception is not required for horizontal curve radius, maximum grade, cross slope, superelevation or stopping sight distance within this calculated physical length when the road does or does not have a turn lane.
- A design exception is not required for overlays and the installation of rumble strips or rumble stripes.

- Design exceptions are generally not required for pavement transitions within VDOT defined “transition areas” of a project. The transition length (L) shall be in accordance with RDM, Appendix A (Lane/Pavement Transitions). However, the Designer shall contact the responsible District Traffic Engineer when reviewing the accident history for the past three (3) years as locations showing accident rates higher than the statewide average for that roadway classification attributable to the substandard design criteria may require a design exception.
- The intent of establishing project termini for the majority of projects scoped as “Bridge Only” is to tie into the existing approach alignment as quickly as possible and in accordance with, and defined and described in, the Manual of the Structure and Bridge Division, Part 2 (See “Bridge Only” projects).

Unless there is a specific safety problem at the project site attributable to any substandard geometric feature, then substandard approach roadway geometrics associated with these “Bridge Only” projects do not require corrections and do not require design exceptions or design waivers unless the existing conditions are made worse.

- A design exception is not required for geometric elements of the ramp proper: Superelevation rate, lane width, horizontal curve radius, maximum grade, etc. Should these elements not meet VDOT minimums, then a design waiver is required. (This does not include minimum acceleration or deceleration lengths as shown in 2011 AASHTO Green Book Table 10.3,10.4 & 10.5)
- A design exception / design waiver is not required for Spot Safety and Operational Improvement Projects (as long as existing geometric features are not made worse) on **non-NHS** roadways with a scope limited to one or more of these elements:
  - Turn lane extensions
  - Vertical curve adjustment
  - Horizontal curve adjustment
  - Signal Optimization/Retiming
  - Adaptive Signals operation
  - ITS devices and systems to improve safety & operational efficiency
  - Sign upgrade to comply with latest MUTCD requirements
  - Flashing Beacons/Warnings
  - Acceleration Lanes on non-interstate system
  - Pedestrian and Bicycle accommodation such as bicycle lanes, shared use path, pedestrian refuge, sidewalk and crosswalk projects
  - Roadway Lighting, Signs, Signals, Raised Pavement Markers, Pavement Markings
  - Installation or adjustment of Guardrail Systems to meet VDOT’s current policy and/or standards
  - Shoulder Widening up to 4 ft.
  - Paving existing graded shoulder
  - High friction surfacing
  - Safety edge
  - Rumble strip installation

- A design exception / design waiver is not required for safety and operational projects such as HSIP and ITS projects on **NHS** roadways in accordance with the Memorandum dated August 28, 2013: <http://www.virginiadot.org/business/trafficeng-productlists.asp>. This agreement is not applicable to Preventative Maintenance, 3R Projects and projects that add capacity to the roadway. Additional projects may be eligible on a case by case basis if approved by the Office of the State Traffic Engineer in coordination with the Federal Highway Administration as appropriate.
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## DESIGN EXCEPTION POLICY (APPLICABLE TO VDOT STRUCTURES & BRIDGES)

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- In addition to the ten (10) controlling criteria, the State Structure and Bridge Engineer has identified the following items as requiring a design exception:
    - Modifications to VDOT parapet/rail standards except as indicated in VDOT's Manual of the Structure and Bridge Division, Part 2
    - Proposed new crash-tested parapets / rails (other than VDOT)
  - Design exceptions shall be requested for all structures and/or bridges on the Interstate, Primary and Secondary System that do not meet AASHTO minimum design standards regardless of who owns and maintains the structure and/or bridge.
  - For additional information on design exceptions with regard to structures and/or bridges, see Manual of Structure and Bridge Division, Part 1 at: <http://www.virginiadot.org/business/bridge-manuals.asp>.
  - Design exceptions for design loading structural capacity, vertical clearance and shoulder width (where the roadway shoulders meet AASHTO minimums, but the bridge shoulder(s) do not) are typically prepared by the bridge designer and submitted to the State Structure and Bridge Engineer through the District Structure and Bridge Engineer. Form LD-440 shall be utilized for the request.
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## DESIGN WAIVER POLICY FOR ROADWAY DESIGN (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 Americans with Disabilities Act Accessibility Guidelines (ADAAG) 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:
    - Ramp Geometrics
    - Paved Shoulder Width
    - Curb and Gutter
    - Minimum Radius
    - Bike and Pedestrian Accessibility Compliance (See IIM-LD-55 & RDM)
    - Ditch Width
    - Lane Shifts / Tapers
    - Buffer Strip Width
    - Superelevation
    - Intersection Sight Distance
    - Total Shoulder Width
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#### DESIGN WAIVER POLICY FOR HYDRAULIC DESIGN (APPLICABLE TO VDOT OWNED AND MAINTAINED ROADWAYS ONLY)

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- Design waivers are required when deviations from VDOT's hydraulic design criteria occur on VDOT owned and maintained roadways only, regardless of functional classification and funding. When design criteria fall short of VDOT's minimum design standards, a design waiver shall be requested by the District Hydraulics Engineer. Design Waivers shall be documented and approved in accordance with the Design Waiver Request Form LD-448.
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#### DESIGN WAIVER POLICY (APPLICABLE TO VDOT STRUCTURES & BRIDGES)

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- Design waivers are required when deviations from VDOT's design criteria occur on VDOT owned and maintained structures only.
  - For additional information on design waivers, see Manual of Structure and Bridge Division, Part 1 at: <http://www.virginiadot.org/business/bridge-manuals.asp>.
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#### DESIGN WAIVER POLICY (APPLICABLE TO LAND DEVELOPMENT REVIEW)

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- For additional information on design waivers applicable to Land Development Review (Office of Land Use), see IIM-LU-500 at: <https://insidevdot.cov.virginia.gov/Docs/Documents/IIM-LU-500Approved.pdf>
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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.

- The Responsible Person preparing the design waiver request shall electronically seal and digitally sign the request in the seal and sign block provided above “Prepared By:”
  - Location and Design Division maintains Form LD-448 at the following website:  
<http://vdotforms.vdot.virginia.gov/>
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## REQUESTS FOR A DESIGN WAIVER (FORM LD-448)

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- Requests for a Design Waiver (Form LD-448) must contain the following:
  - Established design criteria versus proposed and existing criteria.
  - Reason the appropriate design criteria cannot be met.
  - Justification for the proposed criteria.
  - Any background information which documents, supports or justifies the request.
  - Any mitigation that will be provided to further support or justify the request.
  - Cost to meet design criteria.
- Submittal Process
  - Design waiver requests shall be prepared by the 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 and Design Engineer.
  - Approval authority shall not be delegated to a lower position without the approval of the State Location and 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 and Design Engineer and the State Geometric Engineer for means of compliancy and oversight purposes.
  - Location and Design Division 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 Structure and Bridge Design Waivers.

- Designers are expected to adhere to the typical sections and requirements for roadways and structures with bicycle and/or pedestrian facilities found in VDOT's Road Design Manual and VDOT's Manual of the Structure and Bridge Division, Part 2. When it is determined to use bicycle and/or pedestrian facility geometrics that do not meet the design criteria in the above mentioned manuals, a design waiver is required only from the District Location and Design Engineer.
  - Project Title Sheet
    - Design waivers are **not** to be shown on the Project Title Sheet.
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DESIGN WAIVER POLICY FOR MULTIMODAL DESIGN STANDARDS FOR MIXED-USE URBAN CENTERS (APPLICABLE TO BOTH VDOT OWNED AND MAINTAINED ROADWAYS AND LOCALITY OWNED AND MAINTAINED ROADWAYS)

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- When “**optimal**” values cannot be met for the modal emphasis primary element(s) mentioned on the Design Waiver Request Form for Mixed-Use Urban Centers, the Design Waiver Form LD-452 shall be submitted in accordance with this IIM.
  - Mixed-use Urban Centers Waivers shall be reviewed and approved by the appropriate District Location and Design Engineer.
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DESIGN WAIVER REQUEST FORM LD-452 FOR MULTIMODAL DESIGN STANDARDS FOR MIXED-USE URBAN CENTERS

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- Design Waiver Request Form LD-452 shall be completed and all supplemental information necessary and appropriate for the comprehensive review of the engineering details of the waiver request shall be included in the submission.
  - Location and Design Division maintains Form LD-452 at the following website:  
<http://vdotforms.vdot.virginia.gov/>
  - REQUESTS, SUBMITTALS and APPROVALS for this Design Waiver (Form LD-452) shall follow the current Design Waiver (Form LD-448) process as mentioned in this IIM.
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ACCESS MANAGEMENT WAIVER REQUEST AM-E, AM-W

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- Access Management waivers shall be completed following the requirements set forth in Appendix F of VDOT's Road Design Manual and the Access Management Regulations found in the Virginia Administrative Code 24 VAC 30-72 and 24 VAC 30-73.