

***Section 3-01***

***Design Standards and Design Exceptions***

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## **INTRODUCTION**

**General:** Operating Policy 7-1 Design Standards and Tolerable Controls, requires that specific standards, guidelines and design controls be established and applied when designing highway projects. The design standards to be applied are dependent on the type of construction, functional classification and the controlling design criteria. Design elements that do not meet design standards and controlling criteria must be justified and approved through the design exception request.

### **Functional Classification Types:**

- Interstate
- NHS Arterial (Non Interstate)
- Non-NHS Arterial
- Non-NHS Collector
- Non-NHS Local

### **Construction Types:**

- **4R Construction:** New construction or reconstruction for a 20-year minimum design life.
- **3R Construction:** Restoration or rehabilitation to include pavement structure, shoulder widening, auxiliary lanes, safety improvements, bridges, upgrade geometric features, other highway elements, below tolerable controls, to meet standards for a selected design life up to 20 years.
- **2R Construction:** Resurfacing overlay with additional pavement structure to extend serviceability. Minimum thickness to include 1 inch of leveling plus a 2 inch pavement overlay. Other improvements to include minor grading to maintain existing roadway width, minor safety, bridge, or geometric improvements.
- **1R Construction:** Preservation of existing pavement structure pending a future pavement contract, or reactionary measures to keep the highway system open to traffic. Maximum pavement overlay thickness not to exceed 2 inches including leveling.

### **Controlling Design Criteria:**

The following are controlling design elements that the FHWA has identified as being of sufficient importance in highway design:

- **Design Speed** - Take care when considering a variance in design speed. Design speed has a universal effect on design components with significant influence on all features directly related to speed, so avoid any exception or variance if at all possible.
- **Lane Width**
- **Shoulder Width**

- **Structure Width**
- **Structure Capacity - Loading**
- **Horizontal Alignment**
- **Vertical Alignment**
- **Grades**
- **Stopping Sight Distance**
- **Cross Slope or Crown**
- **Superelevation**
- **Vertical Clearance**
- **Horizontal Clearance - Restriction of a horizontal shoulder width.**

### **DESIGN STANDARDS**

Design standards to be applied to the various combination of roadway classification and construction types (4R, 3R, 2R, & 1R) are the current additions of:

- AASHTO, A Policy on Design Standards Interstate
- AASHTO, A Policy of Geometric Design of Highways and Streets
- WYDOT Design Guide, Interstate Highways
- WYDOT Design Guide, NHS Arterial (Non-Interstate)
- WYDOT Design Guide, Non-NHS State Highways
- WYDOT, Road Design Manual

WYDOT Design Guides are specific to the roadway's functional classification and construction type. It's important that the applicable book and section be referenced to insure the correct design standards are being applied.

### **DESIGN EXCEPTIONS**

**General.** A design exception may be requested when it is difficult or cost prohibitive to achieve full compliance with controlling design criteria. Document the circumstances that result in a design exception request, along with a convincing rationale describing why it is impractical to comply with controlling design criteria.

**Design Exception Request:** Are submitted to and approved by the delegated authority. The 1991 Intermodal Transportation Efficiency Act, and a subsequent agreement between the Wyoming Transportation Commission (WYDOT) and Federal Highway Administration (FHWA), delegates the authority to approve design exceptions as follows:

- **FHWA-(Approving Authority): All projects on the National Highway System**, regardless of the funding source (i.e., state or federal-aid). Request and document design exceptions in a letter addressed to the FHWA division administrator with the following signature blocks:

WYDOT:      Recommended by:      Project Development Engineer  
                  Recommended by:      District Engineer  
                  Concurred by:      Highway Development Engineer  
                  Approved by:      Engineering & Planning Engineer

FHWA:      Concurred by:      FHWA Division Administrator

- **WYDOT-(Approving Authority): For all other projects**, regardless of the funding source (i.e., state or federal-aid). Request and document design exceptions in a memorandum to the Highway Development Engineer with the following signature blocks:

WYDOT      Recommended by:      Project Development Engineer  
                  Recommended by:      District Engineer  
                  Concurred by:      Highway Development Engineer  
                  Approved by:      Engineering & Planning Engineer.

OTHERS      Approved by:      Include signature block for approving authority on all off-system projects.

See attached “Sample Letter or Memorandum” for general format. All approved design exceptions (original signed copies) are to be filed in WYDOT’S permanent file.

Project features that do not comply with required current controlling criteria and design standards will require corrective action or a design exception. The process for evaluating, justifying, and documenting the need for a design exception is generally the same, regardless of the approving authority.

When a design exception is pursued on 4R or 3R projects, it requires justification by a detailed engineering and safety analysis with the following exception: On 3R projects a programmatic evaluation is acceptable when the existing design can be shown to be equal to or greater than the 3R design standards. A programmatic evaluation need only show that the design meets 3R criteria and there is no abnormal crash history to indicate an unsafe condition. On 2R and 1R projects, design exceptions are not required providing the existing roadway conditions are not reduced.

**Project Evaluation:** A geometric evaluation is required for (4R, 3R, and 2R) project types with continuous surface treatment. Evaluations are to be based on the posted speed and projected traffic volumes to identify existing elements that do not meet current controlling design criteria. Geometric evaluations are not required for 1R projects.

Evaluations are documented in WYDOT’s design file. Provide a copy to the FHWA when the project is on the National Highway System, regardless of the funding source (i.e., state or federal-aid). Evaluation findings are generally documented in the form of a “Geometric Evaluation Letter” for 2R projects or in the “Reconnaissance Inspection Report” for 4R and 3R projects. Copies of all project evaluations are sent to the Highway Safety Program for consideration as safety improvement projects.

**Preparing Design Exception:** General conditions that warrant design exceptions include, but are not limited to, extreme difficulty or high cost of securing right-of-way, extremely high construction costs, extreme difficulty or high cost of mitigating environmental impacts, or the preservation of significant scenic or historical values.

Design exception requests must clearly state the nature of the exception, conditions which dictate the need for the exception, alternatives considered, and other supporting data that provides justification for the request. Provide a compelling reason for not complying with controlling criteria.

It is recommended that design exception requests be justified mainly on the basis of the factors given below, taking into account mitigation measures that will be provided and that cost estimates be provided when needed for informational support purposes.

**Engineering/Safety Analysis:**

- Identify highway characteristics-functional classification, highway system, current and projected 20-year traffic volumes, volume percentage of vehicle classification type (cars/trucks), geometric features including signing, and description of adjacent sections.
- Identify project type (4R, 3R, or 2R) and include project purpose as documented in the Highway Development reconnaissance report, Programming Section scope statement, E-113, and National Environmental Policy Act (NEPA) document.
- Identify project-specific elements and locations that do not meet controlling design criteria, and analyze the effect of complying with the controlling design criteria versus using lower criteria relative to the following:
  - ▶ Effect on consistency with the project purpose

- ▶ Effect on highway operations
- ▶ Safety
- ▶ Physical features—terrain, existing facility (for example, use of existing centerline to minimize adjacent land-use impacts)

**Environmental Analysis:** Evaluate potential impacts on environmental resources. Be certain that this impact evaluation focuses on the same environmental resources that are determined important during the NEPA process.

**Mitigation:** Incorporate the following mitigating measures: signing, delineation, advisory speed limits, curve/shoulder widening, removal/relocation/shielding roadside obstacles, and others.

**Economic Analysis:** It is generally recommended that use of a cost analysis be secondary to the above engineering/safety analysis. This analysis can support the above engineering evaluation based on physical features.

Adhere to these guidelines for all design exceptions. The Design Exception guidelines presented above supersede all previously stated procedures for requesting design exception approvals.

See attached sample request letters.



# Department of Transportation

State of Wyoming



Dave Freudenthal  
Governor

John F. Cox  
Director

Date \_\_\_\_\_

**“Sample Memorandum” - Use when WYDOT is the delegated approving authority:  
For Interstate and Non-Interstate 2R and 1R project on NHS, and for all Non-NHS  
4R,3R,2R, and 1R projects regardless of the funding source (state or federal-aid).**

## MEMORANDUM

TO: **“Include appropriate name”**  
Highway Development Engineer, Cheyenne

FROM: **“Include appropriate name”**  
Project Development Engineer, Cheyenne

PROJECT: \_\_\_\_\_  
\_\_\_\_\_ Road  
\_\_\_\_\_ Section  
\_\_\_\_\_ County

SUBJECT: Design Exception Request and Approval

*(State reasons for the design exception similar to the example below.)*

An 8-foot [2.4 m] shoulder width is recommended by the AASHTO Green Book, for rural collector roads with design speed of 60 mph [100 km/h] and ADT over 2000. A 6-foot [1.8 m] shoulder is recommended for ADT of 1500 to 2000.

This section of roadway has a current ADT of 1760 and a future Year 2020 design ADT of 2670. The section begins in Moorcroft with the adjacent section to the south being an urban section and ends at MP 160.52 (KP 9.48) with the adjacent section to the north being the Hayworth Draw Section. The Hayworth Draw Section was reconstructed to 3R standards with 6-foot [1.8 m] shoulders this past construction season. Also, the section to the north of Hayworth Draw, which completes this stretch of roadway to Carlisle, was reconstructed in 1988 with 6-foot [1.8 m] shoulders.

*(State advantages of the exception similar to the example below.)*

A design exception is recommended to provide a 6-foot [1.8 m] shoulder instead of the future ADT design width of 8 ft [2.4 m].

The 6-foot [1.8 m] shoulder would match the sections to the north and still meet the recommended design criteria until such time that the ADT is exceeded. It is noted that this roadway has a major collector functional classification as opposed to an arterial route.

Recommended by: Date \_\_\_\_\_ Recommended by: Date \_\_\_\_\_

\_\_\_\_\_  
"Include appropriate name"  
Project Development Engineer

\_\_\_\_\_  
"Include appropriate name"  
District Engineer

Concurred by: Date \_\_\_\_\_ Approved by: Date \_\_\_\_\_

\_\_\_\_\_  
"Include appropriate name"  
Highway Development Engineer

\_\_\_\_\_  
"Include appropriate name"  
Engineering & Planning Engineer

Approved by: Date \_\_\_\_\_

\_\_\_\_\_  
Include signature block for approving  
authority on all off-system projects.

\_\_\_\_\_ (lower case initials of author)

cc: To FHWA if project is on the NHS

\_\_\_\_\_, P.E., District Engineer, \_\_\_\_\_  
\_\_\_\_\_, P.E., District Construction Engineer, \_\_\_\_\_  
\_\_\_\_\_, P.E., Resident Engineer, \_\_\_\_\_  
\_\_\_\_\_, P.E., Design Team Leader, P/D, Cheyenne  
\_\_\_\_\_, P.E., (Consultant address, if applicable)

Permanent File.



# Department of Transportation

State of Wyoming



Dave Freudenthal  
Governor

John F. Cox  
Director

Date \_\_\_\_\_

**“Sample Letter” - Use when FHWA is the approving authority: For all Interstate and Non-Interstate 4R and 3R projects on the NHS, regardless of the funding source (state or federal-aid).**

**“Include appropriate name”**

Division Administrator  
Federal Highway Administration  
2617 East Lincolnway, Suite D  
Cheyenne, Wyoming 82001-5662

RE: Design Exception Request and Approval

PROJECT: \_\_\_\_\_

\_\_\_\_\_ Road  
\_\_\_\_\_ Section  
\_\_\_\_\_ County

Dear. Mr. Miller:

*(State reasons for the design exception similar to the example below.)*

Reference the above project. A public meeting was held in Cheyenne in June 2004. At the time a great deal of public opposition to the proposed modifications to Vandehei Interchange became evident and WYDOT Executive Staff subsequently decided to delay those changes and limit the scope of this project to just the mainline surfacing needs.

Vandehei Interchange and Iron Mountain Interchange are now a part of a cooperative planning effort being spearheaded by the Cheyenne Area Transportation Planning Process and known as the Northwest Cheyenne Plan. Part of this planning study is to develop and incorporate an interchange study for the I-25 corridor from Central Avenue north to the U.S. 85 Torrington Interchange.

As such, we are requesting a design exception for the current project regarding the accel/decel lanes at these two interchanges. Existing conditions and AASHTO Green Book design recommendations are listed in the attached Table 1 and traffic counts are shown in Table 2. Recommended lengths shown in Table 1 are based on the mainline design speed of 70 MPH and an exit/entrance curve design speed of 40 MPH. Each ramp involved has a 5° exit or entrance curve. The mainline posted speed limit at the Vandehei interchange is 65 MPH and at the Iron Mountain Interchange it is 75 MPH.

*(State advantages of the design exception similar to the example below.)*

Since no other work is being done now at either interchange, we are requesting your approval to leave the existing accel/decel lengths as is and not extent them to the AASHTO Green Book desisgn recommendations at this time. AASHTO Green Book design recommendation would then be met in the future when the planning study is complete and the final interchange configurations can be done as one complete product based on the results of the corridor study.

Very truly yours,  
"Include appropriate name"  
Chief Engineer

Recommended by: Date\_\_\_\_\_ Recommended by: Date\_\_\_\_\_

\_\_\_\_\_  
"Include appropriate name"  
Project Development Engineer

\_\_\_\_\_  
"Include appropriate name"  
District Engineer

Concurred by: Date\_\_\_\_\_ Approved by: Date\_\_\_\_\_

\_\_\_\_\_  
"Include appropriate name"  
Highway Development Engineer

\_\_\_\_\_  
"Include appropriate name"  
Engineering & Planning Engineer

Concurred by: \_\_\_\_\_ Date \_\_\_\_\_  
"Include appropriate name"  
FHWA Division Administrator, Wyoming

\_\_\_\_\_: (lower case initials of author)

cc:

- \_\_\_\_\_, P.E., District Engineer, \_\_\_\_\_
- \_\_\_\_\_, P.E., District Construction Engineer, \_\_\_\_\_
- \_\_\_\_\_, P.E., Resident Engineer, \_\_\_\_\_
- \_\_\_\_\_, P.E., Design Team Leader, P/D, Cheyenne
- \_\_\_\_\_, P.E., (Consultant address, if applicable)

Permanent File.