

Risk Analysis in Geometric Design

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Central Federal Lands Highway Division

AASHTO Subcommittee on Design 2009

Indianapolis, IN

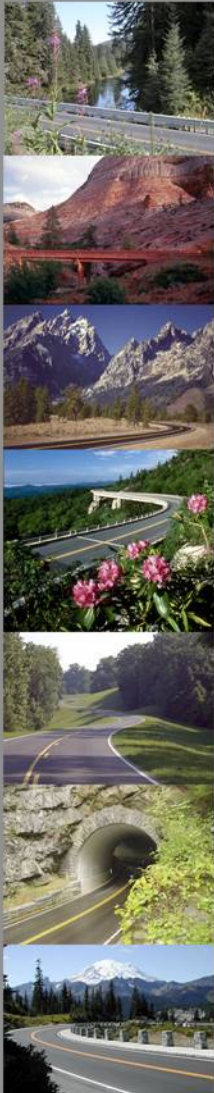


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FLH Organization

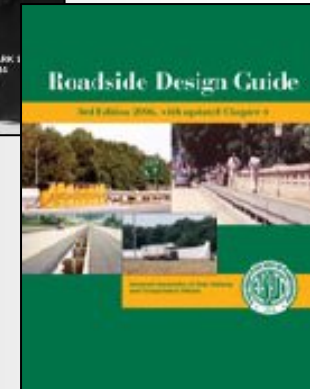
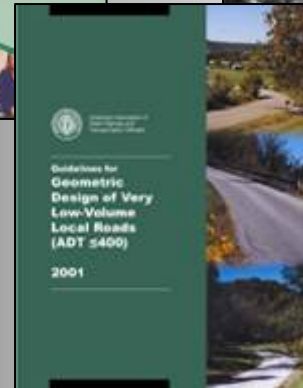
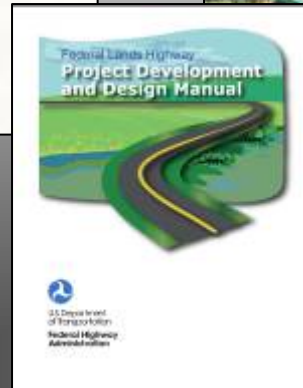
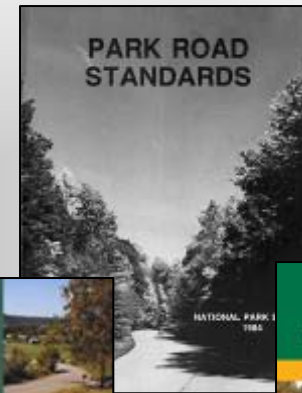
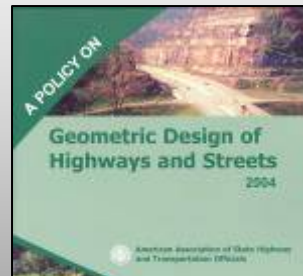
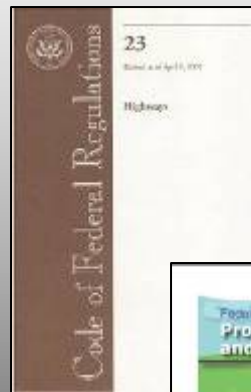
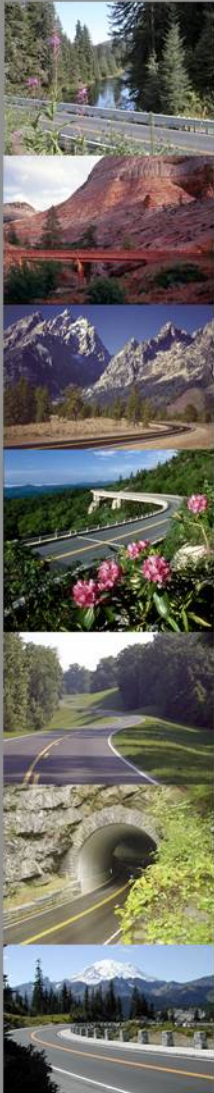
“Create the best transportation system in balance with the values of Federal and Tribal lands”



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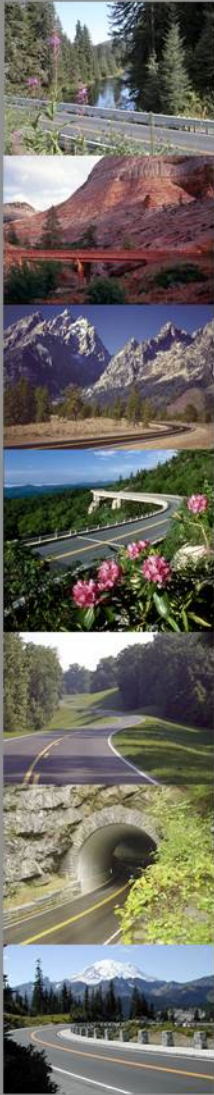
FLH Standards of Practice



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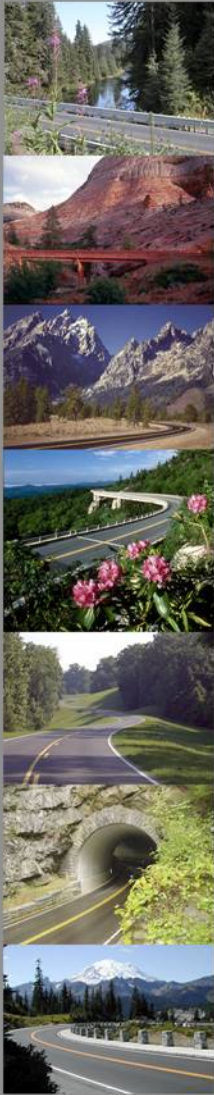
Risk

- “Good” design will not necessarily result from direct use of the policy values
- Engineering judgment is necessary to design a highway that will be
 - efficient and safe in operation
 - well fitted to the terrain and site controls
 - amenable to the community environment
 - carefully tailored for the unique conditions
- Doing a professional, credible job, and documenting the work is the best way to manage risk



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Documentation

- Highway Design Standards (HDS) form
- Design Technical Memorandum



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**CENTRAL FEDERAL LANDS HIGHWAY DIVISION...
HIGHWAY DESIGN STANDARDS**

Project Number and Name: _____

Location: _____

Type of Project: New Construction Reconstruction RRR Other (describe) _____

Description of Work: _____

System:	<input type="checkbox"/> National Park Service	<input type="checkbox"/> National Highway System (NHS)
	<input type="checkbox"/> Forest Service	<input type="checkbox"/> Non NHS
	<input type="checkbox"/> Bureau of Land Management	<input type="checkbox"/> Off system (county road)
	<input type="checkbox"/> Bureau of Indian Affairs	<input type="checkbox"/> Other (describe) _____

Functional Classification: _____

Owner Agency: _____

Terrain: ...select... _____

Design Vehicle: _____

ADT - Show Station Range						
TRAFFIC	YEAR	AVERAGE	SEASONAL	DHV	PERCENT TRUCKS	D
Current	_____	_____	_____	_____	_____	_____
Design	_____	_____	_____	_____	_____	_____

Design Standards: AASHTO ...select... NPS State Other (describe) _____

GEOMETRIC AND BRIDGE CRITERIA - Show Station Range			
GEOMETRIC AND BRIDGE CRITERIA	STANDARD	AS DESIGNED	EXCEPTION
1. Design Speed	Minimum = _____ Design Speed should equal or exceed Posted or Regulatory Speed of completed facility	Posted or Regulatory = _____	Example: Yes - see (1) below
2. Traveled Way Width	_____	_____	Example: Yes - see (2) below
3. Shoulder Width	_____	_____	Example: No
4. Crown	? %	? %	Example: N/A
5. Horizontal Curvature	_____	_____	_____
6. Superelevation	e(max) = ?% Δ = 0.??%	e(max) = ?% Δ = 0.??%	_____
7. Grades	? %	? %	_____
8. Vertical Curvature	K (crest) = _____ K (sag) = _____	K (crest) = _____ K (sag) = _____	_____

9. Stopping Sight Distance	_____	_____	_____
10. Horizontal Clearance to Structure (not clear zone)	_____	_____	_____
11. Vertical Clearance to Structure	_____	_____	_____
12. Bridge Width	_____	_____	_____
13. Bridge Loading	_____	_____	_____

Descriptions of and reasons for exceptions to standards:

Analysis of risks and design features proposed to mitigate exceptions:

FLH SUPPLEMENTAL STANDARDS - Show Station Range			
DESIGN CRITERIA	STANDARD	AS DESIGNED	EXCEPTION
1. Clear Zone	_____	_____	Example: No
2. Barrier Crashworthiness	NCHRP 350	NCHRP 350	_____
3. Design Flood	FLH Project Development and Design Manual Exhibit 7.1-A		Example: No
4. Pavement Design Service Life	?-year	?-year	_____

Descriptions of and reasons for exceptions to FLH standards:

Analysis of risks and design features proposed to mitigate exceptions:

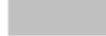
APPROVAL:

- There are no exceptions to applicable standards.
- The exceptions to the design standards as noted and their related risks have been reviewed with the appropriate agencies and parties and are considered acceptable for this project.

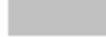
HDS Form



Descriptions of and reasons for exceptions to standards:



Analysis of risks and design features proposed to mitigate exceptions:



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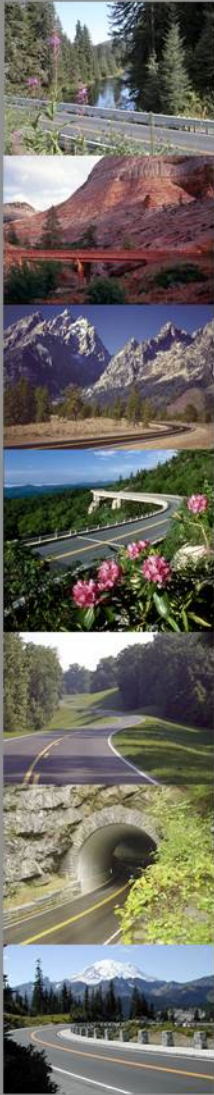
HDS Form Development

- Identify 'applicable' standards during scoping
- Determine the standards to be used for the specific project in the NEPA decision-making document (30%)
- Provide a draft HDS form at each milestone
- Complete the HDS form for signature at the 70%-95% milestone



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Completed HDS From

- Why did you approve this exception?
- What information did you consider?
- Who did you discuss this with?



Project Name
Project Number
NPS PMIS #

XX%
Technical M



by A/E
Federal Highway
Central Federal La

I Introduction

II Major Revisions from Previous Submittal

III Existing Conditions

IV Traffic Data

Clear Zone Width		
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V Crash Data

VI Survey

VII Environmental

VIII Design Speed

IX Typical Section

X Roadway Design

XI Safety

XII Geotechnical and Foundation

Bridge Design Flood
Barrier Design Flood including guard terminal
Pavement Design Flood

XIII Hydraulic

Culvert Design Flood
Roadside Drainage Flood

XIV Structural Design

XV Erosion and Sediment Control

XVI Traffic Control

XVII Signs and Signage

Pavement Drainage Design Flood	xx-year flood	xx-year flood
Storm Drain Design Flood	xx-year flood	xx-year flood
Floodplain Encroachment Design Flood		
Bridge Design Flood		
Longitudinal Embankment Design Flood		
Retaining Wall Design Flood		

XIX Right-of-Way

XX Utilities

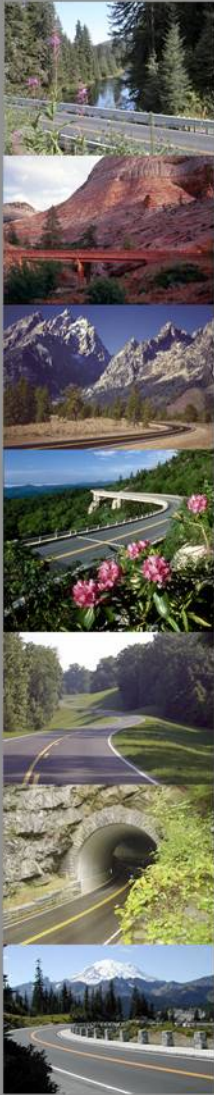
XXI Specifications

XXII Construction Schedule

XXIII Construction Cost Estimate

Appendices:

- A. Highway Design Standards Form
- B. FHWA Standard Practice Checklist
- C. Traffic Study
- D. Crash Data
- E. Clear Zone and Guardrail Summary
- F. Sight Distance Summary



Design Technical Memorandum

- Supplemental details and descriptions
- Communication tool
- Provided at each design milestone

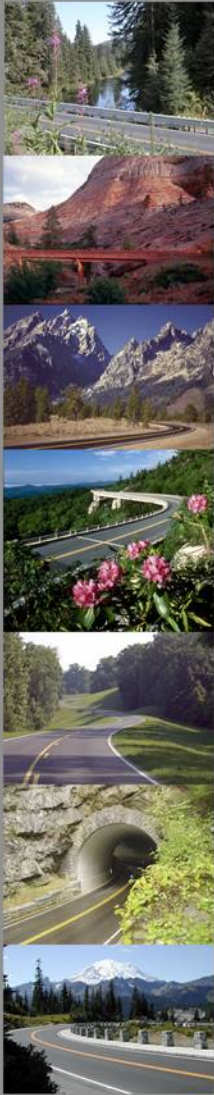


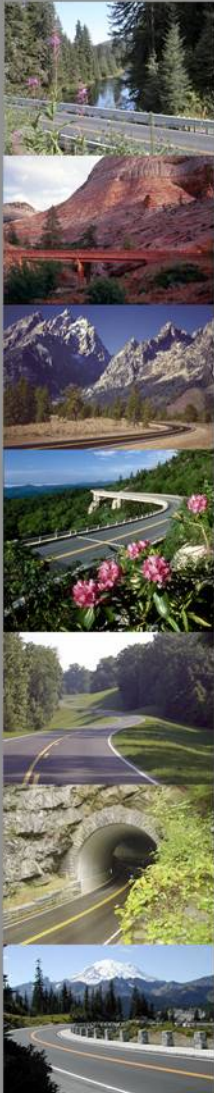
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Managing Risk

- Full analysis of the need for a design exception should be performed
- Include measures to mitigate the potential adverse effects of the design exception
- Document the exception and the mitigation





You should see the new management consultant we hired. He's going to make all of our risks disappear.



(from www.riskmitigationassoc.com)



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