FEDERAL LANDS HIGHWAY
HIGHWAY DESIGN STANDARDS

CO PRA BICA 123(1)
Project Number

3R Example Road
Project Name

Eleven miles east of Cortez, CO. South of main entrance station.
Location

Sta 1+00 to 216+54 and 335+75 to 556+22
Route

3R
Type of Project

Mountainous
Terrain

This project will provide resurfacing, restoration, and rehabilitation to the 10.5 miles of the main entrance road from the Park Entrance to Park Point. Pulverizing and a 3.0" surfacing will be used to improve the surface and ride of the existing roadway.
Description

☐ National Highway System (NHS)

National Park Service
Owner/Maintaining Agency

National Park Roads
Functional System

Principal Park/Road Parkway

Traffic	Year	Annual ADT	Seasonal ADT	DHV	PERCENTAGE TRUCKS DHV	ADT	D
Current	2008	1600		20	1	16	50
Future	2028	1953					

Design Standards: ☑ AASHTO Green Book ☐ AASHTO Low Volume ☑ Park Road Standards ☐ State ☐ Other (Describe)

CRITERIA	STANDARD	AS DESIGNED	EXCEPTION
Design Speed	40 MPH	30 MPH	☑ AASHTO Green Book See (1) below
Design Loading Structural Capacity	HL 93	HL 93	☐ AASHTO Green Book

CRITERIA	STANDARD	AS DESIGNED	VARIANCE
Lane Width	11 ft	11 ft	☐ Park Road Standards
Shoulder Width	3 ft	1 ft	☑ Park Road Standards See (2) below
Horizontal Curve Radius	340 ft	180 ft	☑ Park Road Standards See (3) below
Superelevation Rate	e(max) = 6%	~6%	☐ AASHTO Green Book See (4) below
Stopping Sight Distance	225 ft	>225 ft	☐ AASHTO Green Book
Maximum Grade	13%	<13%	☐ Park Road Standards
Cross Slope	1% -3%	~2%	☑ AASHTO Green Book
Vertical Clearance	14 ft	N/A	☐ AASHTO Green Book

For each exception provide description (including context), reasons, alternatives considered, analysis of risk, and proposed mitigation:

Exceptions:

(1) Design Speed:

Description: The NPS standards recommends a design speed of 40 MPH. The proposed design speed is 30 MPH.

Reasons for exceptions to the standards: The design speed was selected to match the existing design speed on the project.

Analysis (continued)

Analysis of risks: The project design speed is consistent for these portions of the project. There are no site-specific safety issues within these two portions of the project. Risks associated with this design exception is determined to be low.

Design features proposed to mitigate exception: Speed limit signs will be replaced. Delineation will be improved with new pavement markings. A safety edge will be used on the edge of pavement.

Variances:

(2) Shoulder: The NPS standards recommend 3-foot wide paved shoulders. The proposed project will have 1-foot wide paved shoulders. To minimize impacts to Park resources, many of which are buried artifacts near the edge of the existing roadway, the proposed project maintains the existing shoulder width. Due to unacceptable environmental impacts, shoulder widening was not included in this project.

(3) Horizontal curves: There are 46 existing curves that have a centerline radius below the 340 feet for a 35 mph design speed. The proposed horizontal alignment matches existing due to environmental constraints, steep terrain with limited roadway bench width at horizontal curve locations, and excessive construction cost to meet standards.

(4) Superelevation: The proposed values for superelevation and relative gradient of the horizontal curves match existing. NPS maintenance staff indicated that some of the superelevation has been reduced over the years during the numerous patching and overlay projects. Specific values for existing superelevation and relative gradient are unknown, but field observations indicated that there are only minor variations from the standard criteria. Improving the existing superelevation to meet current standards would require placing embankment material outside the existing roadway bench, resulting in unacceptable environmental and cost impacts. Including superelevation adjustments in the project scope would not provide any cost-effective safety or operational improvements.

FEDERAL LANDS HIGHWAY
HIGHWAY DESIGN STANDARDS

CO PRA BICA 123(1)
Project Number

3R Example Road
Project Name

Eleven miles east of Cortez, CO. South of main entrance station
Location

Sta 216+54 to 335+75
Route

3R
Type of Project

Mountainous
Terrain

This project will provide resurfacing, restoration, and rehabilitation to the 10.5 miles of the main entrance road from the Park Entrance to Park Point. Pulverizing and a 3.0" surfacing will be used to improve the surface and ride of the existing roadway.
Description

☐ National Highway System (NHS)

National Park Service
Owner/Maintaining Agency

National Park Roads
Functional System

Principal Park/Road Parkway

Traffic	Year	Annual ADT	Seasonal ADT	DHV	PERCENTAGE TRUCKS DHV	ADT	D
Current	2008	1600		20	1%	16	50
Future	2028	1953					

Design Standards: ☑ AASHTO Green Book ☐ AASHTO Low Volume ☑ Park Road Standards ☐ State ☐ Other (Describe)

CRITERIA	STANDARD	AS DESIGNED	EXCEPTION
Design Speed	40 MPH	50 MPH	☐ AASHTO Green Book
Lane Width	11 ft	11 ft	☐ AASHTO Green Book
Shoulder Width	3 ft	1 ft	☑ Park Road Standards See (1) below
Horizontal Curve Radius	833 ft	200 ft	☑ Park Road Standards See (2) below
Superelevation Rate	e(max) = 6%	~6%	☐ AASHTO Green Book See (3) below
Stopping Sight Distance	400 ft	>400 ft	☐ AASHTO Green Book
Maximum Grade	9%	<9%	☐ Park Road Standards
Cross Slope	1% -3%	~2%	☐ AASHTO Green Book
Vertical Clearance	N/A	N/A	☐ AASHTO Green Book
Design Loading Structural Capacity	HL 93	HL 93	☐ AASHTO Green Book

For each exception provide description (including context), reasons, alternatives considered, analysis of risk, and proposed mitigation:

(1) Shoulder

Description: The NPS standards recommend 3-foot wide paved shoulders. The proposed project will have 1-foot wide paved shoulders.

***Reasons for exceptions to standards*:** To minimize impacts to Park resources, many of which are buried artifacts near the edge of the existing roadway, the proposed project maintains the existing shoulder width. Due to unacceptable environmental impacts, shoulder widening was not included in this project.

Analysis of risks: The project is consistent with adjacent roadway segments, maintaining consistency in shoulder width along the route. Risk associated with this design exception is determined to be low considering the lack of site-specific safety issues, low vehicle speeds, and consistency of the existing roadway corridor.

Design features proposed to mitigate exception: The new pavement will have the safety edge treatment. New regulatory and warning signs will be installed on the project including speed limit, advanced curve, and grade warning signs. Pavement markings will be improved.

(2) Horizontal curves

Description: There are 2 existing curves below the required 833 feet for a 50 mph design speed. The 50 mph design exception curves are located approximately at stations: 217+62, 222+30.

Reasons for exceptions to standards: The proposed horizontal alignment matches existing due to environmental constraints, steep terrain with limited roadway bench width at horizontal curve locations, and excessive construction cost to meet standards.

Analysis of risks: Risk associated with this design exception is determined to be low considering the lack of site-specific safety issues, low vehicle speeds, low volume of truck traffic, and consistency of the existing roadway corridor.

Design features proposed to mitigate exception: New curve warning and advisory speed signs will be installed on the project. Pavement markings will be improved.

(3) Superelevation

Description: The proposed values for superelevation and relative gradient of the horizontal curves match existing. NPS maintenance staff indicated that some of the superelevation has been reduced over the years during the numerous patching and overlay projects. Specific values for existing superelevation and relative gradient are unknown, but field observations indicated that there are only minor variations from the standard criteria.

Reasons for exceptions to standards: Improving the existing superelevation to meet current standards would require placing embankment material outside the existing roadway bench, resulting in unacceptable environmental and cost impacts. Including superelevation adjustments in the project scope would not provide any cost-effective safety or operational improvements.

Analysis of risks: Risk associated with this design exception is determined to be low considering the lack of site-specific safety issues, low vehicle speeds, low volume of truck traffic, and consistency of the existing roadway corridor. No new substandard superelevation areas will be created, or existing ones made worse.

Design features proposed to mitigate exception: New curve warning and advisory speed signs will be installed on the project. Pavement markings will be improved. Selected trees on the outside of curves will be removed to improve roadside safety.

RECOMMENDED ACTION:

☐ There are no exceptions to applicable standards, and the project should proceed to final PS&E.

☑ The listed exceptions to design standards and their related risks have been reviewed with the appropriate agencies and interested parties, and are considered acceptable for this project.

PREPARED BY:

LEAD DESIGNER
Digitally signed by LEAD DESIGNER
DN: cn=LEAD DESIGNER, o, ou, email=LEAD.DESIGNER@DOT.GOV, c=US
Date: 2017.04.14 08:14:23 -06'00'

Lead Designer Date

APPROVAL IS RECOMMENDED:

HIGHWAY DESIGN MANAGER
Digitally signed by HIGHWAY DESIGN MANAGER
DN: cn=HIGHWAY DESIGN MANAGER, o, ou, email=HDM@DOT.GOV, c=US
Date: 2017.04.14 08:14:36 -06'00'

Highway Design Manager Date

PROJECT MANAGER
Digitally signed by PROJECT MANAGER
DN: cn=PROJECT MANAGER, o, ou, email=PM@DOT.GOV, c=US
Date: 2017.04.14 08:14:49 -06'00'

Project Manager Date

PD BRANCH CHIEF
Digitally signed by PD BRANCH CHIEF
DN: cn=PD BRANCH CHIEF, o, ou, email=PDBC@DOT.GOV, c=US
Date: 2017.04.14 08:15:03 -06'00'

Project Development Branch Chief Date

I CONCUR WITH THE ABOVE RECOMMENDATIONS:

PARTNER AGENCY
Digitally signed by PARTNER AGENCY
DN: cn=PARTNER AGENCY, o, ou, email=AGENCY@NPS.GOV, c=US
Date: 2017.04.14 08:15:20 -06'00'

Maintaining Agency/Partner Date

THE ABOVE RECOMMENDATIONS ARE APPROVED:

CHIEF OF ENGINEERING
Digitally signed by CHIEF OF ENGINEERING
DN: cn=CHIEF OF ENGINEERING, o, ou, email=COE@DOT.GOV, c=US
Date: 2017.04.14 08:15:38 -06'00'

Chief of Engineering Date

FEDERAL LANDS HIGHWAY
HIGHWAY DESIGN STANDARDS

CA PFH 123-1(1)
Project Number

4R Example Road
Project Name

North Fork Blue River Road MP 3.6 to 13.6. Located east of Dakota, CA between Van Gordon and Alameda off of State Route 199
Location

Sta. 10+00 to 300+00
Route

Reconstruction
Type of Project

Mountainous
Terrain

Grading, drainage, aggregate base, asphalt pavement, MSE walls, soil nail walls, and bridge construction
Description

☐ National Highway System (NHS)

Jefferson County
Owner/Maintaining Agency

Rural Minor Collector
Functional System

Traffic	Year	Annual ADT	Seasonal ADT	DHV	PERCENTAGE TRUCKS DHV | ADT		D
Current	2017	211		21	1%	2	50
Future	2037	314					

Design Standards: ☑ AASHTO Green Book ☐ AASHTO Low Volume ☐ Park Road Standards ☐ State ☐ Other (Describe)

CRITERIA	STANDARD	AS DESIGNED	EXCEPTION
Design Speed	20 MPH	35 MPH	☐
Design Loading Structural Capacity	HL 93	HL 93	☐

CRITERIA	STANDARD	AS DESIGNED	VARIANCE
Lane Width	10 ft	11 ft	☐
Shoulder Width	2 ft	1 ft	☑ See (1) below
Horizontal Curve Radius	340 ft	110 ft	☑ See (2) below
Superelevation Rate	e(max) = 6%	6%	☐
Stopping Sight Distance	250 ft	257 ft	☐
Maximum Grade	10%	8%	☐
Cross Slope	2%	2%	☐
Vertical Clearance	14 ft	20 ft	☐

For each exception provide description (including context), reasons, alternatives considered, analysis of risk, and proposed mitigation:

Variances:

(1) Shoulder: The AASHTO Green Book recommends 2-foot wide paved shoulders. The proposed project will have 1-foot wide paved shoulders. The shoulder width was selected to match the existing shoulder width of the adjacent segments of the roadway (MP 0.0 to MP 3.6 and MP 13.6 to MP 20.4).

(2) Horizontal Curve Radius: The AASHTO Green Book recommends a minimum horizontal curve radius (R) of 340 ft. Three curves on this project

are below this minimum standard. These curves do not meet the minimum value due to environmental and cost constraints. The proposed curves match the existing alignment.

RECOMMENDED ACTION:

☑ There are no exceptions to applicable standards, and the project should proceed to final PS&E.

☐ The listed exceptions to design standards and their related risks have been reviewed with the appropriate agencies and interested parties, and are considered acceptable for this project.

PREPARED BY:

AE LEAD DESIGNER
Digitally signed by AE LEAD DESIGNER
DN: cn=AE LEAD DESIGNER, o, ou, email=AE@designer.com, c=US
Date: 2017.04.14 08:27:04 -06'00'

A/E Lead Designer Date

APPROVAL IS RECOMMENDED:

AE Manager
Digitally signed by AE Manager
DN: cn=AE Manager, o, ou, email=AEManager@example.com, c=US
Date: 2017.04.14 08:27:29 -06'00'

A/E Manager Date

PROJECT MANAGER
Digitally signed by PROJECT MANAGER
DN: cn=PROJECT MANAGER, o, ou, email=PM@DOT.GOV, c=US
Date: 2017.04.14 08:27:44 -06'00'

Project Manager Date

PD BRANCH CHIEF
Digitally signed by PD BRANCH CHIEF
DN: cn=PD BRANCH CHIEF, o, ou, email=PDBC@DOT.GOV, c=US
Date: 2017.04.14 08:27:59 -06'00'

Project Development Branch Chief Date

I CONCUR WITH THE ABOVE RECOMMENDATIONS:

PARTNER AGENCY
Digitally signed by PARTNER AGENCY
DN: cn=PARTNER AGENCY, o, ou, email=AGENCY@NPS.GOV, c=US
Date: 2017.04.14 08:28:40 -06'00'

Maintaining Agency/Partner Date

COUNTY SIGNATURES
Digitally signed by COUNTY SIGNATURES
DN: cn=COUNTY SIGNATURES, o, ou, email=COUNTY@CO.US, c=US
Date: 2017.04.14 08:29:05 -06'00'

County Date

THE ABOVE RECOMMENDATIONS ARE APPROVED:

CHIEF OF ENGINEERING
Digitally signed by CHIEF OF ENGINEERING
DN: cn=CHIEF OF ENGINEERING, o, ou, email=COE@DOT.GOV, c=US
Date: 2017.04.14 08:29:22 -06'00'

Chief of Engineering Date