

DESIGN EXCEPTION MANUAL



2004

U.S. Customary English Units

DESIGN EXCEPTION PROCEDURE

A. General

When conditions warrant, a design exception may be granted for a project design that proposes one or more controlling substandard design elements (CSDEs). A design exception may be approved when it can be documented that a lesser design value is the best practical alternative. The factors to be considered when determining if a lesser design value should be elected shall include social, economic and environmental impacts together with safe and efficient traffic operations.

On projects requiring a Preliminary Design Submission (PDS), a design exception, if required, shall be included with the PDS package. For those projects that do not require a PDS, a design exception request shall be submitted to the Director, Division of Design Services for approval prior to finalizing the horizontal and vertical geometry. Although the design exception submission consists primarily of a series of checklists, the designer shall attach a more specific analysis of the impacts (social, economic and environmental) to the checklist that is submitted for approval.

A design exception is only required for CSDEs within proposed construction areas of a project. For example, if a project contains spot and/or multiple construction locations (Stop Construction / Resume Construction) within a project's overall limits (Begin Project / End Project), design exceptions are only required for CSDEs within the proposed construction areas. A design exception is not required for a CSDE that is within the transitions at the project limit from the proposed design to the existing, or for a temporary CSDE that may be present during the construction stage of a project.

When a project contains multiple CSDEs that occur at the same location or when the same CSDE occurs at multiple locations, each CSDE will be addressed independently.

Design exceptions will require FHWA approval on full oversight and interstate projects.

B. Controlling Design Elements

The controlling design elements are:

Roadway Elements

- Stopping Sight Distance (vertical curves, horizontal curves, and non-signalized intersections)
- Superelevation (for mainline and ramps)
- Minimum Radius of Curve (for mainline and ramps)
- Minimum and Maximum Grades
- Cross Slope
- Lane Width (through and auxiliary)

- Shoulder Width
- Through Lane Drop Transition Length
- Acceleration and Deceleration Lane Length (for ramps)
- Horizontal Clearance (N/A in New Jersey – minimum allowable offset 0'-0")
- Design Speed (a design exception for a reduction in the design speed will not be approved)

Structural Elements

- Bridge Width
- Vertical Clearance
- Structural Capacity

C. Design Standards

The standard design values for the controlling design elements mentioned above are contained in the following documents:

- NJDOT Design Manual - Roadway
- NJDOT Design Manual - Bridges and Structures
- AASHTO publication, A Policy on Design Standards Interstate System
- AASHTO publication, A Policy on Geometric Design of Highways and Streets

Specific design values for each of the controlling design elements, along with references to AASHTO and NJDOT Design Manuals, are presented in Appendix A, Controlling Design Element Reference Tables 1 through 8. The design values in all NJDOT Design Manuals meet AASHTO design values, except where noted in these tables.

For any of the below listed types of projects, or if highway work on new alignment is proposed, a design exception for controlling design elements that do not meet current standards will be required on all State highway projects and any county or municipal project.

As denoted in 23 CFR 625.3, the following is a list of project types that require a design exception:

- New highway construction
- Existing highway reconstruction (lane addition including auxiliary, acceleration and deceleration lanes, pavement structure replacement - except shoulders, use of an existing shoulder as a through lane, and a change in the horizontal and/or vertical alignment)
- Total bridge replacement on an NHS roadway
- Bridge widening

D. Projects Exempt from the Design Exception Procedure

1. Preventive Maintenance Projects

Preventive maintenance includes rehabilitation or restoration of specific elements of a highway facility when it can be demonstrated that such activities are a cost effective means of extending the pavement or bridge life and shall not degrade any existing or geometric aspects of the facility. The majority of the work to be accomplished on these projects will be between existing curb lines or outer edges of existing shoulders. Preventive maintenance projects will be clearly defined as part of the initial screening process and will be classified as such when presented to the Capital Programming Committee (CPC) Screening Committee for approval.

A general list of preventative maintenance work items is listed below:

- Pavement milling
- Pavement resurfacing (no reduction in lane widths)
- Pavement repair (sawing, sealing, pothole patching, etc.)
- Bridge bituminous resurfacing
- Bridge deck patching
- Joint replacement or repair
- Rehabilitation of existing structures
 - o Deck rehabilitation
 - o Rehabilitation of superstructure/substructure (exclusive of replacement)
 - o Seismic retrofit
 - o Scour Countermeasures
- Bridge deck restoration and component patching

2. Improvement Projects

In addition to preventative maintenance projects that are intended to extend the pavement or bridge life, there are also other highway improvement projects that do not require a design exception for a CSDE that falls within the limits of the project. These projects are typically beyond the existing edge of pavement and are intended to improve safety and aesthetics, and mitigate noise. In addition, improvements within the roadway that are for the purpose of improving safety and do not degrade the existing highway geometrics will be addressed through the CPC Screening Committee.

A CSDE contained within the following of project types or work items or both would not require a design exception:

- Replacement of curb or sidewalk or both
- Roadside safety enhancements
 - o Repair/replacement of beam guide rail
 - o New beam guide rail

- o Resetting beam guide rail
- o Repair or replacement of existing impact attenuators
- o New impact attenuators
- o Removal of obstructions
- Drainage improvements
- Addition of channelizing islands (no reduction in existing lane or shoulder width)
- Signing (bendaway supports)
- Striping (no additional lanes or reduction in existing lane width)
- New or replacement of raised pavement markers
- Access revisions
- Upgrading existing lighting systems
- Modifying sidewalk to comply with ADA requirements
- New signals
- New sign structures (sign bridge, cantilever and bridge mount provided they meet clearance requirements)
- Type II noise barriers (provided existing stopping sight distance is not degrade)
- Minor lane or shoulder widening exclusive of a full lane addition and no right-of-way required
- Intersection improvements (no reduction in existing lane or shoulder width)
- Fencing (provided existing stopping sight distance is not degraded)
- Glare Screens (provided existing stopping sight distance is not degraded)
- ITS (fiber optic cable, message signs, cameras, emergency call boxes, etc.)
- Upgrading existing signals
- Large ground mount signs
- New under deck, highmast, offset, or conventional lighting systems
- Replacement of existing median barriers
- New curb or sidewalk
- Rock fall mitigation (slope cutbacks, wire mesh, catchment zones, fences, etc.)
- Regrading existing berm section
- Jacking of concrete slabs
- Landscape improvements
- Traffic calming features (speed humps, chicane, midblock median islands, choker, narrowed lane, etc. Consult with FHWA on NHS Routes)

3. State Aid Projects

This design exception process for a county or municipal construction project, funded under the State Aid Program is not required, unless the design phase or construction phase is being funded with Federal Aid or the project is on the National Highway System. However, on State Aid Program projects where it is not practical to comply with the appropriate AASHTO design standards, written justification approved by the facility

owner, shall be submitted to the Division of Local Aid and Economic Development District Office by the designer. The justification should indicate the substandard design feature, the proposed construction, and the reasons for not satisfying the standard. A review of current accident data shall be made to insure the design feature(s) in question is not a contributing factor to known accidents.

E. Design Exception Report Format

The design exception report is comprised of three parts: a list of all CSDEs by location number and station/milepost, a checklist of the impacts to meet the standard value, and a table(s) containing a description of the CSDE including the standard design value, the proposed safety measures, accident analysis, and the impacts.

Standard forms and checklists are provide as Attachments and should be used for all design exceptions. Attachments 2, 3 and 4 are to be used for all design exceptions on projects requiring a Preliminary Design Submission (PDS) and shall be included with the PDS package.

For those projects that do not require a PDS, a cover letter (Attachment 1) and Attachments 2, 3 and 4 along with a copy of the Project Fact Sheet and Accident Analysis from the Bureau of Safety Programs shall be submitted to the Director, Division of Design Services, by the Project Manager for approval prior to finalizing the horizontal and vertical geometry.

When the design exception requires FHWA approval, the cover letter (Attachment 1) shall include a line for FHWA approval. The cover letter along with the necessary attachments shall be sent to Director, Division of Design Services, by the Project Manager for submission to the FHWA.

F. Accident Analysis

The design exception request shall use the accident analysis provided by the Bureau of Safety Programs. The analysis should include: an overall accident history summary for the most recent 3 year period, the overall accident rate, the statewide average accident rate for highways of similar cross-section, and the accident detail report printout. Refer to the accident analysis when discussing a CSDE that has indicator accidents that exceed the statewide average. Note that accident analyses are sometimes not needed for features that do not exist. A new ramp is an example. However, if a substandard length deceleration lane is proposed and one does not exist, an accident analyses may help support the conclusion that a substandard deceleration lane would be an improvement.

ATTACHMENT 1

NEW JERSEY DEPARTMENT OF TRANSPORTATION

MEMORANDUM

To: (name)
Director, Division of Design Services

From: (name)
Project Manager

Date:

Phone:

RE: DESIGN EXCEPTION
Route, Section/Contract Number
Municipality
County
Milepost Limits
Project Category
NJDOT Job Number
Federal Project Number (if applicable)

Approval of the design exception is requested to the following controlling substandard design elements contained in the (list only those references that apply: NJDOT Design Manual Roadway; NJDOT Design Manual Bridges and Structures; AASHTO publication, A Policy on Geometric Design of Highways and Streets (Year)) based on the warranting conditions described herein:

Attached is list by location of the impacts for each CSDE identified. **(Note to designer: Include Attachments 2, 3 and 4)**

Please refer to the attached Project Fact Sheet for the project description. An accident analysis is also included.

Based on the warranting conditions presented (the existing conditions, proposed geometry, impacts, accident analysis and safety measures), it is recommended that the above design exception be approved.

Approval By:

(name)
Director, Division of Design Services

Date

Approval By FHWA

(name)

Date

ATTACHMENT 3

Route _____
 Section/Contract No. _____

Controlling Substandard Design Elements									
Impact		Location Number							
Indicator Accidents	Does not exceed statewide average								
	Exceeds statewide average								
Impacts									
COST	No Impact								
	Impact								
ROW	No Impact								
	Slope easements								
	Fee takings								
	Residential Impact								
	Business Impact								
ENVIRONMENTAL	No Impact								
	Wetlands Impact								
	Historic Bridge Impact								
	Historic site Impact								
	Public Parkland Impacted								
	Endangered species impacted								
	Sole source aquifer impacted								
	Contaminated site impacted								
UTILITIES	No Impact								
	Impact								
PUBLIC SUPPORT	Yes (date)								
	No								
	NA								

Note: For each location, check all that apply

ATTACHMENT 4 TABLES

For each CSDE identified on Attachment 2, one or more of the following Tables will be required. The calculated speed for vertical curves and horizontal curves can be determined from Appendix B or [the calculator](#) on the Department's Website.

A. Stopping Sight Distance on Vertical Curves

Location Number	Location (Station/Milepost)	Type of Curve	A (%) Exist. Prop.	L (feet) Exist. Prop.	S (feet) Exist. Prop.	S (feet) Stand.	V(calc.) (mph) Exist. Prop.	Posted Speed/ Design Speed (mph)

- Proposed Safety Measures
- Accident Analysis
- Impact

B. Stopping Sight Distance on Horizontal Curves

Location Number	Location (Station/Milepost)	Radius (feet) Exist. Prop.	M (feet) Exist. Prop.	S (feet) Exist. Prop.	S (feet) Stand.	V(calc.) (mph) Exist. Prop.	Posted Speed/ Design Speed (mph)

- Proposed Safety Measures
- Accident Analysis
- Impact

C. Structural Capacity

Location Number	Location (Station/Milepost)	Bridge Design Load		
		Exist.	Prop.	Standard

- Proposed Safety Measures
- Impact

D. Cross Slope

Location Number	Location (Station/Milepost)	Cross Slope (%)		Cross Slope (%)
		Exist.	Prop.	Standard.

- Proposed Safety Measures
- Accident Analysis
- Impact

E. Superelevation (for mainline and ramps)

Location Number	Location (Station/Milepost)	Radius (feet)		eMax		EMax	V(safe) mph		V(safe) mph	Posted Speed (mph)
		Exist.	Prop.	Exist.	Prop.	Std.	Exist.	Prop.	Std.	

- Proposed Safety Measures
- Accident Analysis
- Impact

F. Minimum Radius of Curve (for mainline and ramps)

Location Number	Location (Station/Milepost)	Radius (feet)		Radius (feet)	Design speed (mph)	Safe Speed (mph)	Posted Speed (mph)
		Exist.	Prop.	Standard.	Prop.	Prop.	

- Proposed Safety Measures
- Accident Analysis
- Impact

G. Minimum and Maximum Grades

Location Number	Location (Station/Milepost)	Type of Grade	Grade (%)		Grade (%)
			Exist.	Prop.	Standard.

- Proposed Safety Measures
- Accident Analysis
- Impact

H. Lane Width (Through and Auxiliary)

Location Number	Location (Station/Milepost)	Existing Width (feet)	Proposed Width (feet)	Standard Width (feet)

- Proposed Safety Measures
- Accident Analysis
- Impact

I. Shoulder Width

Location Number	Location (Station/Milepost)	Type of Shoulder	Existing Width (feet)	Proposed Width (feet)	Standard Width (feet)

- Proposed Safety Measures
- Accident Analysis
- Impact

J. Through Lane Drop Transition Length

Location Number	Location (Station/Milepost)	Lane Length (feet)		Lane Length (feet)
		Exist.	Prop.	Standard.

- Proposed Safety Measures
- Accident Analysis
- Impact

K. Acceleration and Deceleration Lane Length (for ramps)

Location Number	Location (Station/Milepost)	Type Of Lane	Lane Length (feet)		Lane Length (feet)
			Exist.	Prop.	Standard.

- Proposed Safety Measures
- Accident Analysis
- Impact

L. Stopping Sight Distance at Non-Signalized Intersections

Location Number	Location (Station/Milepost)	S (feet) Exist/Prop.	S (feet) Stand.	V(calc.) Exist/Prop (mph).	Posted / Design Speed (mph)

- Proposed Safety Measures
- Accident Analysis
- Impact

M. Bridge Width

Location Number	Location (Station/Milepost)	Bridge Width (feet)		Bridge Width (feet)
		Exist.	Prop.	Standard

- Proposed Safety Measures
- Accident Analysis
- Impact

N. Vertical Clearance

Location Number	Location (Station/Milepost)	Bridge Clearance (feet)		Bridge Clearance (feet)
		Exist.	Prop.	Standard

- Proposed Safety Measures
- Accident Analysis
- Impact

1. Proposed Safety Measures

Provide a brief discussion of the proposed safety countermeasures that are being provided to improve the CSDE(s). Appendix C provides examples of low cost safety measures related to each CSDE.

2. Accident Analysis

For each location where the indicator accidents for the CSDE exceed the statewide average, the designer shall provide a more detailed analysis of the accidents. The accident analysis should include the type of accident, severity, contributing circumstances, environmental conditions and time of day. A collision diagram may also be necessary for locations involving a significant number of accidents.

3. Impact

For each CSDE not met, provide a concise narrative qualitatively describing the impacts that were noted on the checklist (Attachment 3). The narrative should cite the accident analysis and the proposed safety measures, with a concluding statement saying, "Not meeting the standard design value will not result in degrading the relative safety of the roadway."

APPENDIX A

Reference Tables for Proposed CSDEs

The following are reference tables for proposed CSDEs. The tables provide design reference guidance.

TABLE 1		CONTROLLING DESIGN ELEMENTS						CROSS SLOPES
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Exhibit or Text	Section	Min. or Max. Value	Table, Figure or Text	
Local Rural	Cross Slopes	5	Max./Min.	Exhibit	NA			All local roads and streets need only comply with AASHTO.
Local Urban Streets	Pavement Crown	4	Max./Min.	Text	NA			
Rural Collector	Pavement Crown	6	Max./Min.	Text	5	Max./Min.	Text & Figure	
Urban Collector	Pavement Crown	6	Max./Min.	Text	5	Max./Min.	Text & Figure	
Rural Arterial	Pavement Crown	7	Max./Min.	Text	5	Max./Min.	Text & Figure	
Divided Arterial	Cross Slope	7	Max./Min.	Text	5	Max./Min.	Text & Figure	
Urban Arterial	Cross Slope and Pavement Crown	7	Max./Min.	Text	5	Max./Min.	Text & Figure	
Freeways	Pavement & Shoulders	8	Max./Min.	Text	5	Max./Min.	Text & Figure	AASHTO and D.M.R. differ in shoulder cross slope.
All (High Type Pavements)	% increase in Cross Slope for adjacent Lanes	4,7	Max.	Text	5	Max.	Text	The cross slope is usually increased by 0.5% on each successive lane but it may be increased on each successive pair of lanes in some cases.
All (High Type Pavements)	Maximum Algebraic Difference in Pavement Cross Slope at Turning Roadway Terminals	9	Max.	Exhibit	7	Max.	Table	

1. AASHTO Policy in Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)

TABLE 2		CONTROLLING DESIGN ELEMENTS				LANE AND SHOULDER WIDTH		
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Exhibit or Text	Section	Min. or Max. Value	Table, Figure or Text	
Local Rural	Lane & Shoulder Width	5	Min.	Exhibit				AASHTO Governs.
Local Urban	Lane Width	5	Max./Min.	Text				
	Parking Lane Width ³	5	Min.	Text				
Rural Collector	Lane & Shoulder Width	6	Min.	Exhibit	5	Min.	Text & Figure	Difference is in graded shoulder when DHV <200.
Urban Collector	Roadway Width ³	6	Min.	Text	5	Min.	Text & Figure	
	Parking Lane ³	6	Max./Min.	Text				AASHTO Governs.
Rural Arterial	Lane & Shoulder Width	7	Min.	Text & Exhibit	5	Max./Min.	Text & Figure	Difference is in usable shoulder when DHV <200.
	Auxiliary Lane Width ³	3	Max./Min.	Text	5	Max./Min.	Text	
Divided Arterial	Lane & Shoulder Width	7	Min.	Text	5	Min.	Text & Figure	
	Auxiliary Lane Width ³	3	Max./Min.	Text	5	Max./Min.	Text	
Urban Arterial	Lane Width	7	Max./Min.	Text	5	Max./ Min.	Text	
	Shoulder Width	7	Max./Min.	Text	5	Max./Min.	Text	AASHTO refers to Chapt. 4 for shoulder widths.
	Parking Lane ³	7	Max./Min.	Text				AASHTO Governs.
	Auxiliary Lane Width ³	3	Max./Min.	Text	5	Max./Min.	Text	
Freeway	Lane & Shoulder Width	8	Max./Min.	Text	5	Max./Min	Figure	
	Auxiliary Lane Width & Shoulder Treatment ³	10	Max./Min.	Text	5	Max./Min.	Text	

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)
3. This is a type of lane and is a controlling design element.

TABLE 3		CONTROLLING DESIGN ELEMENTS				MINIMUM RADIUS AND SUPERELEVATION		
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Exhibit or Text	Section	Min. or Max. Value	Table, Figure or Text	
Local Urban	Superelevation Rate	5	Min.	Exhibit & Text				AASHTO Governs.
	Minimum Radius	5	Min.	Text				
Urban (Low-Speed)	Superelevation Rate	3	Min.	Exhibit & Text	4	Min.	Figure	See Note 3.
	Minimum Radius	3	Min.	Exhibit & Text	4	Min.	Table	See Note 3.
Rural Hwys. & Urban Streets (High-Speed)	Superelevation Rate	3	Min.	Exhibit	4	Min.	Figure	
	Minimum Radius	3	Min.	Exhibit	4	Min.	Table	D.M.R. shows only rounded values based on 6% max.
Interchange Ramps	Superelevation Rate	9	Min./Max.	Exhibit	7	Min./Max.	Table	
	Minimum Radius	3,9	Min.	Exhibit	4,7	Min.	Figures & Tables	
All (High Type Pavements)	Algebraic Difference in Pavement and Shoulder Grades on a Superelevated Section (Rollover)	4	Max.	Exhibit & Text	5	Max.	Text	

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)
3. Superelevation is not required on Urban Local Roads and Urban Low-Speed Collectors as per AASHTO; therefore, a design exception is unnecessary

TABLE 4		CONTROLLING DESIGN ELEMENTS					GRADES	
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Exhibit or Text	Section	Min. or Max. Value	Table, Figure or Text	
Local Rural	Maximum Grade	5	Max.	Exhibit & Text	NA			AASHTO Governs.
Local Urban	Max. & Min. Grade	5	Max./Min.	Exhibit & Text	NA			
Collector	Maximum Grade for Urban & Rural	6	Max.	Exhibit	4	Max.	Table	
Rural Arterial	Maximum Grade to Design Speed Relationship	7	Max.	Exhibit	4	Max.	Table	
Urban Arterial	Maximum Grade	7	Max.	Exhibit	4	Max.	Table	
Freeway	Maximum Grade for Urban & Rural	8	Max.	Exhibit	4	Max.	Table	
All	Minimum Grade	3	Min.	Text	4	Min.	Text	

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)

TABLE 5		CONTROLLING DESIGN ELEMENTS				SIGHT DISTANCE		
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Exhibit or Text	Section	Min. or Max. Value	Table, Figure or Text	
All	Intersection Sight Distance (horizontal)	5	Min.	Figure	6	Min	Figure	
All	Minimum Horizontal Stopping Sight Distance (HSSD)	3 or 6	Min./Des.	Exhibit	4	Min./Des.	Table, Figure & Text	
All	Design Control for a Crest Vertical Curve, Open Road Condition	3	Min.	Exhibit & Text	4	Min.	Table & Figure	The minimum stopping sight distance (SSD) shall be provided on all vertical curves.
All	Design Control for a Sag Vertical Curve, Open Road Condition	3	Min.	Exhibit & Text	4	Min.	Table & Figure	The minimum length of a crest vertical curve should not be less than 3 times the posted speed.

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)

TABLE 6		CONTROLLING DESIGN ELEMENTS			AUXILIARY LANE LENGTH (interchanges only) and THROUGH-LANE DROP TRANSITION LENGTH			
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Table, Figure or Text	Section	Min. or Max. Value	Table, Figure or Text	
All	Length of Acceleration Lane	10	Min.	Table	4	Min.	Figure	
All	Length of Deceleration Lane	10	Min.	Table	4	Min.	Figure	
All	Length of Through-Lane Drop Transition	3	Min.	Text	4	Min.	Figure	AASHTO refers to Part VI of MUTCD.

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)

TABLE 7		CONTROLLING DESIGN ELEMENTS				BRIDGE WIDTH & STRUCTURAL CAPACITY			
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT ROADWAY DESIGN MANUAL ²				Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Table, Figure or Text	Same As AASHTO	Section	Min. or Max. Value	Table, Figure or Text	
Local Rural & Local Urban	Min. Clear Roadway width & design Loading for a New & Reconstructed Bridge	5	Min.	Table & Text	No ³	5	Min.	Figure	See NJDOT Design Manual Bridges & Structures for structural capacity required for each highway type.
Local Rural	Min. Struc. Capacity & Min. Roadway Width for a Bridge to remain in place	5	Min.	Table	No ³	5	Min.	Figure	
Rural & Urban Collector	Min. Struc. Capacity & Min. Roadway Width for Bridge to remain in place	6	Min.	Table	No ³	5	Min.	Figure	
	Min. Struc. Capacity & Min. Roadway Width for New and Reconstructed Bridges	6	Min.	Table	No ³	5	Min.	Figure	
Rural Arterial	Width & Capacity of Structure	7 ⁴	Min.	Text	No ³	5	Min.	Figure	
Urban Arterial	Width of New Bridge	7	Min.	Text	Yes ³	5	Min.	Figure	
Freeway	Width & Capacity of Structure	8 ⁴	Min.	Text	Yes ³	5	Min.	Figure	

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)
3. The minimum bridge design live load for Interstate and NHS highways, and highways where the projected Average Daily Truck Traffic >500 vehicles/day, is MS18+25%. Otherwise, the minimum bridge design live load is MS18+10%. There will be no exceptions to this minimum live load design criteria.
4. AASHTO also refers to Chapt 10.

TABLE 8		CONTROLLING DESIGN ELEMENTS				VERTICAL CLEARANCE		
Highway Type	AASHTO POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS ¹				NJDOT Design Manual Roadway ²			Additional Comments
	Element Description	Chapt.	Min. or Max. Value	Table, Figure or Text	Section	Min. or Max. Value	Table, Figure or Text	
Local Rural	Vertical Clearance	5	Min.	Text	NA			For all highway types refer to the NJDOT Design Manual Bridges & Structures.
Local Urban	Vertical Clearance	5	Min.	Text	NA			
Urban & Rural Collector	Vertical Clearance	6	Min.	Text	NA			
Urban & Rural Arterial	Vertical Clearance	7	Min.	Text	NA			
Freeway	Vertical Clearance	8	Min.	Text	NA			

1. AASHTO Policy on Geometric Design of Highways and Streets = AASHTO
2. NJDOT Design Manual Roadway = D.M.R. (Design Manual Roadway Governs Unless Otherwise Stated)

APPENDIX B

Vertical Curve Conversion Chart From SSD To V (Calc) & Superelevation Safe Speed Calculation

Conversion Chart From SSD To V (Calc)

SSD		Vcalc	SSD		Vcalc	SSD		Vcalc
Meters	Feet	mph	Meters	Feet	Mph	Meters	Feet	mph
46	152	25	95	312	41	159	521	57
49	160	26	99	324	42	163	536	58
52	169	27	102	336	43	168	551	59
54	178	28	106	348	44	173	566	60
57	187	29	110	360	45	177	581	61
60	197	30	113	372	46	182	597	62
63	206	31	117	385	47	187	613	63
66	216	32	121	398	48	192	628	64
69	226	33	125	411	49	196	644	65
72	236	34	129	424	50	201	661	66
75	246	35	133	437	51	206	667	67
78	257	36	137	451	52	211	694	68
82	267	37	142	464	53	217	711	69
85	278	38	146	478	54	222	728	70
88	289	39	150	498	55			
92	301	40	155	507	56			

Superelevation Safe Speed Calculation

Safe speed is an accepted limit at which riding discomfort due to centrifugal force is evident to the driver. The safe speed of a horizontal curve in miles per hour, given the radius and cross slope, can be calculated by using the following formulas.

[V ≤ 50 mph]

$$V = \frac{-0.015R + ((.015R)^2 + 4R(15E + 2.85))^{1/2}}{2}$$

[V > 50 mph]

$$V = \frac{-0.03R + ((.03R)^2 + 4R(15E + 3.6))^{1/2}}{2}$$

Note: Use when radius is in feet, E=e/100

The formula is based on a Ball Bank indicator reading of 10 degrees

APPENDIX C

Low Cost Safety Measures

Low Cost Safety Measures

Controlling Substandard Design Element	Safety Measures
Stopping Sight Distance	<ul style="list-style-type: none"> • Fixed object removal • Shoulder widening • Highway lighting (sag curves) • Advisory speed signs • Reducing speed limits • Warning signs • No turn on red signs • Left turn slots • Stop and yield signs • Turning prohibitions
Superelevation (mainline and interchange ramps) Minimum Radius of Curve (mainline and interchange ramps)	<ul style="list-style-type: none"> • Delineators • Shoulder widening • Flatten side slopes • Pavement antiskid treatment • Warning Signs • Fixed object removal • Improved drainage system • Raised pavement markers • Rumble strips
Cross Slope	<ul style="list-style-type: none"> • Slippery when wet signs • Transverse pavement grooving • Improved drainage system
Minimum Grades	<ul style="list-style-type: none"> • Regrading of the border • Provide additional drainage
Maximum Grades	<ul style="list-style-type: none"> • Warning signs • Advisory speed limits • Climbing lanes

Low Cost Safety Measures

Controlling Substandard Design Element	Safety Measures
Lane width (Through and Auxiliary) Shoulder width	<ul style="list-style-type: none"> • Pavement edge lines • Raised pavement markers • Delineators • Removing fixed objects • Eliminating steep slopes • Signage (narrow lane, narrowed shoulder) • Rumble strip • Beaded / reflective pavement edge, lines
Through-lane Drop Transition Length	<ul style="list-style-type: none"> • Warning signs • Advisory speed limits
Acceleration and Deceleration Lane Length (for ramps)	<ul style="list-style-type: none"> • Additional pavement markings and signing • Delineators
Bridge width	<ul style="list-style-type: none"> • Traffic control devices • Approach guide rail • Object and pavement markings • Flashers • Warning Signs
Vertical Clearance over Roadway	<ul style="list-style-type: none"> • Warning Signs
Structural Capacity	<ul style="list-style-type: none"> • Warning signs

Appendix D contains more detailed tables that show accident types along with probable causes, studies to be performed to determine probable cause and possible safety measures. Designers can also use this table to conduct a safety analysis in the scoping stages of a project.

APPENDIX D

Intersection and Link Accident Tables

Intersection Accidents

Type of Accident - Left Turn Head On Collision	
Probable Causes	<ol style="list-style-type: none"> 1) Restricted sight distance due to presence of left turning traffic on the opposite approach and improper channelization and geometrics. 2) Too short amber phase. 3) Absence of special left turning phase when needed. 4) Excessive speed on approaches.
Study to be Performed	<ol style="list-style-type: none"> 1) Review existing intersection channelization. 2) Volume count for thru traffic. 3) Perform volume count for left turning traffic. 4) Review signal phasing. 5) Review intersection clearance times. 6) Study need for special left turn phase. 7) Study capacity of the intersection approaches in question for possible multi-phase operation. 8) Perform spot speed study.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Provide adequate channelization. 2) Install traffic signal if warranted by MUTCD. 3) Provide left turn slots. 4) Install stop signs if warranted by MUTCD. 5) Increase amber phase. 6) Provide special phase for left turning traffic. 7) Widen road. 8) Prohibit left turns (study possible adverse effects on other nearby intersections). 9) Reduce speed limit on approaches if justified by spot speed study. 10) Remove left turn traffic. 11) Provide all red phase.

Intersection Accidents

Type of Accident - Rear End Collisions At Unsignalized Intersections	
Probable Causes	<ol style="list-style-type: none"> 1) Improper channelization. 2) High volume of turning vehicles. 3) Slippery surface. 4) Lack of adequate gaps due to high traffic volume from the opposite direction. 5) Inadequate intersection warning signs. 6) Crossing pedestrians. 7) Excessive speed on approaches. 8) Inadequate roadway lighting.
Study to be Performed	<ol style="list-style-type: none"> 1) Review existing channelization. 2) Review pedestrian signing and crosswalk marking. 3) Perform turning count. 4) Perform volume count for thru traffic. 5) Check skid resistance. 6) Perform spot speed study. 7) Check for adequate drainage. 8) Check roadway illumination.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Create right or left-turn lanes. 2) Increase curb radii. 3) Prohibit turns (study possible adverse effects on other nearby locations). 4) Provide "Slippery When Wet" signs (interim measure only). 5) Increase skid resistance. 6) Improve drainage. 7) Install or improve signing and marking of pedestrian crosswalks. 8) Reduce speed limit on approaches if justified by spot speed study. 9) Provide advance intersection warning signs. 10) Improve roadway lighting.

Intersection Accidents

Type of Accident - Rear End Collisions At Signalized Intersections	
Probable Causes	<ol style="list-style-type: none"> 1) Improper signal timing. 2) Poor visibility of signal indicator. 3) Crossing pedestrians. 4) High volume of turning vehicles. 5) Slippery surface. 6) Excessive speed on approaches. 7) Inadequate roadway lighting. 8) Inadequate channelization.
Study to be Performed	<ol style="list-style-type: none"> 1) Review existing channelization. 2) Review pedestrian signing and crosswalk markings. 3) Perform turning count. 4) Perform spot speed study. 5) Check skid resistance. 6) Check for adequate drainage. 7) Check visibility of traffic signals. 8) Check roadway illumination. 9) Review intersection clearance time.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Create right or left-turn lanes. 2) Increase curb radii. 3) Prohibit turns (study possible adverse effects on other nearby locations). 4) Increase skid resistance. 5) Provide adequate drainage. 6) Provide "Slippery When Wet" signs (interim measure only). 7) Install advance intersection warning signs. 8) Install or improve signing and marking of pedestrian crosswalks. 9) Provide pedestrian walk - don't walk indicators. 10) Increase amber phase. 11) Provide special phase for left turning traffic. 12) Provide proper signalized progression. 13) Reduce speed limit on approaches. 14) Install backplates, larger lens, louvers, visors, etc. on traffic signal to improve contrast and visibility. 15) Relocate signals. 16) Add additional signal heads. 17) Improve roadway lighting.

Intersection Accidents

Type of Accident - Pedestrian - Vehicle Collision	
Probable Causes	<ol style="list-style-type: none"> 1) Inadequate pavement markings. 2) Inadequate channelization. 3) Improper signal phasing. 4) Restricted sight distance. 5) Inadequate pedestrian signals. 6) Inadequate roadway lighting. 7) Inadequate gaps at unsignalized intersection. 8) Excessive vehicle speed.
Study to be Performed	<ol style="list-style-type: none"> 1) Field observation for sight obstructions. 2) Pedestrian volume count. 3) Review channelization. 4) Check roadway illumination. 5) Review pavement markings. 6) Review signal phasing. 7) Perform gap studies. 8) Perform spot speed study.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Install pedestrian crosswalks and signs. 2) Install pedestrian barriers. 3) Prohibit curb parking near crosswalks. 4) Install traffic signal if warranted by MUTCD. 5) Install pedestrian walk - don't walk signals. 6) Increase timing of pedestrian phase. 7) Improve roadway lighting. 8) Prohibit vehicle-turning movements. 9) Remove sight obstructions. 10) Reroute pedestrian paths. 11) Reduce speed limits on approaches if justified by spot speed studies. 12) Use crossing guards at school crossing areas.

Intersection Accidents

Type of Accident - Right Angle Collisions At Signalized Intersections	
Probable Causes	<ol style="list-style-type: none"> 1) Restricted sight distance. 2) Inadequate roadway lighting. 3) Inadequate advance intersection warning signs. 4) Poor visibility of signal indication. 5) Excessive speed on approaches.
Study to be Performed	<ol style="list-style-type: none"> 1) Volume counts on all approaches. 2) Field observations for sight obstructions. 3) Review signal timing. 4) Check roadway illumination. 5) Perform spot speed study.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Remove obstructions to sight distance. 2) Increase amber phase. 3) Provide all red phase. 4) Retime signals. 5) Prohibit curb parking. 6) Install advance intersection warning signs. 7) Install backplates, larger lens, louvers, visors, etc., on traffic signal to improve contrast and visibility. 8) Install additional signal heads. 9) Reduce speed limit on approaches if justified by spot speed studies. 10) Provide proper signalized progression. 11) Improve location of signal heads.

Intersection Accidents

Type of Accident - Right Angle Collisions At Unsignalized Intersections	
Probable Causes	<ol style="list-style-type: none"> 1) Restricted sight distance. 2) Inadequate roadway lighting. 3) Inadequate intersection warning signs. 4) Inadequate traffic control devices. 5) Excessive speed on approaches.
Study to be Performed	<ol style="list-style-type: none"> 1) Volume counts on all approaches. 2) Field observations for sight obstructions. 3) Check roadway illumination. 4) Perform spot speed study. 5) Review signing.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Remove obstructions to sight distance. 2) Prohibit parking near corners. 3) Improve roadway illumination. 4) Install yield or stop signs if MUTCD warrants are met. 5) Install traffic signal if MUTCD warrants are met. 6) Install advance intersection warning signs. 7) Reduce speed limits on approaches if justified by spot speed studies.

Intersection Accidents

Type of Accident - Sideswipe Collisions	
Probable Causes	<ol style="list-style-type: none"> 1) Inadequate pavement markings. 2) Inadequate channelization. 3) Inadequate signing. 4) Narrow traffic lanes. 5) Improper street alignment.
Study to be Performed	<ol style="list-style-type: none"> 1) Review pavement markings. 2) Review channelization. 3) Review sign placement. 4) Review lane width. 5) Check alignment.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Provide wider lanes. 2) Install acceleration and deceleration lanes. 3) Place direction and lane change signs to give proper advance warning. 4) Install or refurbish centerlines, lane lines and pavement edge lines. 5) Provide turning lanes. 6) Provide proper alignment.

Link Accidents

Type of Accident - Off-Road Accidents	
Probable Causes	<ol style="list-style-type: none"> 1) Inadequate signing and delineators. 2) Inadequate pavement marking. 3) Inadequate roadway lighting. 4) Slippery surface. 5) Improper channelization. 6) Inadequate shoulders. 7) Inadequate pavement maintenance. 8) Inadequate superelevation. 9) Severe curve. 10) Severe grade.
Study to be Performed	<ol style="list-style-type: none"> 1) Review signs and placement. 2) Review pavement marking. 3) Check roadway illumination. 4) Check skid resistance. 5) Review channelization. 6) Check roadside shoulders and road maintenance. 7) Check superelevation. 8) Check for adequate drainage. 9) Perform spot speed studies.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Install proper centerline, lane lines, and pavement edge markings. 2) Increase skid resistance. 3) Improve roadway lighting. 4) Install warning signs to give proper advance warning and advisory speed limit. 5) Install roadside delineators, guide rails and redirecting barriers. 6) Perform necessary road surface repairs. 7) Improve superelevation at curves. 8) Reduce speed limit if justified by spot speed studies. 9) Upgrade roadway shoulders. 10) Provide "Slippery When Wet" signs (interim measure only). 11) Provide adequate drainage. 12) Flatten curve. 13) Provide proper superelevation.

Link Accidents

Type of Accident - Head-on Collisions	
Probable Causes	<ol style="list-style-type: none"> 1) Restricted sight distance. 2) Inadequate pavement markings. 3) Inadequate signing. 4) Narrow lanes. 5) Inadequate shoulders and/or maintenance. 6) Inadequate road maintenance. 7) Excessive vehicle speed. 8) Severe curve. 9) Severe grade.
Study to be Performed	<ol style="list-style-type: none"> 1) Review lane width. 2) Review pavement markings. 3) Review signing. 4) Check road shoulders where present. 5) Check road for proper maintenance. 6) Perform spot speed study. 7) Field check for sight obstructions.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Provide wider lanes. 2) Provide pennant signs. 3) Install no passing zones at points with restricted sight distances. 4) Install centerlines, lane lines and pavement edge markings. 5) Improve roadside shoulders. 6) Perform necessary road surface repairs. 7) Reduce speed limits if justified by spot speed studies. 8) Remove obstructions to sight distances. 9) Flatten curve. 10) Provide proper superelevation.

Link Accidents

Type of Accident - Pedestrian - Vehicle Collisions	
Probable Causes	<ol style="list-style-type: none"> 1) Restricted sight distance. 2) Inadequate roadway lighting. 3) Excessive vehicle speed. 4) Pedestrian walking on roadway. 5) Inadequate signing. 6) Sidewalks too close to roadway. 7) Improper pedestrian crossing.
Study to be Performed	<ol style="list-style-type: none"> 1) Check sight distances. 2) Check roadway illumination. 3) Review existence of sidewalks. 4) Review warning signs and placement. 5) Perform spot speed study.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Improve sight distance. 2) Prohibit curbside parking. 3) Improve roadway lighting. 4) Install sidewalks. 5) Install proper warning signs. 6) Reduce speed limit if justified by spot speed studies. 7) Install pedestrian barriers. 8) Move sidewalks further from roadway. 9) Enforcement.

Link Accidents

Type of Accident - Railroad Crossing Accidents	
Probable Causes	<ol style="list-style-type: none"> 1) Inadequate signing, signals or gates. 2) Inadequate roadway lighting. 3) Restricted sight distance. 4) Inadequate pavement markings. 5) Rough crossing surfaces. 6) Improper traffic signal pre-emption timing. 7) Improper pre-emption timing of railroad signals or gates.
Study to be Performed	<ol style="list-style-type: none"> 1) Review signing, signals and gates. 2) Check roadway illumination. 3) Review pavement markings. 4) Review sight distance.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Install advance-warning signs. 2) Install proper pavement markings. 3) Install proper roadway lighting on both sides of tracks. 4) Install automatic flashers and gates. 5) Improve sight distance. 6) Install stop signs. 7) Rebuild crossing. 8) Retime traffic signals. 9) Retime railroad signals and gates.

Link Accidents

Type of Accident - Parked Car Accidents	
Probable Causes	<ol style="list-style-type: none"> 1) Improper pavement markings. 2) Improper parking clearance at driveways. 3) Angle parking. 4) Excessive vehicle speed. 5) Improper parking. 6) Illegal parking.
Study to be Performed	<ol style="list-style-type: none"> 1) Review pavement markings. 2) Review parking clearance from curb. 3) Review angle parking if it exists. 4) Perform spot speed studies. 5) Law observance study.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Convert angle parking to parallel parking. 2) Paint parking stall limits 7 ft. (2.1 m) from curb face. 3) Post parking restrictions near driveways. 4) Prohibit parking. 5) Create off-street parking. 6) Reduce speed limit if justified by spot speed studies. 7) Widen lanes. 8) Enforcement.

Link Accidents

Type of Accident - Fixed Objects	
Probable Causes	<ol style="list-style-type: none"> 1) Obstructions in or too close to roadway. 2) Inadequate channelization. 3) Inadequate roadway lighting. 4) Inadequate pavement marking. 5) Inadequate signs, delineators and guide rails. 6) Improper superelevation. 7) Slippery surface. 8) Excessive vehicle speed. 9) Severe curve. 10) Severe grade.
Study to be Performed	<ol style="list-style-type: none"> 1) Review pavement markings, signs and delineators. 2) Review channelization. 3) Field observation to locate obstructions. 4) Check illumination. 5) Check superelevation. 6) Check for adequate drainage. 7) Perform spot speed studies.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Remove or relocate objects. 2) Improve roadway lighting. 3) Install reflectorized pavement lines. 4) Install reflectorized paint or reflectors or both on the obstruction. 5) Install crash cushioning devices. 6) Install guide rails or redirecting barriers. 7) Install appropriate warning signs and delineators. 8) Improve superelevation at curves. 9) Improve skid resistance. 10) Provide adequate drainage. 11) Provide "Slippery When Wet" signs (interim measure only). 12) Reduce speed limit if justified by spot speed studies. 13) Provide wider lanes. 14) Flatten curve. 15) Provide proper superelevation.

Link Accidents

Type of Accident - Sideswipe Collisions	
Probable Causes	<ol style="list-style-type: none"> 1) Inadequate pavement markings. 2) Inadequate channelization. 3) Inadequate signing. 4) Narrow traffic lanes. 5) Improper road maintenance. 6) Inadequate roadside barriers 7) Excessive vehicle speed.
Study to be Performed	<ol style="list-style-type: none"> 1) Review pavement markings. 2) Review channelization. 3) Review sign placement. 4) Review lane width. 5) Check roadside shoulders. 6) Check road surface for proper maintenance. 7) Perform spot speed studies.
Possible Safety Measures	<ol style="list-style-type: none"> 1) Provide wider lanes. 2) Install acceleration and deceleration lanes. 3) Place direction and lane change signs to give proper advance warning. 4) Install or refurbish centerlines, lane lines and pavement edge lines. 5) Perform necessary road surface repairs. 6) Improve shoulders. 7) Remove constrictions such as parked vehicles. 8) Install median divider. 9) Reduce speed limit if justified by spot speed study.

APPENDIX E

Sample Design Exceptions

Example 1

The following is an example of a design exception that would be included in the PDS.

DESIGN EXCEPTION

This project contains the following substandard controlling design elements:

CONTROLLING DESIGN ELEMENTS

<input type="checkbox"/> Stopping Sight Distance (SSD) <input type="checkbox"/> Vertical Curve(s)	<input type="checkbox"/> SSD at Non-Signalized Intersections
<input type="checkbox"/> SSD Horizontal Curve(s)	<input type="checkbox"/> Minimum Radius of Curve
<input type="checkbox"/> Minimum & Maximum Grades	<input type="checkbox"/> Cross Slope
<input type="checkbox"/> Lane Width (Through & Aux.)	<input checked="" type="checkbox"/> Superelevation
<input checked="" type="checkbox"/> Shoulder Width	<input type="checkbox"/> Bridge Width
<input type="checkbox"/> Vertical Clearance	<input type="checkbox"/> Structural Capacity
<input type="checkbox"/> Acceleration & Deceleration <input type="checkbox"/> Lane Length	<input type="checkbox"/> Through Lane Drop Transition Length

Substandard controlling design elements have been identified at the following locations:

Controlling Substandard Design Elements		
Location Number	Location (Station and Milepost)	CSDE
1	Rt. 42 NB, MP 26.88 to 27.00 Sta. 43+25 to 49+50	Substandard right shoulder
2	Rt. 42 NB, MP 14.25 to 14.28 Sta. 42+00 to 53+00	Substandard superelevation

Controlling Substandard Design Elements								
Impact		Location Number						
		1	2					
Indicator Accidents	Does not exceed statewide average		X					
	Exceeds statewide average	X						
Impacts								
COST	No Impact							
	Impact	X	X					
ROW	No Impact	X	X					
	Slope easements							
	Fee takings							
	Residential Impact							
	Business Impact							
ENVIRONMENTAL	No Impact	X	X					
	Wetlands Impact							
	Historic Bridge Impact							
	Historic site Impact							
	Public Parkland Impacted							
	Endangered species impacted							
	Sole source aquifer impacted							
	Contaminated site impacted							
UTILITIES	No Impact		X					
	Impact	X						
PUBLIC SUPPORT	Yes (date)							
	No							
	NA	X	X					

Note: For each location, check all that apply

Shoulder Width

Location Number	Location (Station/Milepost)	Type of Shoulder	Existing Width (feet)	Proposed Width (feet)	Standard Width (feet)
1	Rt. 42 NB & SB, MP 26.88 to 27.00 Sta. 43+25 to 49+50	Right	Varies 0 to 12	Varies 0 to 12	8

- Proposed Safety Measures

The proposed safety measures at Location 1 is resurfacing to improve the pavement skid resistance, installation of 100 mm wide long-life pavement edge lines, raised pavement markers and delineators mounted on the roadside guide rail.

- Accident Analysis

Fixed object accidents at Location Number 1 are over represented. Based upon the data that indicates 27 of the 29 indicator accidents occurred on a wet surface, we believe the wet surface condition is the major contributing factor to the accidents not the CSDE. A copy of the Bureau of Safety Programs accident analysis is included in the attached project fact sheet.

- Impact

Currently there are no shoulders on Route 42 under the Browning Road overpass. Providing standard width right shoulders at Location 1 would require the replacement of the Browning Road overpass. The cost to replace the existing overpass is estimated at \$2,000,000. There are currently no other projects for the 5-year program for this location. Not meeting the standard shoulder width at Location 1 will not result in degrading the relative safety of the roadway.

Superelevation (for mainline and ramps)

Location Number	Location (Station/Milepost)	Radius (feet)		EMax (%)		EMax 6%	V(safe) mph		V(safe) mph	Posted Speed (mph)
		Exist.	Prop.	Exist.	Prop.	Std.	Exist.	Prop.	Std.	
2	Rt. 42 NB, MP 14.25 to 14.28 Sta 42+00 to 53+00	3000	3000	1.5	1.5	4.8	71	71	77	55

- Proposed Safety Measures

The primary safety improvements at Location Number 2 will be the resurfacing of the highway to improve the skid resistance, 4 inch wide long-life pavement striping, and raised pavement markers.

- Accident Analysis

The accident rate at location 2 exceeds the statewide average. For the three-year period analyzed, there were 2 fixed object accidents out of a total of 7 accidents. It is our opinion, 2 accidents in 3 years is too low a frequency to be considered a result of the CSDE, as opposed to random occurrences. A copy of the Bureau of Safety Programs accident analysis is included in the attached project fact sheet.

- Impact

Providing the design superelevation at Location 2 requires the replacement of the concrete median barrier in addition to the increase in quantity of Hot Mixed Asphalt. Project cost would increase by \$280,000. However, only a 5 mph increase in safe speed would be accomplished. There are currently no other projects for the 5-year program for this location. Not meeting the design values at Location 2 will not result in degrading the relative safety of the roadway.

Example 2

The following is an example of a design exception that would be included in the PDS for a substandard design element on a bridge project.

DESIGN EXCEPTION

This project contains the following substandard controlling design element:

CONTROLLING DESIGN ELEMENTS

_____ Stopping Sight Distance (SSD) _____ Vertical Curve(s)	_____ SSD at Non-Signalized _____ Intersections
_____ SSD Horizontal Curve(s)	_____ Minimum Radius of Curve
_____ Minimum & Maximum Grades	_____ Cross Slope
_____ Lane Width (Through & Aux.)	_____ Superelevation
_____ Shoulder Width	_____ <u> X </u> Bridge Width
_____ Vertical Clearance	_____ Structural Capacity
_____ Acceleration & Deceleration _____ Lane Length	_____ Through Lane Drop Transition _____ Length

Substandard controlling design elements have been identified at the following locations:

Controlling Substandard Design Elements		
Location Number	Location (Station and Milepost)	CSDE
1	Rt35 NB & SB MP 51.5 to 52.10 Sta. 150+00 to 181+68	Substandard bridge width

Controlling Substandard Design Elements								
Impact		Location Number						
		1						
Indicator Accidents	Does not exceed statewide average	X						
	Exceeds statewide average							
Impacts								
COST	No Impact							
	Impact	X						
ROW	No Impact							
	Slope easements	X						
	Fee takings	X						
	Residential Impact							
	Business Impact							
ENVIRONMENTAL	No Impact							
	Wetlands Impact	X						
	Historic Bridge Impact	X						
	Historic site Impact							
	Public Parkland Impacted							
	Endangered species impacted							
	Sole source aquifer impacted							
	Contaminated site impacted	X						
UTILITIES	No Impact	X						
	Impact							
PUBLIC SUPPORT	Yes							
	No							
	NA	X						

Note: For each location, check all that apply

Bridge Width

Location Number	Location (Station/Milepost)	Bridge Width (feet)		Bridge Width (feet)
		Exist.	Prop.	Standard
1	M.P. 51.50 to 52.10 Sta. 150+00 to 181+68	54	54	64

- Proposed Safety Measures

The proposed safety measures at this location will be the installation of 4 inch wide long-life traffic stripes and delineators mounted on the bridge beam guide rail.

- Accident Analysis

There were no indicator accidents for the three years analyzed.

- Impact

To provide the standard bridge width would require replacement of the existing through girder structure. The cost to replace the bridge under this resurfacing contract is estimated to be \$1,500,000. A 150% increase in the construction cost. There is an existing gas station located at the northeast quadrant of the existing structure that would need to be acquired. In addition wetlands would be required to provide the standard width. This bridge is currently programmed to be replaced in 5 years. Not meeting the standard bridge width at this location would not result in the degradation of the relative safety of the roadway.

Example 3

The following is an example of a design exception on a project that does not require a PDS.

NEW JERSEY DEPARTMENT OF TRANSPORTATION

MEMORANDUM

To: Mr. Arthur D. Ziner
Director, Division of Design Services

From: Mr. John Smith
Project Manager, Division of Project Management

Date: April 15, 2003

Phone: 609-530-0003

RE: DESIGN EXCEPTION
Route, U.S. 206, Contract Number 0000000
Southampton Township
Burlington County
Milepost 14.00 to 14.19
Project Category: NHS Bridge Replacement
NJDOT Job Number: 5733313
Federal Project Number: BR-000S(131)

Approval of the design exception is requested to the following controlling design substandard elements contained in the NJDOT Design Manual Roadway; NJDOT Design Manual Bridges and Structures; AASHTO publication, A Policy on Geometric Design of Highways and Streets 2001 based on the warranting conditions described herein:

Attached is list by location of the impacts for the CSDE identified.

Please refer to the attached Project Fact Sheet for the project description. An accident analysis is also included.

Based on the warranting conditions presented (the existing conditions, proposed geometry, impacts, accident analysis and safety measures), it is recommended that the design exception be approved.

Approval By:

Mr. Arthur D. Ziner
Director, Division of Design Services

Date

Route U.S. 206
 Contract No. 00000000

DESIGN EXCEPTION

This project contains the following substandard controlling design element:

CONTROLLING DESIGN ELEMENTS

- | | |
|--|---|
| <input checked="" type="checkbox"/> Stopping Sight Distance (SSD)
Vertical Curve(s) | <input type="checkbox"/> SSD at Non-Signalized
Intersections |
| <input type="checkbox"/> SSD Horizontal Curve(s) | <input type="checkbox"/> Minimum Radius of Curve |
| <input type="checkbox"/> Minimum & Maximum Grades | <input type="checkbox"/> Cross Slope |
| <input type="checkbox"/> Lane Width (Through & Aux.) | <input type="checkbox"/> Superelevation |
| <input type="checkbox"/> Shoulder Width | <input type="checkbox"/> Bridge Width |
| <input type="checkbox"/> Vertical Clearance | <input type="checkbox"/> Structural Capacity |
| <input type="checkbox"/> Acceleration & Deceleration
Lane Length | <input type="checkbox"/> Through Lane Drop Transition
Length |

Substandard controlling design elements have been identified at the following locations:

Controlling Substandard Design Elements		
Location Number	Location (Station and Milepost)	CSDE
1	Rt. U.S 206, MP 14.0 Sta. 13+00 to 16+00	Substandard vertical curve

Controlling Substandard Design Elements								
Impact		Location Number						
		1						
Indicator Accidents	Does not exceed statewide average	X						
	Exceeds statewide average							
Impacts								
COST	No Impact							
	Impact	X						
ROW	No Impact							
	Slope easements	X						
	Fee takings							
	Residential Impact	X						
	Business Impact	X						
ENVIRONMENTAL	No Impact							
	Wetlands Impact	X						
	Historic Bridge Impact							
	Historic site Impact							
	Public Parkland Impacted							
	Endangered species impacted							
	Sole source aquifer impacted							
	Contaminated site impacted							
UTILITIES	No Impact	X						
	Impact							
PUBLIC SUPPORT	Yes							
	No							
	NA	X						

Note: For each location, check all that apply

Stopping Sight Distance on Vertical Curves

Location Number	Location (Milepost/Station)	Type of Curve	A (%) Exist. Prop.	L (feet) Exist. Prop.	S (feet) Exist. Prop.	S (feet) Stand.	V(calc.) (mph) Exist. Prop.	Posted Speed/ Design Speed (mph)
1	M.P 14.08 Sta. 13+00 to 16+00	Crest	4.5/4.5	300/300	389/389	495	47/47	50/55

- Proposed Safety Measures

Route U.S. 206 will be resurfaced within the project limits to improve pavement skid resistance. Shoulders will be provided and the guide rail updated to current standards.

- Accident Analysis

There were no indicator accidents for the three years analyzed.

- Impacts

To provide the standard length of vertical curve would require raising the existing road profile. Raising the roadway profile would require extending the project an additional 1400 feet and increase the project construction by \$500,000. An increase in the roadway profile would impact approximately one half acre of wetland and requires slope easements from forty residential properties and one business property. The additional slope easement required from the business property would eliminate all its parking spaces and require relocation of the access driveway in order to limit the maximum driveway gradient to 8%. It is estimated that the cost to acquire the business would be approximately \$500,000. There are currently no other projects for the 5-year program for this location. Not meeting the length of vertical will not result in degrading the relative safety of the roadway.

Project Fact Sheet

- A. Funding Source: HWA / NJDOT
- B. Type of Project: Bridge Replacement
- C. Highway Classification: Rural Arterial
- D. Project Limits: Route U.S 206 extends generally south-north from Red Lion Road (County Route 641) on the south to Main Street (County Route 642) on the north. The southern terminus of the project limits on U.S. 206 is station 10+00 and the northern terminus of the project is station 20+00.
- E. Project Origin: The initially preferred alternative during feasibility assessment described the structural deficiency rating of the existing bridge to be less than 50. It also identified the substandard crest vertical curve and substandard shoulders on Route U.S. 206. This problem statement was justified and assigned to Capital Program Management to develop the final design.
- F. Existing Conditions
- The approach roadway section consists of 12 ft. lane and 8 ft. shoulders in each direction. The roadway section across the bridge consists of a 15 ft. lane and no shoulders in each direction.
 - The roadway section is tangent with a normal crown for the length of the project.
 - There is substandard stopping sight distance on a 300 feet crest vertical curve beginning at station 13+00 and ending at 16+00.
 - Wire rope guide rail exists on both sides of the approaches to the structure.
- G. Proposed Improvements
- The existing bridge over Conrail will be replaced.
 - 8 ft shoulders will be provided on the new bridge.
 - Route U.S. 206 within the project limits will be resurfaced.
 - New guide rail and end treatments conforming to current standard will be constructed.
 - New sidewalk will be constructed on the southbound side of Route U.S.206. The new sidewalk will tie into the existing sidewalk on

- the south side of the bridge at Station 10+00 and extend to the existing sidewalk at station 17+00 on the north side of the bridge.
- H. Roadway Section: The proposed roadway section within the project limits will consist of a 12 ft. lane and an 8 ft. shoulder in each direct direction. The cross slope in the lane and shoulder will be 1.5% and 4% respectively.
 - I. ADT: Existing ADT is 12000 vpd (in 2003). Expected ADT for 2023 is 18000 vpd.
 - K. Posted Speed: The posted speed limit on Route U.S. 206 is 50mph.
 - L. Design Speed: The design speed for this project is 55 mph.
 - M. Approximate Cost of this Project: \$1 million



State of New Jersey

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February 14, 2003

Re: Design Exception Accident Analysis
Route U.S. 206
Southampton Township, Burlington County

Dear Mr. Johnson:

As requested in your letter of January 2, 2003, accident data was collected and analyzed for the subject location. Accident data used is for years 2000 through 2002. The following is a summary of this data.

Substandard Stopping Sight Distance on Vertical Curves - The indicator accidents for this CSDE are same direction accidents. For the three-year period analyzed, there were no indicator accidents.

If you have any questions, please call Richard Petty of this office at (609) 530-0001.

Very truly yours,

Kris Corrigan
Manager
Bureau of Safety Programs