DESIGN EXCEPTION PREPARATION GUIDELINES

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

ROADWAY DESIGN UNIT

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DESIGN EXCEPTION PREPARATION GUIDELINES

The purpose of this document is to assist the roadway designer in the preparation of the formal documentation needed to request a design exception. This document is meant to supplement the Design Exception Policy and provide consistency between the design exception submittals.

These guidelines are broken into two parts. The first part provides guidance for completing the "NCDOT DESIGN EXCEPTION REQUEST" form. The second part provides guidance for completing the "DESIGN EXCEPTION PROCESS CHECKLIST".

- **NCDOT DESIGN EXCEPTION REQUEST FORM**

DESIGN EXCEPTION REQUESTED FOR:

What should be listed here is one or more of the 13 specific controlling criteria outlined in the AASHTO "Green Book". These criteria include:

1. Design Speed*
2. Lane Width
3. Shoulder Width
4. Bridge Width
5. Structural Capacity
6. Horizontal Alignment
7. Vertical Alignment
8. Grade
9. Horizontal Stopping Sight Distance
10. Vertical Stopping Sight Distance
11. Cross slope
12. Superelevation
13. Vertical and Horizontal Clearance (not including clear zone)

*A design speed exception should be requested when several of the design criteria are in violation for a majority of the project length. Use of a design speed exception should be discussed with the Project Engineer.

The criteria for clear zones, located in the AASHTO Roadside Design Guide, are treated as guidance not requiring a design exception.

LOCATION OF DESIGN FEATURE IN QUESTION:

If only a few of the criteria need an exception, a listing of alignment designation and stationing may be appropriate (i.e. –L- STA 10+00, -Y5- STA 12+00 to 15+00, etc.).

For a design speed exception, just list "Entire Project Limits".

If the only design exception for the entire project is located where the project "ties in" to the existing facility, then a memo to the project file describing the design exception should be appropriate documentation. If there is another design exception within the project limits, then include the project "tie in" location in the formal design exception documentation.

PROJECT DATA

Current ADT (Year)

Build year annual daily traffic (ADT) projections. Usually listed in the planning document and possibly updated by submittal directly from Statewide Planning's Traffic Forecast Unit. (Traffic projections should be updated to be within 2 years of let date.)

Design ADT (Year)

Design year annual daily traffic (ADT) projections. Design year is normally 20 years after build year. Usually listed in planning document or updated by direct submittal from Statewide Planning's Traffic Forecast Unit if necessary.

% Trucks

Listed in planning document or traffic projections from Statewide Planning's Traffic Forecast Unit. (% Trucks is the sum of Dual % and TTST %.)

Design Speed

Design speed should be based on the functional classification for the facility. Refer to the 2001 AASHTO "Green Book" pages 67 to 72 and individual chapters for each particular classification for guidance. See Chapter 1, Section 1B of the Roadway Design Manual for a summary of this information. (Design speed for a

facility should be the greater of the minimum design speed for the facility type or the anticipated posted speed plus 5 mph.)

Posted Speed

Posted speed is sometimes listed in the planning document. If not, it will have to be determined by field visits or through discussions with division personnel (Division Construction Engineer, Division Traffic Engineer, etc.). If speed limit is not physically posted, general statutes mandate the speed limit as 55 mph. For the same situation inside city limits, general statutes call for a speed limit of 35 mph.

Functional Classification

The functional classification can be determined from the planning document. If the classification in the planning document states that the road is a Minor Arterial route and the route does not show up on the State's functional classification maps as a Major Arterial, then you should design using the Collector criteria. List the classification as a Collector.

However, care should be taken to choose the proper classification based on current usage. The planning document may state the classification is a collector, but the road actually functions as a local road. The functional classification should be addressed during the scoping phase of a project.

Minimum AASHTO Dimensions & Proposed Dimensions

The purpose of this section is to show the difference in the minimum AASHTO dimensions and the proposed dimensions requiring an exception.

Below is an example of this:

Minimum AASHTO Dimensions	**Proposed Dimensions**
Design Speed = 60 MPH	Design Speed =30 MPH
Sag Vertical Curve, K=45	Sag Vertical Curve, K=12

TOTAL ESTIMATED COST OF PROJECT

Enter the latest construction cost estimate.

ADDITIONAL COST TO MEET MINIMUM AASHTO REQUIREMENTS

This step can be time consuming if an alternative design has to be done prior to preparing a cost estimate. If an alternative design that meets the minimum

criteria has already been completed, then an estimate should be prepared. If no alternative design has been prepared and if it's obvious that to eliminate a design exception would be quite costly, then it may be appropriate to prepare a detailed written explanation of what cost increases could be expected. However, each project is different and the decision to prepare additional cost estimates should be discussed with the Project Engineer.

When no estimate has been prepared, just state in this section "see Basis for Exception, Item 4".

BASIS FOR EXCEPTION

Note – make sure questions 1-5 are restated exactly as shown

1. *Describe how the accident history relates to the proposed design exception. See current 3-year accident history, attached (number, severity, cause, comparison to statewide average, etc.).*

Typically, three- (3) year accident history is discussed in the planning document. If the planning document information is not current, updated accident data should be requested from Traffic Engineering. The latest three (3) years of accident data that is available prior to the date we anticipate signing of the design exception should be requested. Form letter *Traffic Accident Report Request Form.doc* is used to make this request. Documentation in this section should address how past accidents relate to design elements identified in the proposed project scope.

2. *Describe any future plans for upgrading this roadway either at or in the vicinity of the project.*

On most projects there are no plans to upgrade the roadway in the vicinity of the project. The following statement is then generally used, "There are no future plans for upgrading this roadway either at or in the vicinity of this project".

3. *Describe the cross-section, geometrics, access control, etc of the existing roadway outside the project limits.*

The purpose of this section is to describe the characteristics of the roadway outside of the project limits to aid in determining if improving the roadway to eliminate the design exception is economically justifiable and practical.

4. *Explain why it is not reasonable or feasible to meet (engineering, environmental and/or ROW constraints) minimum AASHTO requirements.*

This is the "heart" of the design exception. This section should address why the design exception is needed and provides supporting information as to why minimum design criteria cannot be met. Any and all data supporting the need for a design exception should be clearly presented and fully explained. All reasons should be substantiated with facts, historical data, estimates, etc.

5. *Describe any measures proposed to mitigate the design element that is below standards.*

On most projects there is only one way to mitigate for the substandard design elements and that is to post advisory signs. The following statement is then generally used, " To mitigate the design exception, we have requested that ## MPH advisory signs be installed at appropriate locations to warn motorists of the limitations of the design. The division has committed to reviewing the site for installation of advisory signs after the completion of the project".

- **DESIGN EXCEPTION PROCESS CHECKLIST**

Posted Speed

The posted speed refers to the proposed posted speed after the project is completed (in MPH). On projects with no existing posted speed you should use "Statutory 55 MPH". The posted speed for projects inside city limits may be different (i.e. 35 mph).

Functional Classification

The functional classification can be determined from the planning document. If the classification in the planning document states that the road is a Minor Arterial route and the route does not show up on the State's functional classification maps as a Major Arterial, then you should design using the Collector criteria. List the classification as a Collector.

However, care should be taken to choose the proper classification based on current usage. The planning document may state the classification is a collector, but the road actually functions as a local road. The functional classification should be addressed during the scoping phase of a project.

Terrain

Terrain can be divided into 3 classifications; level, rolling and mountainous. General descriptions of these 3 classifications are given in the 2001 "Green Book" on page 235. Additional information is given in the Roadway Design Manual in Chapter 1, Section 1D. Terrain type should be based on topographic characteristics of the project vicinity and not geographic regions of the state.

The remaining sections describe the design criteria items that are being reviewed for compliance. Attached to these guidelines is a chart showing the pages in the 2001 "Greenbook" that will assist in the preparation of the design exception checklist.

Design Speed

This is the driving force behind the requirements for needing a design exception. The AASHTO Standard values for the items requiring a design exception will be based on higher of either the posted speed or the minimum "Green Book" value for design speeds of that particular type facility (collector, arterial, etc.) The majority of the time, the posted speed will be the control. Therefore, the posted speed should be listed under the column "AASHTO Std." on the row for Design Speed and all the other design elements under this column would relate to the posted speed (or statutory speed).

The proposed design speed, which would be listed in the first column, is typically 5 mph above the posted speed. On certain projects, if numerous design elements require a design exception or a design element that occurs for a majority of the project length requires an exception, then a design speed exception may be warranted.

On new location and urban widening projects, it is rare that a design speed exception would be requested. The most common type of project that a design speed exception is called for is on bridge replacement projects. These types of projects generally have minimal roadway approach work due to environmental concerns and funding constraints.

An example of a design speed exception would be the following scenario:

Project type - bridge replacement over creek with wetlands

Posted speed - 55 mph (statutory)

Last 3 year accident data - None reported

Horizontal alignment - tangent

Vertical alignment - crest curve with k value meeting 35 mph

The scope of this project would be to replace the bridge and construct the roadway approaches within the end limits of the approaching guardrail. In order to correct the vertical curvature to meet 55 mph, the roadway approach construction would need to extend for a considerable length and would involve wetland impacts.

The situation, as described above, would be a candidate for requesting a design speed exception if the deficient design element(s) (1) encompasses the majority of the project length and (2) meets a design speed considerably lower than the posted speed. For item (2), a "rule of thumb" regarding the design speed of an element vs. posted speed, one can use the following guidelines (assuming a 55 mph posted speed):

- 55 mph – posted speed, therefore no exception needed

- 50 mph - request an exception for the design element only
- 45 mph - site specific- design element exception vs. design speed exception
- 40 mph - consider requesting a design speed exception
- 35 mph - consider requesting a design speed exception

An example of a design speed exception checklist is attached. Please note an additional column has been added to document the criteria for the lower requested speed. **NOTE - This additional column is only needed for design speed exceptions. Also, make sure to state the new requested design speed in the cover letter for design speed exceptions.**

Prior to preparing a **design speed** exception, discuss it with the Project Engineer. Under certain circumstances, it is possible that a request to the Regional Traffic Engineer to pursue a lower posted speed in that area may be appropriate. This may negate the need to prepare a design exception. Below is an example request that was sent via e-mail to a Regional Traffic Engineer.

Dear Ms. Becker,

We are in the early planning and design stages for the subject bridge replacement project. The scope of work consists of replacing bridge No. 3 over Ruin Creek along SR 1107 in Vance County. Based upon our field observation and design survey data, its appears that this project is a good candidate to investigate the likelihood of having speed limit reduced and re-posted. Presently the project is not posted; therefore, with our proposed design we are to meet the design criteria for a minimum 55-mph design speed or request a design exception for the design elements that do not meet a 55-mph design speed.

The horizontal and vertical alignment along SR 1107 in the vicinity of this project does not meet our current design guidelines for a 55-mph design speed. By copy of this e-mail, I request that you prepare a Speed Limit Study. The information that you provide from this study will likely be used as one of the mitigation factors for the preparation of the design exception. Any reduction of the speed limit in the vicinity of this project will help aid in the preparation and justification of a design exception.

Please let me know how long you anticipate that it will take to conduct this study. If you have any questions or need any additional information, you can contact Mr. Sam St.Clair, Project Design Engineer, or me at 250-4016.

Sincerely,
Roger

Roger,

Based on my investigation, I will recommend the reduction in the speed limit to 45 mph in this area. Please keep in mind that this is not typically done. We would normally maintain the 55-mph statutory speed limit in rural locations like this and handle any short sections that have alignment issues with advisory signing. However, this particular section of roadway from SR 1110, eastward to SR 1101, has a fair amount of development, and combined with its other roadway characteristics would warrant a 45-mph speed zone. I will write the ordinance requesting the reduction in speed limit.

Thanks,
Kelly

Lane Width

Lane widths are based on functional classification of the roadway and design year traffic projections. See the appropriate chapters in the 2001 AASHTO "Green Book" for each particular facility type for guidance. Part I, 1-13 of the Roadway Design Manual references the appropriate exhibits in the "Green Book".

Shoulder Width

Shoulder width is based on functional classification of the roadway and design year traffic projections. See the appropriate chapters in the 2001 AASHTO "Green Book" for each particular facility type for guidance or chapter 1-4 in the Roadway Design Manual.

Bridge Width

The current NCDOT Bridge Policy has been revised to reflect the bridge widths recommended in the 2001 AASHTO "Green Book" for each type of functional classification. A copy of the Bridge Policy can be found in the Roadway Design Manual, Part 1, 6-1. The bridge width discussion begins at the section titled "Deck Widths and Horizontal Clearances".

http://www.doh.dot.state.nc.us/preconstruct/highway/dsn_srvc/value/manuals/

Structural Capacity

This is the Structure Design Unit's responsibility, be sure they have checked for any design exception needs.

Maximum Grade

Maximum grades are determined based on terrain type and design speed. See the appropriate chapters in the 2001 AASHTO "Green Book" for each particular facility type for guidance. Part 1, 1-14 of the Roadway Design Manual references the appropriate exhibits in the "Green Book".

Min. Horizontal Curve Radius

This value can be obtained from the 2001 AASHTO "Green Book" page 145, Exhibit 3-14.

Sag Vertical Curve K

The K value is defined as the horizontal distance in feet [meters] needed to make a 1% change in roadway gradient, and as such is a measure of vertical curvature. The K value is useful in determining minimum lengths of vertical curves for various design speeds by comparing roadway grades and stopping sight distance (see explanation of SSD below). Design controls for sag vertical curves are listed in Exhibit 3-79 on page 280 of the 2001 "Green Book".

Crest Vertical Curve K

The K value is defined as the horizontal distance in feet [meters] needed to make a 1% change in roadway gradient, and as such is a measure of vertical curvature. The K value is useful in determining minimum lengths of vertical curves for various design speeds by comparing roadway grades and stopping sight distance (see explanation of SSD below). Design controls for crest vertical curves are listed in Exhibit 3-76 on page 274 of the 2001 "Green Book".

Horizontal SSD & Vertical SSD

Stopping Sight Distance (SSD) is dependent upon the design speed, brake reaction time, braking distance, and deceleration. The stopping sight distance for any given design speed can be obtained from Exhibits 3-1 and 3-2 in the 2001 "Green Book", pages 112 and 115 respectively. The SSD is also listed in Exhibits 3-76 (page 274) and 3-79 (page 280) with the corresponding K values for crest and sag vertical curves.

The values for Horizontal SSD and Vertical SSD on the checklist under the column for "AASHTO Std." will be the same.

The value for Horizontal SSD under the "Prop Design" column can be obtained graphically from the plans as described in the 2001 "Green Book" on pages 128-130.

The value for Vertical SSD under the "Prop Design" column can be obtained from Exhibits 3-76 (page 274) and 3-79 (page 280) by entering the chart with the actual K value used in the plans.

Pavement Cross Slope

Pavement cross slope is based on functional classification and typical sections. See chapter 4 in the 2001 AASHTO "Green Book" for each particular facility type for guidance.

Typically, this value will be 0.02, except for roads east of I-95 and other roadways with consistently flat grades, in which case the cross slope will be 0.025. A slope of 0.025 is not to be used on two lane roadways or on four lane roadways with each travel direction crowned at the centerline of pavement.

(It is very rare to have an exception for pavement cross slope.)

Superelevation

The value that should be shown under the "AASHTO Std" column is the maximum superelevation rate for the type of roadway being designed. This value can be obtained from the Roadway Design Manual, Part I, 1-15.

Vertical Clearance

Minimum vertical clearances are dependent upon facility type. See the appropriate chapters in the 2001 AASHTO "Green Book" for each particular facility type for guidance. These values are also listed in the Roadway Design Manual, Part I, 6-1.

Horizontal Clearance

Horizontal clearance distances (Clear Zone) are based on the design speed, design year traffic projection, and the perpendicular ground slope. See the appropriate chapters in the AASHTO Roadside Design Guide 2002 for horizontal clearance distances. For clear zones, the criteria in the AASHTO Roadside Design Guide should be treated as guidance and not as a national standard requiring a design exception if not numerically met (*per the USDOT / FHWA publication Flexibility in Highway Design).* However, a minimum clear zone distance commensurate with prevailing traffic volumes and vehicle speeds should be provided where practical *(2001 "Green Book page 323).*

The horizontal clearance requested on the checklist deals with the horizontal distance to obstructions. These values can be obtained in the appropriate section for each facility classification. Also, see page 322 in the 2001 "Green Book" for further discussion.

DESIGN EXCEPTION POLICY

Revised 1/99

1) INTRODUCTION

The "design exception" process is the procedure that documents the economic, physical, social, or environmental restraints that prevent the application of specific highway design criteria or standard. The use of a design exception does not constitute a hazardous or unsafe condition. Approval is not intended to forgive or endorse the use of a hazardous condition, but to acknowledge and concur that fulfilling a particular design standard requires an unreasonable expense or impact due to special or unusual conditions on the project.

2) POLICY

It is the policy of the N.C. Division of Highways (NCDOH) that the geometric design of all new highway construction, reconstruction or improvements on the State's National Highway System (NHS) meet the standards contained in the current edition of AASHTO's A Policy on Geometric Design of Highways and Streets for the appropriate functional (Freeways and/or Arterials) classification of the highway, AASHTO's A Policy on Design Standards -Interstate System or the Division of Highways' R-R-R Guidelines.

Exceptions to the standards set forth in the above policies and guideline may be approved only after careful consideration is given to all project conditions such as maximum service and safety benefits for the dollar invested, compatibility with adjacent sections of roadway, and the probable time before reconstruction of the adjacent section is required.

Preventative maintenance work includes roadway activities such as joint repair, pavement patching, resurfacing 1-1/2 inches or less in thickness, shoulder repair, restoration of drainage systems, bridge painting, pavement markings and other maintenance type activities that do not change any geometric features of the highway. Due to the nature of preventative maintenance activities, design exceptions will not be required.

During preparation of project environmental documents, the need for design exceptions, such as design speed, bridge or pavement widths, is often identified. Any such anticipated design exceptions required on a project are to be listed in the environmental document in a section entitled ANTICIPATED DESIGN EXCEPTIONS.

(3) APPLICABILITY

All highway projects (NHS and Non-NHS) designed by, or approved by, any unit of the NCDOH'S Highway Design Branch shall meet the AASHTO policy referenced. Failure to meet the design standards will require a design exception in accordance with Section 4 of this document.

All highway projects or improvements on the NHS that are designed, constructed or approved by a NCDOH Division Office shall meet the AASHTO policy referenced. Failure to meet the design standards will require a design exception in accordance with Section 4 of this document.

AASHTO standards apply to all work on the Interstate System and freeways (including 3R/4R work), new construction of NHS and non-NHS projects and the new lanes involved in widening existing two lane highways to four-lane divided facilities. The R-R-R guidelines apply to non-freeway 3-R projects, non- freeway safety projects and to the existing roadway when adding additional lanes to create a divided facility. The Highway Design Branch's Policy and Design Manuals, including the Bridge Policy, have been developed to meet minimum AASHTO standards. Designs conforming to these references generally need not be considered for design exceptions.

(4) DESIGN EXCEPTION APPROVALS

The requirements for design exceptions apply to all highway projects or improvements, as described above, regardless of the funding source for the work. In addition to work actually being performed, design exceptions are also required for any substandard design feature that requires formal approval (within the limits of the project) on existing highways that are not corrected by the project.

Formal design exception approval is required when minimum AASHTO criteria related to any of the following features is not met:

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Bridge Width
5. Structural Capacity
6. Horizontal Alignment
7. Vertical Alignment
8. Grade
9. Horizontal Stopping Sight Distance
10. Vertical Stopping Sight Distance
11. Cross Slope
12. Superelevation
13. Horizontal And Vertical Clearance

Formal approval is also required for exceptions to the R-R-R Guidelines. Project files should fully justify and document the need for a design exception to the standards.

Failure to meet any known AASHTO design standard other than the thirteen noted above should also be documented in the project files along with the appropriate reasons. Formal written approval of these exceptions is not required.

Design exceptions are normally justified and approved during the design phase of the project. Approval authority for design exceptions depends upon the type of work and the highway system. Approval responsibility for various types of projects is shown in Table 1. For those projects requiring NCDOH Highway Design Branch approval, the State Highway Engineer-Design will approve all design exceptions. The appropriate NCDOH Division Engineer is the Approving Official for those improvements requiring Division design exception approval. For those projects requiring Federal Highway Administration (FHWA) design exception approval, the FHWA Division Administrator, or his designee, is the Approving Official.

(5) PROCEDURES

The attached Design Exception Request form lists five items to be addressed as a basis for any design exception. The form should be completed for design features requiring formal approval. All five items should be adequately discussed with particular attention given to the accident analysis and mitigation items. The completed form should be submitted through the appropriate Unit Head or the designated Division personnel to the Approving Official. A file or log of approved design exceptions is to be maintained by the Approving Official's office.

The attached form should be also used to document failure to meet any known AASHTO design standard, other than the thirteen previously mentioned, when formal approval is not required. This documentation should be reviewed with the appropriate Unit Head or the Division Engineer's designee.

Mitigation measures for design exceptions should normally be investigated and considered. When mitigation is proposed as part of the design exception request, the responsible unit should be notified of the required measures to be provided on the project. The first notification should be by copy of the attached form when the approval is requested or the file is documented. The proposed mitigation should also be discussed with the responsible Unit at the preliminary field inspection.

The field inspection letter from the Division should include discussion of design exceptions, but the formal request for design exceptions should be in a separate memorandum.

TABLE 1

SYSTEM	*PROJECT / WORK TYPE*	*FHWA APPROVAL*	*DOH APPROVAL*
INTERSTATE	Projects that add lanes, add new interchanges, or revise existing interchanges.	**X** (1) (2)	
	Projects that will be added to the Interstate system under Section 139(a) or Section 139 (b)	**X** (1) (2)	
	Intelligent Transportation System Projects	**X** (1) (2)	
	Major 3-R Projects	**X** (3) (2)	
	All other type work		**X** (2)
NHS - OFF INTERSTATE	Projects that add lanes, add new interchanges, or revise existing interchanges.	**X** (3)	
	Intelligent Transportation System Projects	**X** (1)	
	All other type work		**X**
	High Speed Rails	**X** (1)	
ALL OTHERS	All projects		**X**

(1) FHWA approval required for Federally funded projects. The appropriate DOH Official approves design exceptions on non-Federally funded projects.

(2) Design exceptions for vertical clearance on the Interstate System require FHWA approval.

(3) FHWA approval required only if full preliminary engineering project is federally funded. For State funded preliminary projects, the appropriate DOH Official approves the design exception regardless of the type of funds used for the ROW and construction project.

NCDOT DESIGN EXCEPTION REQUEST

F.A. Project No.: State Project No.:

TIP No.: County:

Design Exception Requested for: (*design speed, bridge width, lane or shoulder width, structural capacity, horizontal or vertical clearance, stopping sight distance, horizontal or vertical alignment, grades, cross slopes, superelevation*)

Location of Design Feature in Question:

PROJECT DATA

Current ADT (Year): Design ADT (Year):

% Trucks Design Speed: Posted Speed:

Functional Classification:

Minimum AASHTO Dimensions: Dimensions Proposed:

Total Estimated Cost of Project:

Additional Cost to Meet Minimum AASHTO Requirements:

BASIS FOR EXCEPTION

1. Describe how the accident history relates to the proposed design exception. See current 3-year accident history, attached (number, type, rates, severity, cause, comparison to statewide average, etc.).

2. Describe any future plans for upgrading this roadway either at or in the vicinity of this project.

3. Describe the cross-section, geometrics, access control, etc. of the existing roadway outside the project limits.

4. Explain why it is not reasonable or feasible to meet (engineering, environmental, and/or ROW constraints) minimum AASHTO requirements.

5. Describe any measures proposed to mitigate the design element that is below standards.

Rev. 3/25/96

DESIGN EXCEPTION PROCESS CHECKLIST

Date: _____ Project Engineer: _____

TIP No: _____ Functional Classification: _____

Posted Speed _____ Terrain _____

Items requiring formal approval	Prop Design	AASHTO Std(1)	Exception Req'd
Design Speed(2)			
Lane Width			
Shoulder Width			
Bridge Width			
Structural Capacity(3)			
Maximum Grade			
Min. Horizontal Curve Radius			
Sag Vertical Curve K			
Crest Vertical Curve K			
Horizontal SSD			
Vertical SSD			
Pavement Cross Slope			
Superelevation			
Vertical Clearance			
Horizontal Clearance			

Listed below are the known non-complying items not requiring an approved design exception.

(1) The AASHTO STD. as it relates to the design speed should be equal to the higher of either the posted speed or the minimum "Greenbook" value for design speeds.
(2) If design speed is less than the posted or statutory speed, a design exception is required.
(3) Structure Design's responsibility - be sure they have checked for need of design exception.

MEMO TO: Mr. Tony Wyatt, PE

ATTENTION: Mr. Christopher Oliver
Traffic Safety Engineer

DATE:

FROM: (name, address, phone number, courier number, & e-mail address)

SUBJECT: Request for Traffic Accident Data (please check the appropriate blocks)

_____ Collision Diagram	_____ T07509 Straight Line Summary
_____ Copies of Accidents	_____ T07000 Intersection Summary Printout
_____ Hard Copies & Rates	_____ Other
_____ Rates	_____ Before & After

DIVISION: _____ COUNTY: _____ CITY: _____

LOCATION _____

TIME PERIOD: Accident dates from: _____

CRITERIA:

Minimum Number of Accidents: _____

Maximum Distance from the Intersection: _____

Distance on Crossroad: _____

TIP or State Number: _____

Please attach a map or a sketch of the location. If you have any questions regarding a request please call Monica Kerr @ 919-733-5730.

EXAMPLE

CHECKLIST FOR DESIGN SPEED EXCEPTION

Date: March 15, 2002 Project Engineer: Roger Thomas, PE

TIP No: B-3231 Functional Classification: Collector

Posted Speed Statutory 55 mph Terrain Rolling

Items requiring formal approval	Prop Design	AASHTO Std	AASHTO Std(1)	Excep. Req'd
Design Speed(2)	40 mph	40 mph	55 mph	40mph/55mph Yes / Yes
Lane Width	11	11	11	No / No
Shoulder Width	8	6	6	No / No
Bridge Width	28	28	28	No / No
Structural Capacity(3)	N/A	N/A	N/A	N/A
Maximum Grade	8%	13%	8%	No /No
Min. Horizontal Curve Radius	286.48(30mph)	510	1065	Yes / Yes
Sag Vertical Curve K	*33 (25 mph)	64	115	No / No
Crest Vertical Curve K	61 (40 mph)	44	114	No / Yes
Horizontal SSD	325	305	495	No / Yes
Vertical SSD	>650	305	495	No / No
Pavement Cross Slope	.02 ft/ft	.02ft./ft.	.02 ft/ft	No / No
Superelevation	.06	.06	.06	No / No
Vertical Clearance	25	23	23	No / No
Horizontal Clearance	3	3	3	No / No

Listed below are the known non-complying items not requiring an approved design exception.

* This vertical curve is only 100 feet from the intersection with US 220. Lower speeds are expected approaching a stop condition.

(1) The AASHTO STD. as it relates to the design speed should be equal to the higher of either the posted speed or the minimum "Greenbook" value for design speeds.
(2) If design speed is less than the posted or statutory speed, a design exception is required.
(3) Structure Design's responsibility - be sure they have checked for need of design exception.

DESIGN EXCEPTION PROCESS CHECKLIST PAGE NUMBERS FOR AASHTO STANDARD

(All values are based on the 2001 "Greenbook")

Items Requiring Formal Approval	Urban Local	Rural Local	Urban Collectors	Rural Collectors	Urban Arterials	Rural Arterials	Divided Arterials	Freeways
Design Speed (1)	394	384 & 385; 5-1	426; 6-1 & 434	424 & 426; 6-1	474	448	448	507
Lane Width	397	387 & 388; 5-5	429; 6-5 & 437	428 & 429; 6-5	476	452; 7-3	459	508
Shoulder Width	388; 5-5	387 & 388; 5-5	429; 6-5	429; 6-5	452; 7-3 & 477	452; 7-3	459	508
Bridge Width	390; 5-6, 5-7 & 403	389 & 390; 5-6, 5-7	430; 6-6, 6-7 & 440	430; 6-6 & 431; 6-7	485	451	451	510
Structural Capacity (2)	390; 5-6, 5-7	390; 5-6, 5-7	430; 6-6 & 431; 6-7	430; 6-6 & 431; 6-7	451	451	451	510
Maximum Grade	395	386; 5-4	435 & 436; 6-8	427; 6-4	475 & 476; 7-10	450; 7-2	450; 7-2	509 & 510; 8-1
Min. Horizontal Curve Radius	145; 3-14	145; 3-14	145; 3-14	145; 3-14	145; 3-14	145; 3-14	145; 3-14	145; 3-14
Sag Vertical Curve K	280; 3-79	280; 3-79	280; 3-79	280; 3-79	280; 3-79	280; 3-79	280; 3-79	280; 3-79
Crest Vertical Curve K	274; 3-76	274; 3-76	274; 3-76	274; 3-76	274; 3-76	274; 3-76	274; 3-76	274; 3-76
Horizontal SSD	110, 112; 3-1 & 395	384 & 385; 5-2	426; 6-2	425 & 426; 6-2	449; 7-1	449; 7-1	449; 7-1	110, 112; 3-1 & 228
Vertical SSD	110, 112; 3-1 & 395	384 & 385; 5-2	426; 6-2	425 & 426; 6-2	449; 7-1	449; 7-1	449; 7-1	272 & 274; 3-76
Pavement Cross Slope	396	387	435	314; 4-4 & 425	476	450	459	309 & 314; 4-4
Superelevation	396	387	435	428	475	450	463	509
Vertical Clearance	403	389	440	431	476	451	451	510
Horizontal Clearance	403	391	441	431	485	452	452	511

(1) The AASHTO STD as it relates to the design speed should be equal to the higher of either the posted speed or the minimum "Greenbook" value for design speeds.
(2) Structure Design's responsibility - be sure they have checked for need of design exception.

EXAMPLE

MEMO TO: Ms. Deborah Barbour, PE
State Design Engineer

FROM: Mr. Jay Bennett, PE
State Roadway Design Engineer

DATE: April 11, 2001

SUBJECT: Project (*WBS Element here)* (B-9999) Watauga County
F. A. Project MA-BRZ-459
Bridge 999 over Some River and
approaches on SR 1355

Request for Design Exception

This is a request for a design exception for design speed. See attachment for pertinent information.

If you have any questions, please contact _____, Project Engineer or me.

Project Design Engineer	Asst. State Roadway Engineer
Project Engineer	State Roadway Design Engineer

JAB/pei
Attachments
cc: Project Engineer

APPROVED: _____

DATE: _____

Cc: Jay Bennett, PE
Project Engineer

EXAMPLE

NCDOT DESIGN EXCEPTION REQUEST
(Project does not require FHWA design approval)

F.A. Project No.: **MA-BRZ-459** State Project No.: ***WBS Element here***

TIP No.: **B-9999** County: **Watauga**

Design Exception Requested for: **Design Speed**

Location of Design Feature in Question: **Entire Project**

PROJECT DATA

Current ADT (2000): **192** vpd Design ADT (2020): **400** vpd

% Trucks: **3%** Design Speed: <**20 mph** Statutory Speed: **55 mph**

Functional Classification: **Rural Local Route**

Minimum AASHTO Dimension: **Design Speed = 30 mph**

Proposed Dimension: **Design Speed** = <**20 mph**

Total Estimated Cost of Project: **$725,000**

Additional Cost to Meet Minimum AASHTO Requirements: **N/A**
(See Item 4 in Basis for Exception)

BASIS FOR EXCEPTION

1. *Describe how the accident history relates to the proposed design exception. See current 3-year accident history, attached (number, type, rates, severity, cause, comparison to statewide average, etc.).*

   No accidents were reported in the vicinity of the bridge during the period from September 1, 1993 to August 30, 1996. More recent accident data information is not available at this time.

2. *Describe any future plans for upgrading this roadway either at or in the vicinity of this project.*

   Division 11 has paved the gravel segment shown north of the proposed bridge and resurfaced existing pavement on SR 1355. There are no future plans for upgrading this roadway either at or in the vicinity of this project.

3. *Describe the cross-section, geometrics, access control, etc. of the existing roadway outside the project limits.*

   Currently the existing road has less than 18’ of pavement at the bridge with 2’ to 8’ grass shoulders throughout. The existing one lane structure has a clear roadway width of 11’. The horizontal alignment is tangent on the bridge with a sharp, 60’ radius curve immediately off the bridge to the north.

4. *Explain why it is not reasonable or feasible to meet (engineering, environmental, and/or ROW constraints) minimum AASHTO requirements.*

   The proposed design calls for 9’ lanes with 4’ grassed shoulders. Guardrail will be added to protect the bridge approaches and shoulders will be widened to 7’ where guardrail is required. The proposed bridge, with a clear roadway width of 24’ will be located approximately 70’ west of the existing structure. This will allow traffic to be maintained on the existing structure during construction.

   To improve the design speed to 55 mph, a major relocation of SR 1355 would be required. Minimum 5 degree horizontal curves with 0.06 superelevation would require taking two homes and would have greater impacts on all of the properties south and west of the current alignment. Vertical curvature to meet a sag K-value of 100 would raise the bridge by 15 feet as well as lengthen it by 250 feet. This higher grade would also greatly complicate the ability to make driveway ties to the properties within the project limits. Designing for 55 mph would require wider pavement and a wider bridge. This would increase the “footprint” of the project, and therefore, increase the negative impacts to the adjacent properties.

   Cost estimates for the alternates that meet a 55 mph design speed were not requested because of the severe impacts this type of design would have on the existing development. These types of improvements would not be consistent with the existing nature of the roadway outside of the project limits.

   The proposed design provides a minimum design speed of <20-mph with some design elements satisfying 30 to 60 mph design speeds. (See the design exception process checklist for examples.) This proposed design is compatible with the existing SR 1355 alignment outside the project limits and is acceptable in consideration of the low projected design year traffic volume (400 vpd).

5. *Describe any measures proposed to mitigate the design element that is below standards.*

   The existing one lane bridge has an advisory posting of 20 mph. Advisory postings will be evaluated again by Mr. John Doe, PE, Area Traffic Engineer, upon completion of the project.

EXAMPLE

MEMO TO: Ms. Debbie Barbour, PE
State Design Engineer

FROM: Jay A. Bennett, PE
State Roadway Design Engineer

DATE: September 2, 2003

SUBJECT: Project 32835.1.1 (B-3045) Stokes County
F. A. Project BRSTP-89(5)
Bridge No. 17 over Dan River and approaches
on NC 89

Request for Design Exception

This is a design exception request to reduce the design speed from 55 mph to 40mph. See attachments for pertinent information.

If you have any questions, please contact Glenn Mumford PE Project Engineer, or me.

Project Design Engineer	Asst. State Roadway Engineer
Project Engineer	State Roadway Design Engineer

JAB/lws
Attachments
cc: Glenn Mumford, PE

APPROVED: _____

DATE: _____

cc: Jay A. Bennett, PE
Glenn Mumford, PE
Vickie L. Embry

NCDOT DESIGN EXCEPTION REQUEST
(Project does not require FHWA design approval)

F.A. Project No.: **BRSTP-89(5)** State Project No.: **32835.1.1**

TIP No.: **B-3045** County: **Stokes**

Design Exception Requested for: **Design Speed reduction from 55 mph to 40 mph**

Location of Design Feature in Question: **Entire Project**

PROJECT DATA

Current ADT (2003): **910** Design ADT (2025): **1415**

% Trucks: **6%** Design Speed: **40 mph** Statutory Speed: **55 mph**

Functional Classification: **Rural Major Collector**

Minimum AASHTO Dimensions: **40 mph** Dimensions Proposed: **40 mph**

Total Estimated Cost of Project: **$1,850,000**

BASIS FOR EXCEPTION

1. *Describe how the accident history relates to the proposed design exception. See current 3-year accident history, attached (number, type, rates, severity, cause, comparison to statewide average, etc.).*

   There was one accident reported in the vicinity of the bridge during the 3-year period from April 1, 1998 to March 31, 2001. A vehicle on SR 1504 (Lynchburg Road) approaching NC 89 failed to stop due to brake failure and the driver attempted to make a right turn onto NC 89. The vehicle's momentum carried it into the left lane and it struck the bridge rail.

2. *Describe any future plans for upgrading this roadway either at or in the vicinity of this project.*

   There are no future plans for upgrading this roadway either at or in the vicinity of this project.

3. *Describe the cross section, geometrics, access control, etc. of the existing roadway outside the project limits.*

   The existing roadway is 20’ wide with 6’ to 8’ shoulders throughout the proposed project limits. The existing bridge is 379’ long and 28’ wide. The eastern approach and existing bridge are on a horizontal tangent, and the western approach is on a 12-degree curve. The speed limit is 55 mph, by statute, since the speed limit is not posted.

4. *Explain why it is not reasonable or feasible to meet (engineering, environmental and/or ROW constraints) minimum AASHTO requirements.*

   To meet a design speed of 55 mph, the horizontal curve radius at the beginning of the project would have to be flattened to approximately 5 degrees, requiring the alignment to be shifted further south, increasing the impacts to a parallel stream and coming dangerously close to several buildings on the southwest side of the current alignment. Altering the vertical design to meet a 55 mph design speed would have comparable negative impacts to the adjacent properties and the parallel stream. In addition, changing the proposed grades would greatly increase the difficulty of maintaining traffic during construction. The proposed design provides a design speed of 40 mph, the recommended AASHTO minimum for this facility type, with some design elements satisfying 40 to 55 mph design speeds. (See the Design Exception Process Checklist for more specific information.) The proposed design is compatible with the existing NC 89 alignment outside of the project limits and will provide equal or improved conveyance compared to the existing roadway.

5. *Describe any measures proposed to mitigate the design elements that are below standards.*

   40 mph advisory signs are posted in the project vicinity for the NC 89/SR 1504 intersection. Upon completion of the project, Vickie L. Embry, Regional Traffic Engineer, will evaluate the need for additional advisory postings.

DESIGN EXCEPTION PROCESS CHECKLIST

Date: September 2, 2003 Project Engineer: Glenn Mumford, PE

TIP No: B-3045 Functional Classification: Rural Major Collector

Posted Speed 55mph (Statutory) Terrain Rolling

Items requiring formal approval	Prop Design	AASHTO Std	AASHTO Std[1]	Exception Req'd 40 mph/55 mph
Design Speed[2]	40 mph	40 mph	55 mph	**Yes**
Lane Width	11 ft	11 ft	11 ft	No/No
Shoulder Width	6 ft	5 ft	5 ft	No/No
Bridge Width	28 ft	28 ft	28 ft	No/No
Structural Capacity[3]	HS 20	HS 20	HS 20	No/No
Maximum Grade	3.0067%	8%	7%	No/No
Min. Horizontal Curve Radius	509.30 ft[4]	510 ft	1065 ft	No/Yes
Sag Vertical Curve K	67	64	115	No/Yes
Crest Vertical Curve K	80	44	114	No/Yes
Horizontal SSD	>305 ft	305 ft	495 ft	No/Yes
Vertical SSD	316 ft	305 ft	495 ft	No/Yes
Pavement Cross Slope	2.0%	1.5%-2.0%	1.5%-2.0%	No/No
Superelevation	0.06	$\leq$ 0.08	$\leq$ 0.08	No/No
Vertical Clearance	N/A(River)	N/A (River)	N/A (River)	No/No
Horizontal Clearance	>10 ft	10 ft	10 ft	No/No

(1) The AASHTO STD. as it relates to the design speed should be equal to the higher of either the posted speed or the minimum "Greenbook" value for design speeds.
(2) If design speed is less than the posted or statutory speed, a design exception is required.
(3) Structure Design's responsibility - be sure they have checked for need of design exception.
(4) The slight difference in the values for the proposed radius and the AASHTO requirement for 40 mph (0.70 ft) is a result of the switch to measuring horizontal curvature by radius instead of degree of curve and the rounding associated with that conversion.

EXAMPLE

Date

NOTE Please see Table 1 in the Design Exception Policy for when this letter is required.

Mr. John Sullivan
Division Administrator
Federal Highway Administration
310 New Bern Avenue, Suite 410
Raleigh, North Carolina 27601

Dear Mr. Sullivan:

SUBJECT: Project *WBS Element* (*TIP #*) _____ County
F. A. Project _____
_____
_____

Request for Design Exception

We request a design exception for _____
_____. See attachment for pertinent information.

If you have any questions, please contact _____, Project Engineer, or me.

_____ _____
Roadway Project Design Engineer Asst. State Roadway Engineer

_____ _____
Roadway Project Engineer State Roadway Design Engineer

Sincerely,

Deborah M. Barbour, PE
State Design Engineer

DMB/___
Attachment
cc: Jay A. Bennett, PE
Roadway Design Project Engineer

APPROVED: _____

DATE: _____
Cc: Deborah M. Barbour, PE