WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE

DD-604
NON-FREEWAY NHS RRR POLICY
October 19, 2006

Attached for your use is the Division of Highways Non-Freeway NHS RRR Policy dated October 19, 2006 which was approved by the Federal Highway Administration on January 31, 2007. It shall be used on all applicable projects.

Attachment

NON-FREEWAY NHS RRR POLICY

INTRODUCTION

These criteria have been developed to assure that maximum benefits can be derived from available funds for restoration, rehabilitation, and resurfacing (RRR) of non-freeway highways on the National Highway System (NHS) in a manner which will preserve and extend the service life and enhance safety. Because the priority and scope of such projects are based primarily on needs and economic considerations, emphasis is placed on implementation of cost-effective improvements, where practical, while considering and including appropriate safety improvements.

Non-Freeway NHS Route RRR projects, are basically an attempt to extend the service life of an existing highway and enhance safety by use of pavement resurfacing, shoulder restoration, traffic control devices, safety improvements, and drainage improvements as required. Projects may also include minor adjustments to superelevation, improvements to lane widths, radii, or other modifications to eliminate spot safety hazards. Reference is hereby made to National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, for further use by the designer in considering safety improvements. This Report can be found at the following web address: http://safety.transportation.org/guides.aspx.

RRR projects are defined as restoration or rehabilitation of existing pavement, substructure, superstructure or other significant parts of the existing system. Specifically, pavement overlay projects shall be designed using the criteria contained herein, when the project scope consists of an overlay greater in thickness than a one and one-half inch wearing course and either a patching and leveling course or a scratch course as defined in DD-644. Additionally, bridge deck overlays and projects repairing structural members shall require the application of this criteria. Generally the level of service is not increased.

Special circumstances such as extraordinary costs, significant environmental impacts, route continuity, etc., may require consideration of exceptions to these criteria. Any exceptions to these criteria will be documented as required by DD-605 "Design Exception Policy". FHWA approval must be obtained on non-exempt Federal-aid projects. On any project designated for concurrence review by FHWA, any required design exceptions shall also be concurrently reviewed by FHWA.

When costs due to upgrading geometric features or the structural section for RRR projects exceed the original proposed expenditure by a substantial amount, the designer will evaluate the benefits received from a RRR project versus a reconstruction project.

APPLICABILITY

These criteria shall apply to all RRR non-freeway projects on the National Highway System regardless of funding source. All design elements not meeting the criteria set forth in this directive will require the preparation and approval of a design exception.

FUNCTIONAL CLASSIFICATION

The highway system in West Virginia has been functionally classified into the following areas: Arterial, Collector and Local Roads and Streets.

Arterial highways generally provide direct service between cities and larger towns and are high speed, high volume facilities. Arterial routes may be freeways, other divided highways or two-lane highways. All NHS routes are by definition Principal Arterials.

PHYSICAL CHARACTERISTICS, POTENTIAL IMPACTS, AND PROJECT SELECTION

The physical characteristics of a highway and its general location often determine what improvements are necessary, desirable, possible, practical, or cost-effective. Topography, climate, adjacent development, existing alignment (horizontal and vertical), cross section (traveled way width, shoulder width, cross slope, side slopes, etc.), and similar characteristics will be considered in determining the scope of geometric or safety improvements to be made.

Quite often, the scope of geometric improvements made by RRR projects is influenced by potential impacts on the surrounding land development. Typically, social, environmental and economic impacts severely limit the scope of RRR projects, particularly where the existing right of way is narrow and there is considerable adjacent development. The need for additional right of way frequently determines the upper limit of practical geometric improvements.

Projects are identified and selected based on a variety of factors with the pavement or bridge condition being of utmost importance. The pavement condition itself will not affect the extent of geometric improvements included in the project. Geometric improvements will be initiated to fulfill traffic service/safety needs.

TRAFFIC VOLUMES

Traffic data is needed in the design of all highway improvements. For RRR Projects the need for a formal forecast of future traffic is greatest when the current traffic is approaching the capacity of the highway, and decisions must be made regarding the timing of major improvements such as additional lanes. Studies to determine future traffic are not normally necessary on low volume roads where even high percentage increases in traffic do not significantly affect design decisions. The current average daily traffic will be used for design purposes except in specific cases of capacity-related problems.

DESIGN SPEED

The minimum design speed shall be the existing posted speed limit.

HORIZONTAL CURVATURE/SUPERELEVATION

Within the limits of the RRR Project the existing horizontal curvature and superelevation will not be determined for each curve. All curves will be investigated during field reviews and available crash data for the locations reviewed. Reconstruction of the curve, modification of the superelevation, and/or special signing/delineation will be considered as appropriate; however, reconstruction would only be considered cost-effective at higher ADT levels. Advisory curve signs with speed plates will be erected for all curves with safe driving speed less than the posted speed limit or regulatory speed limit, or if possible, the superelevation will be adjusted. The designer is also encouraged to consider the following strategies on curves identified to have a high crash rate: widening of the roadway or shoulder throughout the curve, installation of shoulder rumble strips (this would require the shoulder to be paved to a minimum width of 3 feet), enhancement of delineation along the curve by use of post-mounted delineators outside the roadway, and the mitigation of pavement-edge drop-offs by designing and placing a "wedge" of pavement, at a 30 to 35 degree angle, at the edge of the pavement.

The above information is taken from Volume 7 of the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, to which reference in hereby made to the designer for more information concerning other strategies for increasing the safety of horizontal curves.

VERTICAL ALIGNMENT

Design speeds of existing crest vertical curves will not be determined within the RRR project limits. During the design process all vertical curves will be reviewed for possible reconstruction if the curve significantly reduces stopping sight distances, or the curve hides major potential hazards such as intersections, sharp horizontal curves or narrow bridges. If reconstruction of the curve, to include flattening of the vertical curve (if a crest curve) or widening of the shoulders, or relocation of the intersection(s) is determined not to be cost-effective, warning signs or advisory signing modification for the potential hazard will be considered. Also, enhancement of visibility by use of delineators will be considered, as well as removal of roadside fixed-object hazards.

PAVEMENT THICKNESS FOR OVERLAY

A pavement design will be executed in accordance with DD-641 "Pavement Design Selection Guide." Pavement designs are to be approved by the Deputy State Highway Engineer/ Operations. Exceptions to Pavement Thickness Design will be documented and approval requested from the Deputy State Highway Engineer/Development. A brief history of the existing pavement shall be included with the request for exception to the design thickness, along with a report of the existing pavement conditions obtained from field inspections. The straight-line diagrams maintained by the Planning and Research Division can be utilized as a source of information regarding the history of the existing pavement.

Special Skid Resistant Pavement (bid Item 402001-*) is to be used for the final wearing course on all routes where the ADT is 3,000 or more. Pavement per Section 401 may be utilized as

the final course when the ADT is less than 3,000 and there is no evidence of a high wet-pavement crash rate at that particular location. Special Skid Resistant Pavement will be specified on routes that have a reported high wet-pavement crash rate.

LANE AND SHOULDER WIDTHS

A. DIVIDED ARTERIAL CRITERIA

Lane Width: Lane width shall be 12 feet (3.6 m) minimum.

Usable Shoulder Width:

1. Usable shoulders to the right of traffic will be 8 feet (2.4 m) minimum.

2. Usable shoulders to the left of traffic will be 3 feet (0.9 m) minimum. For six or more lanes, 8 feet (2.4 m) should be provided.

   Paving of the usable shoulder is preferred. Rumble strips will be required on all paved shoulders 3 feet (0.9 m) or greater in width.

B. UNDIVIDED ARTERIAL CRITERIA

Lane and Shoulder Widths in feet (meters)				
Current Design Volume ADT	**Design Speed mph(km/h)**	**Shoulder Width Feet(meters)**	**Lane Width in feet (meters)**	
			<10% Trucks	**≥10% Trucks**
< 2000	< 50(80)	4(1.2)	10(3.0)	11(3.3)
	≥ 50(80)	4(1.2)	11(3.3)	12(3.6)*
≥ 2000	All	6(1.8)	11(3.3)	12(3.6)*

*11 feet (3.3 m) lanes may remain where alignment and safety records are satisfactory.

NOTE: Shoulder widths noted are minimums from a design criteria standpoint. Actual constructed widths should be in accordance with the existing, available shoulder width up to a maximum of 10 feet (3.0 m). The designer shall maintain, as much as possible, a consistent paved shoulder width through the project. This width should match that width which can be obtained predominantly along the roadway in question. For urban roadway segments with a curb/curb and gutter section, lane and shoulder widths are to match the existing section unless traffic service/safety needs dictate the need for widening, assuming existing lane widths meet or exceed the minimums listed in this table.

PAVEMENT CROSS SLOPE AND SUPERELEVATION

Pavement resurfacing under the RRR program will be accomplished such that the finished pavement is center crowned on tangent sections and the cross slope is a minimum of 1.6%. When warranted by the crash history, the existing superelevation shall be evaluated per the AASHTO criteria. On four-lane, high speed, divided highways the designer shall require the Contractor to submit the existing superelevation data for review. If the existing superelevation does not meet AASHTO standards, the designer shall either require the Contractor to upgrade the superelevation or shall prepare a design exception for approval.

VERTICAL CLEARANCE

Vertical clearance shall be at least 14 feet (4.3 m) over the entire roadway, including usable shoulder. If a design exception is approved, signing, in conformance with the Manual on Uniform Traffic Control Devices, is to be used to delineate the low clearance.

SAFETY

Because safety enhancement is an essential consideration, RRR projects will be developed and accomplished in a manner which considers and includes appropriate roadside safety improvements. Once RRR project route segments are selected, an analysis of several years of accident data will be made for each. Evaluation of crash records often reveals problems requiring special attention. Relative crash rates can be an additional important factor in establishing both the priority and scope of RRR Projects. The crash history for the project area will be compiled and compared to the statewide average accident rate for the same type of road. This data review is an integral part of the RRR Project development process to determine feasible safety modifications for incorporation into the project as necessary. Route segment crash rates, critical crash rate segments, spot locations having potential for safety improvements, and hazardous segments identified through the highway safety improvement program will be identified, documented, and made available for each RRR Project developed. Also, the Designer will coordinate with the District Traffic Engineer for the District in which the project is located for a determination if the project includes locations with known safety issues, based on the Division of Highway's tracking system prioritized safety improvements list. These safety issues will be evaluated and addressed in the project, if feasible. The design will incorporate spot improvements as well as general safety feature upgrading as appropriate. These determinations will be made considering the accident rate for each RRR segment, ADT, design speed, geometry, and other pertinent factors.

The designer is hereby directed to the National Cooperative Highway Research Program Report 500, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan for guidance concerning strategies for safety enhancements related to the various types of dangers faced by drivers described in the report's Volumes, which can be found at the following web address: http://safety.transportation.org/guides.aspx.

The Volumes are referenced as follows:

1. Volume 1: A Guide for Addressing Aggressive-Driving Collisions
2. Volume 2: A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses
3. Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations
4. Volume 4: A Guide for Addressing Head-On Collisions
5. Volume 5: A Guide for Addressing Unsignalized Intersection Collisions
6. Volume 6: A Guide for Addressing Run-Off-Road Collisions
7. Volume 7: A Guide for Reducing Collisions on Horizontal Curves
8. Volume 8: A Guide for Reducing Collisions Involving Utility Poles
9. Volume 9: A Guide for Reducing Collisions Involving Older Drivers
10. Volume 10: A Guide for Reducing Collisions Involving Pedestrians
11. Volume 11: A Guide for Increasing Seat Belt Use
12. Volume 12: A Guide for Reducing Collisions at Signalized Intersections
13. Volume 13: A Guide for Reducing Collisions Involving Heavy Trucks

Interactive Highway Safety Design Model

The Interactive Highway Safety Design Model (IHDSM) is road safety evaluation software that evaluates the safety impact of specific geometric designs for roadways. This software, available free on this web site: www.ihsdm.org/ihsdm_public/index.html, estimates current or future safety performance based on crash predictions. This software can be used to analyze the predicted safety performance of a roadway segment before a RRR project, and then be used to predict the safety performance of the proposed improvement in the project. Comparisons can then be made, using the predicted reduction in crashes, of the cost-effectiveness of an improvement.

It is recommended that this analysis be used for 2-lane RRR projects only.

Road Safety Audits

A Road Safety Audit (RSA) is the formal safety performance examination of an existing or future road or intersection by an independent audit team. Its main objective is to address the safe operation of intersections and roadways to ensure a high level of safety for all road users. More information concerning RSA's can be found at the following web sites: safety.fhwa.dot.gov/state_program/rsa/ and www.roadwaysafetyaudits.org.

An RSA team assesses the crash potential and safety performance of a roadway or intersection and prepares a report that identifies potential safety issues. Project officials or managers can then evaluate and determine appropriate changes. An RSA can be used in any phase of project development from planning to construction. An RSA done during the planning and design stages can identify potential safety issues before they are built into the project.

It is recommended that Road Safety Audits be conducted on multilane RRR projects. This determination will be made by the Traffic Engineering Division in conjunction with the District Traffic Engineer for the District in which the project is located. If it is decided a Road Safety Audit is not necessary, then at minimum the crash data must be obtained and analyzed to identify any existing safety problems.

Clear Zone

The term "clear zone", for this design policy, shall be used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles. The disposition of existing obstacles within the clear zone shall be treated in the following order of preference:

1. Remove or relocate obstacle.

2. Redesign obstacle to reduce hazard (e.g. frangible mountings, etc.)

3. Shield obstacle with approved traffic barrier.

4. Leave obstacle in place with or without treatment (e.g. delineation). This will require the designer to prepare documentation to the project file of the reasons for leaving the obstacle in place and the choice of delineation, if any.

Cut slopes within the "clear zone" require special attention by the designer. Smooth cut faces, free of jagged projections, may be left in place. Cut faces that are rough can be graded to a smooth face in the contract or shielded by an approved traffic barrier. If no corrective action is taken on rough cut faces inside the "clear zone", a design exception must be written.

The minimum clear zone for non-freeway NHS routes shall be as follows:

A. MULTILANE HIGHWAYS (RURAL AND URBAN)

The minimum clear zone shall be determined in accordance with the latest edition of the AASHTO Roadside Design Guide.

B. **TWO LANE HIGHWAYS**

Rural Highways:

Minimum Clear Zone in feet(meters)		
Current Design	**Design Speed**	
Volume (ADT)	**≤ 40 mph (60 km/h)**	**> 40 mph (60 km/h)**
≤ 750	6(1.8)	8(2.4)
751 to 2000	8(2.4)	10(3.0)
2001 to 4500	10(3.0)	12(3.6)
> 4500	12(3.6)	14(4.2)

Urban Highways (Without curb and gutter):

Minimum Clear Zone in feet(meters)		
Current Design	**Design Speed**	
Volume (ADT)	**≤ 30 mph (50 km/h)**	**> 30 mph (50 km/h)**
≤ 2000	4(1.2)	6(1.8)
> 2000	6(1.8)	8(2.4)

Urban Highways (With curb and gutter):

The minimum clear zone shall be one and one-half feet behind the curb.

SIGNING, SIGNALS AND PAVEMENT MARKINGS

All traffic signs, pavement markings and traffic signals will be in conformance with the "Manual on Uniform Traffic Control Devices." Traffic control during construction shall be maintained in accordance with a traffic control plan included in the plans. The traffic control plan shall be as specified in the latest edition of the Division's "Manual on Temporary Traffic Control for Streets and Highways".

BRIDGE LOADING

All bridges encountered within or immediately adjacent to RRR Project limits will be investigated to determine their load carrying capacity. For each bridge, the rating will be determined from the state highway bridge inventory. If the rating equals or exceeds an HS-20

loading, the bridge will be considered to meet the RRR program design criteria for bridge loading. For bridges with a rating below an HS-20 loading, a design exception shall be required for the bridge to remain in its existing condition.

BRIDGE RAILING

Bridge railings will be evaluated according to criteria established in the Division's "Bridge Design Manual", dated March 1, 2004, Section 3.2.2 – Barriers, on all bridges within or immediately adjacent to RRR Project limits. The evaluation will determine if the existing railing is acceptable or must be modified. All bridge railings shall be continuous and have a surface with no protrusions that could snag vehicles. Also, considering the ADT and speeds served, the railings shall have uniform and adequate overall strength.

A. If the railing is determined not to be structurally adequate, a structurally adequate bridge railing is to be provided as part of the project. If a determination of adequacy cannot be made by the project designer, Engineering Division should be consulted to make this determination.

B. If the railing is determined not to be crash worthy, a crash worthy railing is to be provided as a part of the project.

BRIDGE APPROACH GUARDRAIL

Approach guardrail, in accordance with current Division of Highways' Standards, will be installed at all bridge locations. This will include an appropriate attachment to the bridge railing, a transition section and an end treatment. Only approved crash tested approach guardrail installations will be used.

BRIDGE WIDTH

A. DIVIDED ARTERIALS

Bridges < 200 feet should have the full width of roadway.
Bridges ≥ 200 feet, traveled way plus 4 feet (1.2 m) offset (inside and outside) to the face of parapet. APD bridges that were originally constructed with a travel way plus three foot offsets (inside and outside) may also remain in place.

B. **UNDIVIDED ARTERIALS**

Current Design Volume ADT	Usable Bridge Widths
≤ 2000	Width of Approach Travel Way + 2 feet(0.6 m)
2001 to 4000	Width of Approach Travel Way + 4 feet(1.2 m)
> 4000	Width of Approach Travel Way + 6 feet(1.8 m)*

*Bridges ≥ 200 feet, traveled way plus 4 feet (1.2 m) offset (inside and outside) to the face of parapet. APD bridges where the original constructed bridge width was equal to the travel way plus three foot offsets (inside and outside) may also remain in place.

Appropriate warning signs and delineation will be provided for all bridges with widths less than the finished approach roadway (lanes + shoulders) width.

NON-FREEWAY NHS RRR DESIGN CHECKLIST

The attached design checklist shall be submitted with all Non-Freeway NHS RRR Project PS&E submittals to Program Administration Division. The Design Exception report per DD-605 is only required on those projects where exceptions are included in the design.

Sheet _____ of _____

NON-FREEWAY NHS RRR DESIGN CHECKLIST

State Project Number _____

Federal Project Number _____

County _____

Project Name _____

Date _____

Current ADT: _____ vpd

Design Speed: _____ mph (km/h)

Pavement Thickness for Overlay (if applicable): _____ inches (mm)

Lane Width: **Criteria _____ feet (meters)**

Actual _____ feet (meters)

Shoulder Width: **Criteria _____ feet (meters)**

Actual _____ feet (meters)

Vertical Clearance: **_____ feet (meters)**

Clear Zone: **Criteria _____ feet (meters)**

Actual _____ feet (meters)

Bridge Width: **Criteria _____ feet (meters)**

Actual _____ feet (meters)

Bridge Railing (if applicable):

Structurally Adequate **Yes** **No**

Crash Worthy **Yes** **No**

Bridge Rating: **HS - _____**

Safety Improvements Considered (add additional sheets as necessary):

_____

_____

_____

_____

Safety Improvements Incorporated: **Yes** **No**

Design Exceptions Required & Attached: **Yes** **No**

Completed by: _____