

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DESIGN DIRECTIVE**

**DD-606
NON-NHS RRR POLICY
*October 19, 2006***

Attached for your use is the Division of Highways' Non-NHS RRR Policy dated October 19, 2006 which was approved by the Division of Highways on January 18, 2007. It shall be used on all applicable projects.

Attachment

RRR POLICY
ROUTES NOT ON THE
NATIONAL HIGHWAY SYSTEM

2006

INTRODUCTION

These criteria have been developed to assure that maximum benefits can be derived from available funds for restoration, rehabilitation, and resurfacing (RRR) of highways other than freeways 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 economic considerations, emphasis is placed on implementation of cost-effective improvements where practical while considering and including appropriate safety improvements.

Non-freeway resurfacing, restoration, and rehabilitation projects, referred to as "RRR Projects," are basically an attempt to reestablish the original project by improving the riding characteristics and include 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, and other significant efforts to eliminate spot safety hazards. Projects are most commonly bituminous concrete resurfacing with shoulder restoration and spot safety improvements. Generally the level of service is not increased. 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>.

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".

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 an RRR project versus a reconstruction project. When a reconstruction project is selected instead of a RRR project, the Division of Highways' latest Design Standards and Design Directives will be utilized in redesign.

APPLICABILITY

These criteria shall apply to all RRR non-freeway projects not 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 by legislation into the following areas: Expressway, Trunkline, Feeder and Local Service. The American Association of State Highway and Transportation Officials (AASHTO) utilizes, as presented in the publication; "The AASHTO Green Book," a similar functional classification system. The designations used are; Freeway, Arterial, Collector and Local Roads and Streets. Therefore, state highways have been assigned these classifications also.

Arterial highways generally provide direct service between cities and larger towns and are high speed, high volume facilities. Collector highways serve small towns directly, connecting them and local roads to the arterial system. Local Roads and Streets primarily provide access to farms, businesses, residences, and other abutting properties from either Arterial or Collector highways.

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 (pavement 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 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

A reasonable and logical average running speed on each arterial, collector, and local road/street RRR Project will be established for use as the design speed. This speed shall be determined by review of posted speeds and curve advisory speed signs, and assessing the roadside development, curvature, and other roadway features such as pavement width, shoulder width, and horizontal and vertical alignments. A speed study may be required, due to the fact that the posted speed limit may not represent the actual running speed of that segment of roadway. Projects may contain segments with different design speeds.

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 is hereby made to the designer for more information concerning other strategies for increasing the safety of horizontal curves. The web link for this report is: <http://safety.transportation.org/guides.aspx>.

VERTICAL ALIGNMENT/STOPPING SIGHT DISTANCE

Design speeds based on stopping sight distances 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 (1) the ADT is greater than 2000, (2) the curve significantly reduces stopping sight distances, or (3) 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), 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 for an eight-year performance period on all Non-NHS Routes. This is in compliance with Design Directive 641, Pavement Design Selection Guide. Pavement thickness designs are to be approved by the Director of the Engineering Division. Exceptions to Pavement Thickness Design will be documented and approval requested from the Divisions' 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 accident rate at that particular location. Special Skid Resistant Pavement will also be specified on routes that have a reported high wet-pavement accident rate.

LANE AND SHOULDER WIDTHS

Lane and shoulder width studies have been completed for the Transportation Research Board. The report entitled "Roadway Widths for Low-Traffic-Volume Roads" has been prepared as the National Cooperative Highway Report 362.

The research studies show that for roads with less than 2000 ADT, there is no apparent accident reduction above a total roadway width, including travel lane and usable shoulder width, of 9.2 m (30'). Widening a lane from 2.4 m (8') or 2.7 m (9') to 3 m (10') produces no apparent benefit of accident reduction.

The research studies show that the accident rate is not improved by widening a lane from 2.7 m (9') to 3 m (10') unless a shoulder width of 1.5 m (5') is provided. Widening a lane from 3 m (10') with little or no shoulder width to 3.4 m (11') plus greater than 0.9 m (3') shoulders appears effective in terms of expected reduction of accident rates. The study shows that accident rates are lower on 3.4 m (11') and 4 m (12') lanes than on 3 m (10') or 2.7 m (9') lanes; however, the accident rate appears to be essentially the same for 4 m (12') lanes as on 3.4 m (11') lanes.

Shoulder widths were not studied in regards to reduction of accident rates independently as indicated above. Each project shall be evaluated on pavement and shoulder widening for cost effectiveness. Widening should only be conceded if the accident rate can be significantly reduced. The remainder of the route, of which a project may be only a short segment, should be reviewed for continuity of lane and shoulder widths.

The following Pavement/Shoulder Width Table is to be used to determine the minimum values for cross section elements of the facilities on Non-Freeway Non-NHS RRR Projects:

PAVEMENT/SHOULDER TABLE			
<i>ARTERIAL</i>			
ADT	PAVEMENT(MINIMUM)		SHOULDER MINIMUM**
	>60 km/h (40 MPH)*	≤60 km/h (40 MPH)	
>2000	6.7 m (22')	6.1 m (20')	01.2 m (4')
≤2000	6.1 m (20')	5.5 m (18')	0.6 m (2')
<i>COLLECTOR</i>			
ADT	PAVEMENT(MINIMUM)		SHOULDER MINIMUM**
	>64 km/h (40 MPH)*	≤64 km/h (40 MPH)	
>2000	6.1 m (20')	5.5 m (18')	0.6 m (2')
≤2000	5.5 m (18')	5.5 m (18')	0.3 m (1')

* km/h(MPH) Designations Are Design Speeds

** Widths noted are minimums from a State approved design criteria standpoint. Actual constructed widths should be in accordance with the existing, available shoulder width up to a maximum of 2.4 m (8').

Exceptions to the Division's minimum widths in the Pavement/Shoulder Width Table for pavement and shoulders must be documented and approved by the Division of Highways Deputy State Highway Engineer/Development or other designated official.

For urban roadway segments with a curb/curb and gutter section, pavement and shoulder widths are to match the existing section unless traffic service/safety needs dictate the need for widening.

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. In the situation that this evaluation results in a crash rate that is determined to be excessive, the designer shall require the Contractor to submit the existing elevation 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 on all state highways shall be at least 4.1 m (13'-6") over the entire roadway width. If this clearance cannot be provided, a design exception shall be prepared according to DD-605 and submitted for approval, and appropriate signing will be erected.

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' 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 crash 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 link: <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

Clear Zone

The roadside recovery area is commonly referred to as the clear zone and is defined as that area available for use by errant vehicles, starting at the edge of the traveled way and terminating at the closest obstruction. The primary purpose of a clear zone is the safety of the traveling public. The maximum width of any clear zone which the Division of Highways can control is limited by its right of way; however, moving all existing obstacles from the right of way may not be necessitated by the clear zone policy.

While it may be ideal to remove all obstacles, in many cases such removals may be impractical and ineffective. For example, it is less effective to move those obstacles near the outer limits of the clear zone than those near the traveled way. Moving a pole one foot so that it lies on the right of way line or off the right of way is not always prudent nor cost-effective and adds little to the safety intent of the zone. Once a decision is made to move an obstruction from the clear zone, it should be moved as far from the traveled way as practical.

Although the basic concept seems simple, there are a number of factors which make for the development and implementation of an effective clear zone difficult. One of the biggest factors influencing the establishment of a clear zone in West Virginia is terrain. Many of our roadways are constructed along hillsides with steep slopes, which may have natural obstacles (such as rock cliffs, streams, hillsides, etc.) within the desirable clear zone width. Development of a policy which requires a statewide uniform clear zone distance within such areas would be neither practical nor effective.

It will be the responsibility of the Engineering, Traffic (along with the District traffic Engineer), and Right of Way Divisions to work together, to establish a consistent clear zone for each project. The width of this zone should be based on the type of highway, operating speed and accident history of the highway section with consideration given to existing features within the highway right of way. Obstacles within the established zone shall either be removed, given adequate protection, or identified by proper warning devices. All obstacles outside the consistent clear zone should be evaluated on an individual basis to determine whether greater distances could be attained for short distances.

The design speed is one of the primary controls for establishing a consistent clear zone, since it generally correlates with the severity of the accident and the distance an errant vehicle is likely to stray from the traveled way.

Design speeds can be divided into two classes:

60 km/h (40 MPH) or Less: This design speed is typical for rural local service routes, collector routes, and urban roads and streets. Collisions with fixed objects at these speeds are less likely to be severe. In most cases within this class, it will be of little benefit to move obstructions unless there is a documented accident history.

Greater than 60 km/h (40 MPH): This design speed is found on many rural arterial and collector highways and is common on urban arterials. These highways are generally

characterized by the absence of parking or other impediments to smooth traffic flows. High speed operations characterize most rural arterials and a few urban arterials. In these situations, a collision with a fixed object will almost certainly result in major property damage and/or medical trauma. Given these operating speeds, the keys to establishing a consistent clear zone are the features of the roadside and the potential for accidents. When the Division of Highways determines that existing objects are likely to be involved in accidents and/or cause injuries to the highway user, corrective measures will be initiated to provide a safer environment via an appropriate clear zone. Decisions on each project should be made based on documented accident history and existing obstacles along the road or street.

While this policy has not set a defined clear zone width, it has established some very fundamental guidelines. These guidelines are to be used by those individuals responsible for determining how much clear zone can be reasonably obtained in any given highway section. This clear zone should never be less than the designated shoulder width. The ultimate goal is to provide the maximum usable clear zone available in any given section of highway.

ENCROACHMENTS AND UTILITIES (GUARDRAIL ONLY PROJECTS)

Projects for replacement guardrail to be placed at designated locations and which are not continuous shall have the non-work areas identified on the plans by the words "Project Omission." Encroachments existing within the non-work areas will not be shown on the Encroachment Report. All other Encroachments will be shown by Station and Offset on the straight line plan and listed in the Encroachment Report.

The designer will list utilities that are in conflict and/or may be involved in the limits of work. This determination shall be made by contacting the affected utilities. A "Plan Note" will be included in the plans stating that the Contractor will be responsible for contacting the utility companies before entering the area of potential conflict. The note shall include the names of utilities and the location by station or mile post as determined. The note shall also include the name and telephone number for the contact person for each utility company involved.

SIGNING, SIGNALS AND PAVEMENT MARKINGS

All traffic control 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 operating rating will be determined from the state highway bridge inventory. If the operating rating equals or exceeds an HS-15 loading, the bridge will be considered to meet the RRR program design criteria for bridge

loading. For bridges with an operating rating below an HS-15 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' Standard, will be installed at all bridge locations. This will include an appropriate attachment to the bridge railing, a transition section and an end treatment. When existing roadway physical features prohibits placement to full standards, the design will provide the best treatment possible.

BRIDGE WIDTHS

Bridge widths for bridges to remain in place should be in accordance with the following:

CONDITION	BRIDGE WIDTH
ADT >2000 or Design Speed greater than 60 km/h (40 MPH)	*Approach Pavement +1.2 m (4')
ADT ≤2000 or Design Speed 60 km/h (40 MPH) less	*Approach Pavement +0.6 m (2')

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

NON-FREEWAY NHS RRR DESIGN CHECKLIST

The attached design checklist shall be submitted with all Non-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.

NON-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: _____