

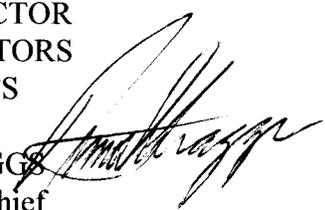
Memorandum

*Flex your power!
Be energy efficient!*

To: DISTRICT DIRECTOR
DEPUTY DIRECTORS
DIVISION CHIEFS

Date: November 19, 2007

File: 608

From: TIMOTHY CRAGG 
Acting Division Chief
Division of Design

Subject: Design Information Bulletin 79-03

Effective immediately, Design Information Bulletin (DIB) 79-03 “Design Guidance and Standards for Roadway Rehabilitation Projects [Pavement Focused (2R) and Resurfacing, Restoration, and Rehabilitation (3R) Projects]...” has been updated and is available on the Division of Design website at www.dot.ca.gov/hq/oppd/dib/dib79-03.pdf.

BACKGROUND

Progressively since the 1980's, Federal regulations have allowed increased flexibility when using Federal-aid funding for cost-effective pavement repairs. Caltrans has consistently utilized this increased flexibility with the support of the Federal Highway Administration (FHWA). The FHWA has allowed Caltrans to develop and adopt a comprehensive pavement program to preserve and extend the service life of the California State Highway System (SHS). DIB 79-03 increases that flexibility by enabling Caltrans to identify, design, and deliver a new category of pavement repair projects, 2R Projects, that not only return the pavement to a state of good repair, but also enhance highway safety through efficient integration of targeted and cost-effective safety improvements. The Safety Screening process that will be used to identify 2R Projects, regardless of functional classification, and the integration of safety improvements into 2R Projects is an effective way to preserve both mobility and safety. DIB 79-03 provides design guidance and standards for both 2R and 3R Projects, and for certain other types of projects, on the SHS.

SUMMARY OF KEY CONCEPTS IN DIB 79-03

- All roadway rehabilitation projects are to be scoped taking into consideration all modes of travel and the context of the facility being rehabilitated.
- A life cycle cost analysis shall be performed to assist the decision-making process being used to select the pavement rehabilitation strategy or strategies used within the project limits; see *Highway Design Manual (HDM) Topic 619* and the *LCCA Procedures Manual* for further guidance.
- The purpose and need for 2R and 3R Projects is to restore the facility to a state of good repair so that the roadway will be in a condition that only requires minimal maintenance expenditures by Caltrans.

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- The determination of whether a segment of highway is to proceed as either a 2R or 3R Project is to be made after a Safety Screening has occurred and during the pre-PID phase.
- District Traffic Safety will perform this Safety Screening prior to the initiation of the PID phase;
- The results of the Safety Screening and the pavement condition analysis will be used to determine and adequately define the scope of the project.
- If District Traffic Safety identifies an immediate safety concern, the immediate initiation of a safety improvement project should be considered and weighed against waiting for the delivery of a 2R or 3R Project.
- Upgrades and additions to pedestrian facilities must be considered on projects covered by DIB 79-03. Pedestrian accessibility and compliance with the Americans with Disabilities Act (ADA) is to be decided on a project-by-project basis in accordance with *DIB 82* and *HDM Topic 105*.
- Features required for compliance with the Caltrans National Pollutant Discharge Elimination System (NPDES) Permit / Storm Water Management Plan (SWMP) must be included in the scope of work for 2R and 3R Projects.

If you have any questions, please contact Kevin Herritt, Chief, Geometric Design Standards at (916) 653-0253. Project specific applicability and questions should be referred to the Division of Design District Coordinators.

c: Holders of the Highway Design Manual
Deputy District Directors for Design
Deputy District Directors for Project Management
Deputy District Directors for Planning
Deputy District Directors for Maintenance and Operations
District Permit Engineers
Kevin Herritt

DESIGN INFORMATION BULLETIN NUMBER 79-03

**Department of Transportation
Division of Design
Office of Geometric Design Standards**

**Design Guidance and Standards
For
Roadway Rehabilitation Projects**

[Pavement Focused (2R) and Resurfacing, Restoration, and Rehabilitation (3R) Projects]

And

Certain Other Projects

[Storm Damage, Protective Betterment, Operational Improvement and Safety-funded Projects]

APPROVED BY:



**TIMOTHY CRAGGS
ACTING DIVISION CHIEF
DIVISION OF DESIGN**

November 19, 2007

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1.0 Capital Pavement Improvements to the State Highway System

The focus of this Design Information Bulletin (DIB) is to provide guidance on design procedures and standards for roadway rehabilitation projects, both 2R and 3R, and to provide guidance on how to identify safety enhancements and other upgrades to include in these projects. This DIB supplements the highway design guidance and standards provided in the California Department of Transportation *Highway Design Manual (HDM)*. The standards established herein are communicated in the same manner as defined in Chapter 80 of the *HDM*. When this DIB is silent on a subject covered in the *HDM*, the new construction design guidance in the *HDM* applies.

This DIB is not a textbook or a substitute for engineering knowledge, experience or judgment. Many of the instructions given herein are subject to amendment as conditions and experience may warrant. Special situations may call for variation from the policies and procedures described in this document, subject to Division of Design approval, or such other approval as may be specifically provided for in the text.

More information regarding highway design for roadway rehabilitation projects can be found in the *American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide* and *AASHTO "Highway Safety Design and Operations Guide - Chapter 4: "Rural Highways."* Copies of these publications can be ordered through the AASHTO website. Other resources that are available and should be reviewed include:

- *DIB 82: "Pedestrian Accessibility Guidelines for Highway Projects;"*
- *Storm Water Quality Handbook "Project Planning and Design Guide;"*
- Chapter 7 of the *Traffic Manual*;
- *California MUTCD*;
- *"Guidelines for Reconstruction of Intersections,"* dated August 1985, which is available through the Headquarters Division of Traffic Operations;
- *HDM Pavement Engineering Chapters 600 through 670*; and the,
- *Life-Cycle Cost Analysis (LCCA) Procedures Manual*.

1.1 Pavement Repair Program Elements in the State Highway and Protection Program (SHOPP)

The SHOPP has various funding programs that the Department uses to repair the pavements on the State Highway System. Specifically:

- 3R Projects are programmed in and funded out of the SHOPP 201.120 Program;
- Capital Preventive Maintenance (CAPM) Projects are programmed in and funded out of the SHOPP 201.121 Program;
- 2R Projects are programmed in and funded out of the SHOPP 201.122 Program; and,
- Long-life Pavement Rehabilitation projects are programmed in and funded out of the SHOPP 201.125 Program.

This DIB provides guidance for projects in the SHOPP 201.120 and 201.122 Programs. For further information about these SHOPP program elements, see Chapter 7 in the *Coding Manual* on the Headquarters Division of Accounting website.

1.2 Capital Preventive Maintenance (CAPM) Projects

CAPM Projects are not covered by this document. See the *Project Development Procedures Manual (PDPM)*, *HDM Topic 603*, and *DIB 81: Capital Preventative Maintenance (CAPM) Guidelines* on the Departmental website for more guidance on CAPM Projects.

1.3 Project Development Guidance for 2R and 3R Projects

Chapter 9 of the *PDPM* describes the project development process for roadway rehabilitation projects. The Project Initiation Document (PID) typically used for roadway rehabilitation projects is the “*Project Scope Summary Report (PSSR) for 3R Projects*.” This document should be used for both pavement resurfacing, restoration, and rehabilitation (3R) and pavement resurfacing and restoration (2R) projects. In addition, the “*Main Streets: Flexibility in Design and Operations*” publication located on the Department Division of Design “Context Sensitive Solutions” website should be consulted for guidance during the scoping process.

1.3.1 Purpose and Need

Generally speaking, the purpose and need for 2R and 3R Projects is to restore the facility to a state of good repair so that the roadway will be in a condition that only requires minimal maintenance expenditures by the Department; see *HDM Topic 612* for further guidance on Department standards related to pavement design life. 2R Projects are to be programmed as “pavement-focused” projects, with their primary goal being to extend the service life of the identified pavement structure; while 3R Projects, in addition to extending the service life of the pavement structure, also replace and upgrade other highway appurtenances and facilities within the project limits that are failing, worn out or functionally obsolete. The determination of whether a segment of highway is to proceed as either a 2R or 3R Project is to be made after Safety Screening has occurred and during the pre-PID phase; see Section 1.3.3 for further guidance.

1.3.2 Existing Pavement Condition

The scope of a roadway rehabilitation project is driven by the purpose and need for the project. Roadway rehabilitation projects will vary in scope depending on pavement condition needs and the identified safety enhancements, and other facility upgrades, needed within the project limits. Analysis of the pavement condition data reported in the Pavement Management System will identify the structural deficiencies of the pavement structure that needs to be repaired and trigger the need for a project. Additional data including testing data and materials analysis such as deflection test results for flexible pavements; and notes from field reviews of the project site may also dictate the viable pavement repair strategies for the project. The *PDPM* should be consulted for further guidance on scoping roadway rehabilitation projects, the Scoping Team Review process, and additional guidance on deflection studies and field reviews. The *HDM*, particularly Topics 625, 635, and 645, should be consulted for further guidance on rehabilitation designs and requirements for pavements.

1.3.3 Safety Screening to Identify 2R Projects

Safety Screening to identify and analyze the collisions within the limits of all proposed roadway rehabilitation projects is required, regardless of highway type; see *HDM Index 62.3*. A review of collision data and other relevant information is required to determine if the highway segment in need of pavement repairs qualifies as a 2R Project, or if it should be repaired and upgraded as a 3R Project. The District Traffic Safety unit will perform the Safety Screening prior to the initiation of the PID phase. The results of the Safety Screening, in addition to the results of the pavement condition analysis, will be used to determine and adequately define the scope of the project. Integrating targeted (e.g., addition of protection devices,

such as Metal Beam Guard Rail) and cost-effective safety improvements (e.g., signing, striping) into 2R Projects is an effective way for the Department to preserve both mobility and safety. District Traffic Safety can be contacted to obtain more details on the Safety Screening process and procedures.

If the Safety Screening determines that targeted and cost-effective traffic operation strategies are the only needed safety enhancements within the project limits, the project can be identified as a “pavement-focused” 2R Project. If the Safety Screening results in the determination that more extensive safety work is required, which is beyond the targeted and cost-effective traffic operation strategies mentioned above, then the project will be identified as a 3R Project. In either case, the scope of the project should incorporate the recommendations of the Safety Screening.

If during the Safety Screening, a safety issue is identified and recommended for corrective action, District Traffic Safety will consider initiating a separate safety improvement project. In most cases, safety enhancements incorporated into 2R and 3R Projects are considered proactive safety measures.

1.3.4 Alternative Countermeasures to Reconstruction for Safety Improvement

In some cases, reconstruction measures to enhance safety in a corridor are impractical. When that is the case for a given location or segment of highway, it is important to remember that there exists a broad range of alternative measures that can be used alone or in combination with others to improve the safety along an existing highway. The Headquarters Division of Traffic Operations Office of Traffic Safety Program website has additional guidance on countermeasures to reconstruction which provides a list of “*General Countermeasures for Accident Patterns and Their Probable Cause*” that may aid designers. See *Highway Safety Improvement Program (HSIP) Guidelines*, Chapter 3.0, pages 3-15 through 3-21 for further information. Table 1 in this DIB serves as a supplement to the *HSIP* guidance and provides a partial list of alternative countermeasures to reconstruction for various existing geometric conditions.

1.4 Applicability to Certain Other Types of Projects

Certain storm damage repair, protective betterment, operational improvement and safety-funded non-freeway projects, as defined below, are to be designed using the geometric design guidance provided in Section 3.3 of this DIB:

- All projects costing less than the Minor A limit (excluding the cost of Right of Way and Environmental Mitigation);
- Projects costing more than the Minor A dollar limit and do not involve extensive grading, paving, or retaining structures that are not spot locations.
- Projects that are considered “spot” improvements; typically, these projects can be up to approximately one-half mile in length. Examples of this type of work include storm damage repairs, curve improvements, adding turn pockets, miscellaneous pavement widening, culvert replacement, and rock slope protection.
- Permanent Restoration projects, triggered due to fire, earthquake, slides or storm damage, that do not include structures such as walls or bridges, may be restored to the “condition” that existed prior to the damage.
- The 2R and 3R guidance in this DIB also applies to bridge deck rehabilitation projects funded from the Bridge Rehabilitation (20.xx.210.110) Program that necessitate the inclusion of improvements to the geometric features, and other improvements, in addition to the work being performed to restore the bridge deck.

**TABLE 1
ALTERNATIVE COUNTERMEASURES TO RECONSTRUCTION**

| Existing Geometric Condition: | Alternate Countermeasure: |
|--|---|
| <p align="center">Narrow lanes and shoulders</p> | <ul style="list-style-type: none"> ◆ Pavement edge lines ◆ Raised pavement markers ◆ Recessed pavement markers in snow areas ◆ Post (roadside) delineators ◆ Rumble strips |
| <p align="center">Steep side slopes</p> | <ul style="list-style-type: none"> ◆ Shield with guardrail ◆ Roadside delineators |
| <p align="center">Roadside obstacles</p> | <ul style="list-style-type: none"> ◆ Remove or relocate obstacle ◆ Slope flattening (including ditches) ◆ Add breakaway hardware to obstacle ◆ Shield with guardrail ◆ Delineate |
| <p align="center">Narrow bridge</p> | <ul style="list-style-type: none"> ◆ Traffic control devices ◆ Approach guardrail ◆ Object markers ◆ Rumble strips placed on approaches |
| <p align="center">Poor sight distance at vertical crest</p> | <ul style="list-style-type: none"> ◆ Traffic control devices ◆ Fixed-object removal ◆ Shoulder widening ◆ Relocate driveway or local road to a location with better sight distance ◆ Lighting |
| <p align="center">Sharp horizontal curve</p> | <ul style="list-style-type: none"> ◆ Traffic control & warning devices ◆ Add lighting ◆ Shoulder widening ◆ Appropriate superelevation ◆ Slope flattening ◆ Pavement antiskid treatment ◆ Obstacle removal ◆ Obstacle shielding |
| <p align="center">Various Intersections Issues</p> | <ul style="list-style-type: none"> ◆ Traffic control devices ◆ Traffic signalization (warrants must be met) ◆ Fixed lighting ◆ Speed controls ◆ Add turn lanes ◆ Increase sight distance |

2.0 2R Projects

2.1 Pavement Rehabilitation Strategies

2R pavement rehabilitation strategies do not differ from those used on 3R Projects; see Section 3.1 of this DIB for further guidance.

2.2 Project Scoping Guidance

2.2.1 General Guidance

All roadway rehabilitation projects are to be scoped taking into consideration all modes of travel and the context of the facility being rehabilitated. A life cycle cost analysis shall be performed to assist the decision-making process being used to select the pavement rehabilitation strategy or strategies used within the project limits; see *HDM Topic 619* and the *LCCA Procedures Manual* for further guidance. The Maintenance Supervisor in the area of the project should also be contacted for input on highway deficiencies and needed safety upgrades. Maintenance personnel are typically very familiar with their segments of highway system and can often identify upgrades or deficiencies that might otherwise be overlooked such as drainage issues, pavement failures, collision locations, deficiencies related to bicycle and pedestrian usage, slope stability problems, the need for maintenance pullouts, safety concerns, and any other problematic issues. If the identified upgrades or deficiencies are significant (e.g., most highway appurtenances are failing, worn out or functionally obsolete, work necessary to upgrade the geometric design features requires additional right of way, environmental impacts are encountered that require additional study), the project may no longer qualify as a 2R Project and the Design Coordinator should be contacted as soon as possible for further project specific guidance.

In addition, the *PDPM* should also be consulted to review the current Departmental requirements, practices, and procedures related to project scoping and project delivery documentation.

2.2.2 Pedestrian Accessibility and the Americans with Disability Act (ADA)

Pedestrian accessibility and compliance with the ADA is to be decided on a project-by-project basis in accordance with *DIB 82* and *HDM Topic 105*. Upgrades and additions to pedestrian facilities must be considered on projects covered by this DIB. Federal and State law require the installation of curb ramps at intersections with curbs where they are absent. Pedestrian facilities that are altered must be upgraded to current ADA accessibility standards. If the project does not alter pedestrian facilities, consideration should still be given to upgrading the facilities, especially if pedestrian safety can be enhanced. Although new sidewalks should be considered, projects covered by this DIB are not required to add new pedestrian facilities throughout the limits of every project. Upgrades such as walkway (sidewalk) gap closures, widening sidewalks to current standards, upgrading curb ramps to current standards, relocating path width obstructions, sidewalk cross slope, and accessible driveways are to be evaluated and considered. Where pedestrians will use the shoulder in locations where sidewalks are not justified, see Section 2.2.9 of this DIB for further guidance. Facilities near school zones, rail grade crossings, parks, playgrounds, and other uses that have the potential to generate pedestrian activity are to be evaluated per the guidance in *DIB 82*. The Departmental website, under Traffic Operations, should also be visited to obtain guidance in the *California Manual of Uniform Traffic Control Devices (California MUTCD)* and additional Departmental guidance on work zone requirements during construction related to pedestrians.

2.2.3 Bicyclist Accommodation

Bicyclist safety must be taken into consideration on all 2R Projects. On 2R Projects it may be appropriate to widen shoulders; see Section 2.2.9 of this DIB for further guidance. *HDM Index 1003.2* should also be reviewed for guidance on bicycle lane widths when bicycle lanes are adjacent to on-street parallel vehicle parking to avoid conflicts between the parked vehicle doors, the bicyclists and the vehicles in the traveled way.

Also, see *HDM Chapter 1000* for further bicycle design criteria noting *HDM Index 1003.6(2)* regarding surface quality and the use of rumble strips, and *HDM Index 1003.6(3)* for requirements pertaining to drainage inlet grates. The Traffic Operations and the Office Engineers websites should be visited to obtain further guidance in Part 3 of the *California MUTCD* and the appropriate *Standard Plans* on rumble strips and their placement related to the needs of bicyclists. The Traffic Operations website should also be visited to obtain guidance in the *California MUTCD* and Departmental guidance on work zone requirements during construction related to the needs of bicyclists.

2.2.4 Storm Water Management

Features required for compliance with the Caltrans National Pollutant Discharge Elimination System (NPDES) Permit / Storm Water Management Plan (SWMP) must be included in the scope of work for 2R Projects. This not only involves the Best Management Practices (BMPs) required based on the work performed as part of the pavement repair strategies, plus any appurtenance and facility upgrades, but may also include BMPs for NPDES Permit compliance.

Contact the District Storm Water Coordinator for guidance on the current Caltrans NPDES Permit requirements and BMPs to include in the project. After consulting the District Storm Water Coordinator, consult with the District Maintenance Supervisor for the area to discuss the proposed BMPs and issues related to their maintenance.

2.2.5 Pavement Edges and Tapers

2.2.5.1 Edge Drop-offs

Pavement edge drop (e.g., vertical drops or ruts) can develop at the edge of paved surfaces and must be investigated for safety concerns. Consideration should be given to adding shoulder backing, see Section 2.2.5.2, or reconstructing the embankment on overlay projects because edge drops often develop over time. Visit the Department's Pavement website to review Pavement Tech Notes on "*Pavement Tapers*" for further guidance.

In addition, longitudinal edge differences are problematic for bicycles and motorcycles and are to be avoided. On the outside of superelevated curves, overlays and surface treatments (including Open Graded Friction Courses, OGFC) must extend to the edge of shoulder; see *HDM Index 645.1*.

Unpaved driveways, public road intersections and private road intersections should be paved to prevent pavement edge drops from developing. Such facilities are to be evaluated location-by-location and selectively paved on an as needed basis.

2.2.5.2 Shoulder Backing

Shoulder backing is a common design element for paving projects. Shoulder backing is a granular material that is used to protect the outside edge of pavement from edge cracking, avoid pavement edge loss, provide

edge support and minimize edge drop-offs. Guidance has been prepared to assist designers with shoulder backing. Visit the Department's Pavement website to review Pavement Tech Notes on "*Shoulder Backing*" for further guidance.

2.2.5.3 Pavement Tapers

Pavement tapers are a common design detail for 2R Projects. The goal of these tapers is to provide a smooth, ideally unnoticeable transition from one pavement type, overlay, or surface to another. Guidance has been prepared to assist designers with pavement tapers. Visit the Department's Pavement website to review Pavement Tech Notes on "*Guidance for Pavement Tapers*" for further information.

2.2.6 Curbs and Dike

Curb and dike placement, removal, and replacement may be done on 2R Projects as needed. Curbs and dikes have safety implications and must be evaluated based upon *HDM Topic 303*. Current practice involves placing or replacing curb and dike only when necessary and after all safety aspects have been considered. Curb and dike that is currently nonstandard should be removed or replaced based on the guidance in *HDM Topic 303*, unless specific circumstances dictate otherwise. The District Hydraulics unit, District Landscape, and Maintenance Supervisor in the area of the project should review any design proposals that involve dike removal or placement to ensure that it's removal does not impact an erodible slope.

2.2.7 Drainage Facilities

Only drainage repairs for structural deficiencies and the restoration of function and capacities are to be included in 2R Projects. The Maintenance Supervisor in the area of the project should be contacted to assist in identifying such drainage facility needs. District Maintenance should be contacted to have their culvert inspection crew(s) check all of the culverts to identify any structural deficiencies and possible need for replacement. If extensive modifications are needed to address or mitigate fish passage (e.g., grade control structures, step pools), then the project will be identified as a 3R Project.

2.2.8 Vertical Clearance at Structures

On 2R Projects, improving nonstandard vertical clearance should be based on the Safety Screening. However, where existing vertical clearance does not meet the requirements stated in *HDM Index 309.2* and cannot be achieved by milling prior to overlaying the pavement, the removal and replacement of the existing pavement may be necessary.

2.2.9 Shoulders on and Connections to Conventional Highways

2R Projects on conventional highways should be brought to the attention of the Design Coordinator as early as possible in the project development process to obtain their concurrence on the appropriate shoulder width(s) for project. Shoulders on conventional highways may need to be widened in urbanized areas, suburban areas with commercial and residential development adjacent to central business districts, and other locations where it is known or anticipated that shoulder usage by pedestrians and bicyclists is common. The need to widen the shoulder to accommodate pedestrians and bicyclists should be discussed with the Design Coordinator as early as possible in the project development process, if it has not already been discussed during the pre-PID phase. The Design Coordinator should also be made aware of the number and frequency of residential road and commercial connections to the conventional highway to determine if widening the existing shoulder is desirable.

2.2.10 Traffic Operation Strategies

Targeted and cost-effective traffic operation strategies such as roadway safety (protection) devices, signing, and striping to address identified accident patterns should be included in 2R Projects as needed. The Safety Screening completed by District Traffic Operations should be used to identify and determine what features are to be added to each pavement focused 2R Project.

2.2.10.1 Roadway Safety (Protection) Devices

The District Traffic Safety Systems Coordinator must be consulted regarding the application of and appropriate use of all roadway safety devices. Roadway safety devices typically include Metal Beam Guard Rail (MBGR), guardrail end treatments, crash cushions, median barrier, bridge rail, and bridge approach transition railing. Roadway safety devices that do not meet *NCHRP Report 350* criteria (or the latest crashworthiness criteria adopted by FHWA) are to be identified during the project's Safety Screening and upgraded or replaced. Roadway safety devices such as MBGR, bridge rails, and barriers may also require reconstruction when pavement overlays, shoulder backing, or slope changes necessitate adjusting their heights to meet the allowable limits. Consult with the District Traffic Safety Systems Coordinator to identify and discuss all of the roadway safety devices that may require an adjustment in height.

2.2.10.2 Signs and Delineation

Signs and pavement markings within the project limits should be evaluated for replacement and/or upgrading on an as needed basis. This evaluation should consider visibility performance, conformance with existing policies, appearance, and legibility for both day and night conditions.

2.2.10.3 Shoulder and Centerline Rumble Strips

Shoulder and Centerline Rumble strips are an effective proactive safety measure in reducing run-off-road or cross centerline collisions. Rumble strips can be used adjacent to the outside lane and along the centerline of undivided highways, or adjacent to both inside and outside lanes of divided highways. Consideration should also be given to adding a centerline buffer zone with rumble strips on highway segments where collision data exhibits a high number of cross centerline collisions. Consult with District Traffic regarding potential locations for installation of shoulder and centerline rumble strips. The Traffic Operations and the Office Engineers websites should be visited on the Department website to obtain further guidance in Part 3 of the *California MUTCD* and the appropriate *Standard Plans* on rumble strips.

2.2.11 All Other Highway Appurtenances and Design Features

The purpose of a 2R Project is to focus on repairing the pavement to extend the service life of the facility. If the Safety Screening for the segment of highway under consideration as a 2R Project indicates that the highway segment needs repairs and upgrading of its appurtenant facilities, the highway must be scoped as a 3R Project. If this is the case for a proposed project, a decision will need to be made to either rescope or modify the project in some manner to conform to the 2R guidance in this DIB.

2.3 Documentation of Design Exceptions

The philosophy of the 2R Program and its projects is that the geometric features and the safety of the facility will not be degraded. If the Safety Screening concludes that a 2R Project is appropriate for the proposed project, both Mandatory and Advisory Design Exception fact sheets will not be required for geometric design features, but a statement to document that conclusion should be included in both the Project History File and the PID for the project. All newly proposed nonstandard features must be

documented in a Mandatory or Advisory Design Exception Fact Sheet, as appropriate. Newly proposed nonstandard geometric design features are to be documented using the procedures in Chapter 21 of the *PDPM*.

Pavement designs for 2R Projects must meet the requirements found in *HDM Chapters 600* through *670*.

Exceptions to Accessibility Design Standards on 2R Projects are to be documented following the guidance provided in *DIB 82*.

3.0 3R Projects

3.1 Pavement Rehabilitation Strategies

Pavement rehabilitation strategies are constantly evolving with new technologies and materials. The following needs to be taken into account when selecting the 3R pavement strategy:

- Pavement design life (see *HDM Topic 612*);
- Minimizing maintenance worker exposure;
- Minimizing maintenance effort;
- Consistency with adjacent corridor pavement;
- Long term corridor plan;
- Constructability;
- Traffic handling during construction; and,
- Cost-effectiveness (both initial and life cycle – see *LCCA Procedures Manual* and *HDM Topic 619*).

Pavement repair techniques and rehabilitation strategies are to be developed in coordination with District Materials, District Maintenance, and the Office of Pavement Design. Refer to the *HDM Pavement Engineering Chapters 600* through *670* and the Departmental Pavement website for additional pavement guidance and information. Exceptions to the pavement design standards and guidance in the *HDM* are to be documented appropriately.

3.2 Project Scoping Guidance

3.2.1 General Guidance

3R Projects differ from New Construction and Reconstruction projects in that they do not include capacity improvements, major highway realignments, or major upgrades to geometric features to meet current standards. The guidance provided for 2R Projects in Section 2.2.1 of this DIB also applies to 3R Projects except that instead of a project “no longer qualifying as a 2R Project” because the upgrades needed to eliminate the identified deficiencies are significant (e.g., most highway appurtenances are failing, worn out or functionally obsolete, work necessary to upgrade the geometric design features requires additional right of way, environmental impacts are encountered that require additional study), upgrades that are not appropriate for 3R Projects may warrant the initiation and programming of a New Construction or Reconstruction project.

3.2.2 Pedestrian Accessibility and the Americans with Disability Act (ADA)

The guidance provided for 2R Projects in Section 2.2.2 of this DIB also applies to 3R Projects.

3.2.3 Bicyclist Accommodation

The guidance provided for 2R Projects in Section 2.2.3 of this DIB also applies to 3R Projects.

3.2.4 Storm Water Management

The guidance provided for 2R Projects in Section 2.2.4 of this DIB also applies to 3R Projects.

3.2.5 Pavement Edges and Tapers

The guidance provided for 2R Projects in Sections 2.2.5.1, 2.2.5.2, and 2.2.5.3 of this DIB also applies to 3R Projects.

3.2.6 Curbs and Dike

The guidance provided for 2R Projects in Section 2.2.6 of this DIB also applies to 3R Projects.

3.2.7 Drainage Facilities

On 3R Projects, the guidance in *HDM Indexes 803.3* and *804.3* regarding the need for repair, replacement, and upgrading of existing drainage facilities applies. In addition, the Maintenance Supervisor in the area of the project should be contacted to assist in identifying the drainage facility needs. District Maintenance should be contacted to have their culvert inspection crew(s) check all of the culverts to identify any structural deficiencies and possible need for replacement.

Where shoulders carry roadway drainage, the hydraulic capacity should be verified. If the cross slope is modified, the designer should be aware that additional pavement thickness or cross slope modifications may require modifying drainage facilities such as dikes, inlets, and slotted pipe.

Drainage features can present clear recovery zone issues and should be evaluated for modification. Refer to the *AASHTO Roadside Design Guide* for further information on traversable drainage features. However, if traversable drainage features in the *Roadside Design Guide* are being considered for use, the District Hydraulics unit needs to be contacted to discuss their utilization.

3.2.8 Structures

3.2.8.1 Vertical Clearance

In addition to the guidance provided for 2R Projects in Section 2.2.8 of this DIB and *HDM Index 309.2*, the following guidance also applies to 3R Projects:

- Structures Maintenance must be contacted to determine the past history of structure “hits” to existing structures within the project limits. When it is proposed to reduce the existing vertical clearance of a structure, either temporarily or permanently, the Transportation Permits Region Manager must be contacted to determine the potential use of the roadway at the structure location by over-height and over-width permit loads.
- Milling, grinding, or replacing the existing pavement should always be considered to avoid reducing the vertical clearance. Raising the structure is another option that may be considered.

- The final decision should include consideration of adjacent structure clearances and the likelihood of over-height loads passing beneath the structure in question. Vertical clearance signs should be modified, as necessary.

3.2.8.2 Structural (Bridge) Capacity

Existing structures within the project limits may have inadequate load capacity to meet the Transportation Permits Program needs. Consequently, the Transportation Permits Region Manager should be contacted to determine the potential use of the facility by overweight vehicles and the impacts of any load-restricted bridges within the project limits. If a bridge is determined to require strengthening for loads, the bridge reconstruction work should normally be considered as a part of the project. Although strongly discouraged, under certain circumstances, structure reconstruction can be deferred to avoid delaying the overall project due to environmental and/or right of way clearance problems, structure design time constraints, etc. The guidance regarding the deferral of a structure widening provided in the *PDPM* may also be applied to the deferral of a structure replacement.

3.2.8.3 Bridge Rail and Other Structure Improvements

Departmental Policy (Structures Maintenance and Investigations Policy and Procedures Memo Number 2003.1) states that the upgrade of bridge rail classified as not meeting currently acceptable standards will be made on a Department-wide programmatic basis for all bridges on the State highway system. On 3R Projects, bridge rail within the project limits that does not meet *NCHRP Report 350* criteria (or the latest crashworthiness criteria adopted by FHWA) are to be identified during the project's Safety Screening and upgraded or replaced by the project. This need should be identified early on during the project development process when scoping the 3R Project. The Office of Structure Design Technical Liaison Engineer should be contacted to discuss the need, if any, to upgrade the bridge rails within the project limits and any other structure improvements identified in the *Structures Replacement And Improvement Needs (STRAIN) Report*.

3.2.9 Maintenance

Maintenance vehicle pullouts should be placed upstream of recurrent work areas so the maintenance vehicles can shield the workers from errant vehicles. Similarly, it is appropriate to locate work areas downstream of large "fixed shields" such as structures, while keeping in mind sight distance for ingress/egress. The designer should look for opportunities to provide vehicle parking and access from adjacent parallel facilities (local roads) through use of gates and pathways. See *HDM Index 107.2* for further guidance on providing features that can enhance the personal safety of maintenance workers and law enforcement officers that work on the State Highway system.

3.2.10 Traffic Operation Strategies

3.2.10.1 Roadway Safety (Protection) Devices

The guidance provided for 2R Projects in Section 2.2.10.1 of this DIB also applies to 3R Projects.

3.2.10.2 Signs and Delineation

All signs and pavement markings within the project limits should be evaluated for replacement and/or upgrading. This evaluation should consider visibility performance, conformance with existing policies, appearance, and legibility for both day and night conditions.

While traffic control devices may not fully mitigate all problems associated with nonstandard geometric features, they can compensate for certain operational deficiencies. In addition, minimizing or eliminating possible adverse safety and operational features by judicious use of special traffic regulations, positive

guidance techniques and traffic operational improvements can often reduce extensive reconstruction of existing highways. District Traffic should be contacted for guidance when additional signs, markings, or other traffic control devices are being considered as a possible mitigation for a nonstandard geometric feature or to address a safety issue.

Signs with information regarding vertical clearance shall be updated or installed per Division of Traffic Operations Policy Directive #00-03, effective September 1, 2000. Interchange exit numbers shall be added per Division of Traffic Operations Policy Directive #02-04, effective February 1, 2002.

3.2.10.3 Shoulder and Centerline Rumble Strips

The guidance provided for 2R Projects in Section 2.2.10.3 of this DIB also applies to 3R Projects.

3.2.11 Highway Appurtenances

The effects on accessibility, relating to both existing and proposed highway appurtenances, on all roadway users must be carefully reviewed and appropriately addressed.

Also, the need to adjust highway appurtenances such as object markers, sign supports, luminaries, irrigation systems, etc., should be reviewed for potential or known maintenance worker safety issues. Although the highway appurtenances will be analyzed during the Safety Screening for the project, every functional unit, particularly Maintenance, should also evaluate them. See *HDM Index 210.6* for guidance regarding safety railing, fences, and concrete barriers that may be appropriate to include in the project. For additional guidance, see Section 3.3.3.6.3, "Clear Recovery Zone," in this DIB.

3.2.12 Landscaping

Typically, projects covered under this DIB do not involve landscape work. However, there may be a need to replace existing landscaping due to construction activities. Consult with the District Landscape Architecture unit regarding the Roadside Program and the need for replacement planting and/or other roadside features.

3.3 Geometric Design Guidance

3.3.1 Projects on Freeways, Expressways, and Multilane Conventional Highways

3R Projects on Freeways, Expressways, and Multilane Conventional Highways shall not degrade the safety or the geometric features of the facility. 3R Projects on these facilities are required to meet the current geometric standards for new construction as stated in the *HDM* and the additional guidance that is provided in Section 3.3.2 of this DIB. Any exceptions to Mandatory and Advisory design standards are to be documented appropriately; see the *PDPM* for further guidance.

3.3.2 Additional Geometric Design Guidance for Projects on Freeways and Expressways

3.3.2.1 Cross Slope (Traveled Way)

To achieve an economy in materials and to minimize the impact on median facilities such as slotted drains, drainage inlets, and median barriers, it may be acceptable to reduce the thickness of the overlay on the inner lanes of the traveled way to the minimum thickness and cross-slope tolerances. Breaks, or crowns, in the resurfacing should occur at the lane lines, not in the wheel paths. However, before it is decided to reduce the thickness of the overlay and adjust the various cross slopes, the District Materials and Hydraulics units need to be consulted with to concur with these decisions.

In addition, on expressways and multilane conventional highways, where the existing traveled way cross slope exceeds the standard and it is not reasonable to adjust the existing curb, gutter, and sidewalk, milling or removal and replacement of the existing pavement may be necessary.

3.3.2.2 Ramps and Gore Areas

Removing or relocating fixed objects such as overhead signs, lighting, curbs, and existing crash cushions in the vicinity of on-ramp and off-ramp gores should be considered. A review should be made of the collision and maintenance history of “hits” into existing signs and crash cushions to determine the advisability of removing or relocating the signs and crash cushions. District Traffic and Maintenance should assist when performing this evaluation.

Gore curbs that are not in accordance with the guidance in *HDM Indexes 504.3(11)* and *504.2(5)*, and *Topic 303* should be removed. When the overlay thickness matches or exceeds the height of curb, it may be unnecessary to remove the curb pending an investigation for the need to convey runoff.

When rehabilitating ramps on the National Network or on Service Terminal Access routes, consideration should be given to modifying the ramps to accommodate Surface Transportation Assistance Act (STAA) of 1982 design vehicles. Consult with the District Truck Service Manager for routes on and connecting to National Network and Terminal Access routes. See *HDM Indexes 404.3(2)* and *404.3(3)* for further guidance on the use of truck turn templates.

Consideration should be given to paving areas that will reduce the maintenance worker’s exposure to traffic and removing, or relocating, maintainable features such as: inlets, controller cabinets, ITS equipment, etc. See *HDM Chapter 500* for guidance related to gore paving. Contact the local area Maintenance Supervisor for assistance in determining these locations. Also see Design Memo dated September 30, 1998 and entitled: “*New Design for Safety Practice: Roadside Paving*” located on the Department website, under Project Delivery Memos.

3.3.2.3 Interchange Spacing

A design exception for interchange spacing as stated in *HDM Index 501.3* and *DIB 77* is not required unless the project involves a new interchange or an interchange is being relocated. If the project involves a new or relocated interchange, *HDM Index 501.3* and *DIB 77* must be consulted.

3.3.3 Geometric Design Guidance for Two- and Three-Lane Conventional Highways

Federal Code, Title 23 CFR Section 625.2(b), states: “Resurfacing, restoration and rehabilitation (RRR) projects, other than those on the Interstate system and other freeways, shall be constructed in accordance with standards which preserve and extend the service life of highways and enhance highway safety.” The following additional guidance applies to projects on two- and three-lane conventional highways.

3.3.3.1 Selection of Design Speed

The criteria for design speed as discussed in *HDM Index 101.1* applies to projects on two- and three-lane conventional highways covered by this DIB. The Design Coordinator and/or Design Reviewer should be consulted regarding the design speed, and the design speed should be documented in the PID or PR.

3.3.3.2 Stopping Sight Distance at Grade Crests and Sags

The criteria for stopping sight distance at vertical curves in *HDM Indexes 201.1*, *201.4*, and *201.5* apply to projects covered by this DIB. The Safety Screening should also be used to identify and determine which, if any, grade crests or sags may warrant improvement. The vertical alignment within the limits of the project

shall be evaluated for possible improvements at “spot” locations taking into consideration the collision data at the location. Performing this evaluation at all “spot” locations is not meant to imply that all of the vertical curves should be upgraded. District Traffic Operations should be consulted to assist with determining which vertical curves should be upgraded.

Special attention should be given to crest vertical curves where the available sight distance corresponding to the design speed of the crest vertical curve is 20 mph or more below the 85th percentile speed of the section of highway preceding the curve; District Traffic Operations can assist in estimating the 85th percentile. Where this condition exists and the crest vertical curve conceals highway features such as intersections, driveways, horizontal curves, narrow bridges, at-grade railroad crossings, etc., consideration must be given to reconstructing these vertical curves or removing these features. If a crest vertical curve is not upgraded following the evaluation because reconstruction is not feasible, consider installing warning signs or using other mitigation strategies.

Sag vertical curves are rarely related to collisions because drivers have adequate sight distance during daylight hours, and at night the driver’s range of sight is restricted to the vehicle’s headlight limitations. If necessary, street lighting can be added to mitigate reduced stopping sight distance on sag vertical curves. Discussions should be held with District Electrical regarding the feasibility of lighting. Sag vertical curves can be slightly improved during overlays with little extra cost or impacts.

3.3.3.3 Superelevation

The criteria for superelevation contained in *HDM Index 202.2* apply to projects covered by this DIB. If nonstandard superelevation rates exist, they must be evaluated for possible improvement.

Superelevation improvements can often be attained inexpensively and with minimal impact on overlay projects, and should therefore be incorporated. Where as-built plans do not exist or no longer reflect the current conditions, a Digital Inclinometer (Smart Level) may be used to estimate the superelevation rate.

3.3.3.4 Horizontal Alignment

The criteria for horizontal alignment contained in *HDM Index 201.6* and *Topic 203* apply to projects covered by this DIB. Horizontal alignments shall be evaluated for possible improvements at “spot” locations. The evaluation of horizontal curves must consider collision data. District Traffic Operations should assist when performing this evaluation. Typically, nonstandard horizontal curves requiring additional right of way and/or that result in significant environmental impacts are not upgraded without supporting collision data that justifies the additional costs or impacts. Where the radius of a curve is less than 300 feet, with an interior angle greater than 60 degrees, consideration must be given to providing additional lane width to accommodate vehicle offtracking. See *HDM Topic 404* and *Index 504.3(b)* for more information and widening criteria.

Although individual horizontal and vertical curves may meet design criteria, their use in combination must be considered to avoid undesirable alignments. For example, the alignment of a segment of highway may consist of a series of curves. The first curve in this series, particularly if it follows a long tangent, must receive special attention because, once a driver safely passes through it, the driver should be prepared for the subsequent curves in the series. To prepare a driver for a series of curves, the design speed of this first curve, especially if it follows a long tangent, should be at least equal to the design speed of the tangent section of highway leading into it; which is important because drivers tend to travel at higher speeds on tangent segments of highway. The other curves in the series should only differ from the design speed of the curve that follows or precedes it by 10 mph; which is the desired maximum reduction or increase in speed

between curves in a series. Special attention should also be given to any curve within a series of curves that has a significantly smaller radius than the other curves. If improvements are being considered at any of the curves in a series of curves, the effects of the proposed change(s) to an individual curve will need to also be evaluated on the entire series of curves; this particularly needs to be done to curves adjacent to the one being improved. The intended outcome from all of this analysis is to avoid “moving” a collision concentration from one curve in the series to another. See *HDM Index 203.3* for additional information regarding alignment consistency.

Also see *HDM Index 204.6* and the AASHTO document “*A Policy on Geometric Design of Highways and Streets*” for guidance of desirable and undesirable alignment combinations.

The following should be considered when evaluating horizontal curves for improvements:

- Reconstruction with a larger horizontal radius.
- Correction or improvement of superelevation.
- Widening the shoulders.
- Installing rumble strips.
- Widening lanes or providing a buffer for truck offtracking.
- Flattening fill slopes that are 4:1 or steeper on the inside and outside of the curve. For slopes between 3:1 and 4:1, check for adequate run out distance. See the AASHTO “*Roadside Design Guide*” for methods of determining the run out distance.
- Installation of roadside barrier. See the *Traffic Manual* on the Department website, under Division of Traffic Operations, and discuss with the District Traffic Operations personnel for guidance.
- Permanently removing vegetation or cutting back slopes to provide a “sight bench” at locations where the stopping sight distance is reduced by vegetation growth or cut sections.
- Consult with District Traffic Operations or the Headquarters Division of Traffic Operations Liaison about adding signs, delineation, and/or markers to mitigate operational deficiencies.
- Add lighting.
- Move intersections outside of curves.

3.3.3.5 Intersections (Public and Private Connections) and Driveways

3.3.3.5.1 General

Road connections (both public and private) and driveways must be evaluated for possible improvements. The decision to improve intersections can often be made by observing vehicle, bicycle, and pedestrian movements during field visits. *DIB 82* and *HDM Topic 105* should be reviewed for pedestrian accessibility and compliance with the ADA; which is decided on a project-by-project basis.

3R Projects also present an opportunity for driveway upgrades. Contact the District Encroachment Permits office to see if there are issues with any existing driveways that may need to be addressed.

To facilitate movements in and out of driveways and local streets, connections should be paved to the edge of the right of way or far enough beyond the right of way line so that the rear drive wheels of longer vehicles can accelerate on a paved surface. This is to prevent vehicles wheels from spinning while attempting to enter the highway. It also serves to prevent rock and debris from collecting on the mainline shoulder, which can be a problem for both bicycles and pedestrians.

HDM Topic 205, HDM Indexes 405.7, 405.8, and 405.9 provide further guidance on the design of public road intersections and driveways.

3.3.3.5.2 Corner Sight Distance

The Corner Sight Distance criteria in *HDM Topic 405* apply to these projects. All intersections shall be evaluated for possible improvements. The evaluation of corner sight distance must consider collision data. District Traffic should assist when performing this evaluation. It is often difficult to obtain corner sight distance per *HDM Topic 405* at all intersections, but that does not preclude the need to evaluate cost-effective solutions (e.g., those that do not physically impact homes, businesses, historic buildings, large natural land features) at each location.

3.3.3.5.3 Left- and Right-Turn Channelization

Left and/or right turn channelization should be considered at intersections to public roads and other potential higher volume intersections.

Consult with both District Traffic Operations and Traffic Safety when establishing the need for turn channelization. See *HDM Indexes 405.2 and 405.3* for further geometric guidance on right- and left-turn channelization. Also see “*Guidelines for Reconstruction of Intersections*,” dated August 1985, which is available through Headquarters Division of Traffic Operations.

3.3.3.5.4 Skew Angle

The criteria pertaining to intersection skew in *HDM Index 403.3* applies and should be reviewed. The Safety Screening should also be used to identify and determine which, if any, skewed intersections may warrant realignment. Skew angles less than 75 degrees must be investigated for potential upgrades. If realigning the local street will require a large expense of funds and right of way impacts are significant, an intersection is typically not modified.

Skewed “T” intersections are typically easier to upgrade than through streets because they impact only one side of the highway. Small radius curves can be added on the cross street because speeds on the cross street are typically low due to the stopped condition. When “T” intersections cannot be upgraded without extensive realignments, improvements may be accomplished by minor widening at the curb returns and the striping realigned to an angle closer to perpendicular; see Section 3.3.3.5.5, “Truck Turning,” in this DIB for issues related to pedestrian movements when increasing the curb return radii. Also see *HDM Index 403.3* for additional discussion on the angle of intersections.

3.3.3.5.5 Truck Turning

The criteria for truck turning in *HDM Index 404.3 (2) and (3)* apply to these projects. Intersections experiencing frequent truck use should be evaluated to accommodate truck offtracking. See *HDM Topic 404* and *HDM Index 405.8* for further information on designing for offtracking. Designers should inspect the ground adjacent to intersection curb returns for physical evidence of vehicle offtracking, which can identify those locations most in need of upgrades.

It is often impractical to provide for truck turning on most local streets due to the infrequency of truck use at these locations. Where truck volumes are very low, bus turning may be a more appropriate application, especially if it is a school bus or transit route. There are several factors affecting the decision to increase the curb return radii at these locations:

- Large curb return radii could promote higher than desirable speeds for motor vehicles making right turn moves.

- Assure trucks and buses will off-track into same direction lanes and shoulders of the receiving roadway and not intrude upon the lanes in the opposite direction of travel.
- Pedestrian crossings will become longer; therefore, the additional length of the pedestrian crossings and its impacts to wheelchair ramp placement (see *DIB 82* for additional guidance on ADA design issues) will need to be evaluated.
- Pedestrians waiting to cross are set further from turning vehicles, which might place pedestrians out of the field of vision of the Driver.
- Impacts to adjacent property and right of way cost.

3.3.3.6 Cross Section Design Elements

3.3.3.6.1 Widths

3.3.3.6.1.1 Traveled Way

All lane widths for projects covered by this DIB shall be 12 feet except as follows:

In urbanized areas with restricted right of way and operating speeds 35 mph or less, it may be appropriate to reduce right- and left-turn pocket lane widths to 11 feet when supported by an approved design exception. The lower speeds in the left- and right-turn lanes make it reasonable to use narrower widths in urban areas. As an order of importance, the right-turn lane is typically reduced first because the left-turn lane is adjacent to oncoming traffic. Truck turning can be an important factor when reducing lane widths under these conditions. A truck usage study and turning analysis must be applied to each location where turning lane widths are reduced.

Further reductions in right-turn lane width, to 10 feet, are sometimes warranted in severely constrained situations.

See Section 3.3.3.4 of this DIB for guidance on lane widening to accommodate truck offtracking on radii less than 300 feet.

3.3.3.6.1.2 Shoulders

3.3.3.6.1.2.1 Roadbed

The shoulder widths given in Table 2 shall be the minimum paved shoulder width for two-lane conventional highway projects covered by this DIB. Shoulders less than the “Minimum Existing In-Place Shoulder Width” shall be widened to the “3R Shoulder Width.” Shoulders at or above the “Minimum Existing In-Place Shoulder Width” may be rehabilitated at their existing widths, including minor widening for lateral support or uniformity of pavement width, **unless pavement widening or realignment is performed, then the 3R shoulder width criteria applies. If the Safety Screening recommends widening beyond the “Minimum Existing In-Place Shoulder Width,” the roadbed shall be widened to the “3R Shoulder Width” or the “3R Bridge Shoulder Width,”** as appropriate.

Shoulders are important to accommodate bicycle traffic, and pedestrian traffic where sidewalks are not present. The minimum usable shoulder for bicycles and pedestrians is 4 feet, but wider shoulders are more appropriate. Wider shoulders should be considered on highways with higher vehicular volumes and speeds.

The truck, bus and recreational vehicle usage on the highway should be taken into account when determining shoulder widths. When truck, bus and/or recreational vehicle volumes are generally higher than

10%, particularly on curvilinear highways, shoulder widths greater than those in Table 2 should be considered.

When adding passing or climbing lanes or right turn lanes, the minimum width of the adjacent shoulder shall be 4 feet.

Where a left turn lane is provided and a right turn lane is not, the right shoulder width shall be the “3R shoulder width” as provided in Table 2, but not less than 4 feet (5 feet where a gutter is present). The minimum right shoulder width adjacent to right turn pockets shall be 4 feet (5 feet where a gutter is present).

TABLE 2

Two-Lane Conventional Highway 3R Standards for Shoulder Widths

| Existing ADT (vehicles) | 3R Bridge Shoulder Width (ft) | 3R Shoulder Width (ft) | Minimum Existing In-Place Bridge Shoulder Width (ft) | Minimum Existing In-Place Shoulder Width (ft) |
|----------------------------|----------------------------------|---------------------------|---|--|
| 0-250 | 4 | 0 * | 0 | 0 |
| 251-1000 | 4 | 2 * | 2 | 0 |
| 1001-3000 | 8 | 4 * | 4 | 2 |
| 3001-6000 | 8 | 8 | 6 | 4 |
| 6001-18,000 | 8 | 8 | 8 | 4 |
| Over 18,000 | 8 | 8 | 8 | 8 |

* See discussion in Section 3.3.3.6.1.2.1, “Roadbed.” Under certain conditions, the minimum width of the adjacent right shoulder shall be 4 feet, or 5 feet where a gutter is present.

3.3.3.6.1.2.2 Bridges

The bridge shoulder widths given in Table 2 shall be the minimum paved bridge shoulder for two-lane conventional highway projects covered by this DIB. The structure clear width (width between curbs or rails, whichever is less) shall equal or exceed the approach roadbed width. Shoulders less than the “Minimum Existing In-Place Bridge Shoulder Width” shall be widened to the “3R Bridge Shoulder Width.” Bridge shoulders at or above the “Minimum Existing In-Place Bridge Shoulder Width” may be rehabilitated at their existing widths.

Upgrading existing bridge rail, approach guardrail, and guardrail transition railing connections is to be included in the project regardless of the bridge shoulder width requirements discussed above. **If bridge rail is being replaced, the shoulders shall be widened to the bridge 3R shoulder width.** The Headquarters

Bridge Preservation Program Manager must be consulted in determining if a bridge rail type requires upgrading.

Bridge replacement strategies shall meet new construction standards.

3.3.3.6.2 Cross Slopes

3.3.3.6.2.1 Traveled Way

The criteria in *HDM Index 301.2* apply.

3.3.3.6.2.2 Shoulders

The shoulder cross-slope criteria contained in *HDM Indexes 302.2* and *307.2* also apply, except as follows: **On tangent sections of conventional urban highways with operating speeds of less than or equal to 45 mph and where it is necessary to match existing curb and gutter, the maximum shoulder cross slope shall be 8% except when snow and ice conditions prevail.** Locations with snow and ice removal operations are to follow the guidance in *HDM Index 302.2 (3)*.

When shoulder widths are 2 feet or less, shoulder cross slopes shall match the traveled way cross slope, but may be increased to 9% if necessary for drainage.

When curb ramps are present, shoulder cross slopes greater than 5% may exceed ADA standards where the maximum grade break at the base of the curb ramp is 13.3%. See *DIB 82* for further guidance regarding compliance with the ADA.

Where shoulder cross slopes do not meet the above criteria and it is not reasonable to adjust existing curb, gutter and sidewalk, grinding or removal and replacement of the pavement may be necessary. Each project must be evaluated on an individual basis. Where shoulders carry roadway drainage, the hydraulic capacity of the shoulder should be verified.

See *HDM Indexes 301.2* and *302.2* for the maximum grade break between edge of traveled way and shoulder cross slopes.

3.3.3.6.3 Clear Recovery Zone (CRZ)

The horizontal clearance criteria in *HDM Index 309.1* apply to these projects with the exception of the following: It is not the intent to flatten all of the side slopes within the project limits. Typically, existing side slopes are not flattened unless the project incorporates grading on a slope, or there are CRZ concerns identified in the Safety Screening. When widening or modifying existing embankment slopes, 4:1 or flatter side slopes should be used. Although cut slopes represent a form of fixed object and should also be 4:1 or flatter, less emphasis is placed on them. In any case, slopes should be designed as flat as is reasonable. Slopes steeper than 4:1 may require special erosion control features as described in the *Storm Water Quality Handbook, "Project Planning and Design Guide" (PPDG)*. See *HDM Topic 304* and Chapter 7 in the *Traffic Manual*, on the Headquarters Division of Traffic Operations website, for further guidance on side slopes and their relation to the CRZ and placement of roadside safety devices at the top of embankment slopes.

The Safety Screening process will look at the CRZ associated with the segment of highway being evaluated. The absence of collisions should not be used as a reason to not include CRZ strategies in the scope of a project. Improving the CRZ is an effective proactive measure in reducing the occurrence or severity of run-

off-road collisions along corridors. Refer to Table 1 for alternative countermeasures regarding roadside obstacles.

The AASHTO publication “*Roadside Design Guide*” provides detailed design guidance for creating a forgiving roadside environment. Also, see Chapter 7 in the *Traffic Manual*, on the Headquarters Division of Traffic Operations website.

3.3.3.6.4 Side Slopes

The following geometric design standard from *HDM Topic 304* is permissive for two- and three-lane conventional highway projects:

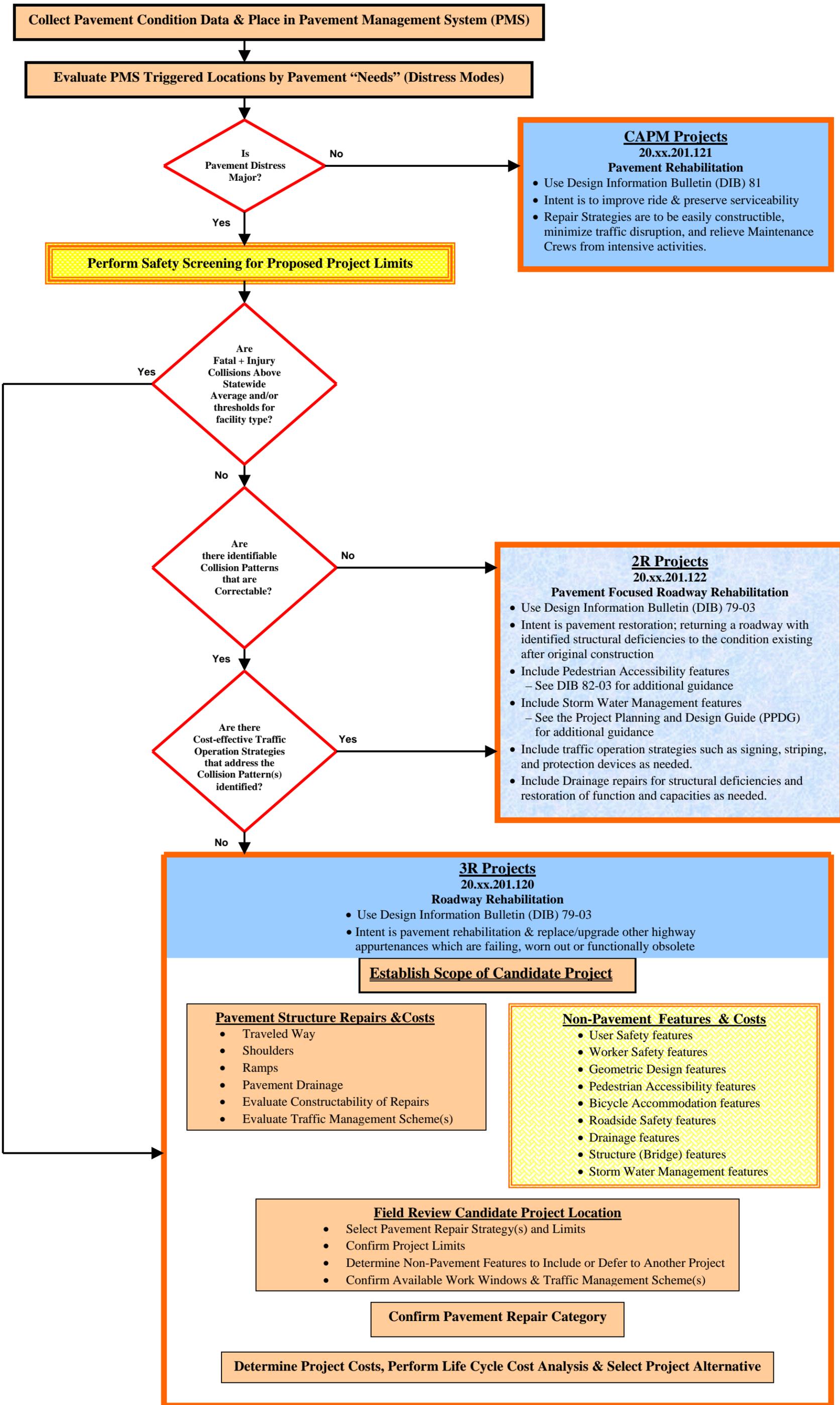
In projects involving grading where slopes catch in a distance less than 18 feet from the edge of the shoulder, a uniform catch point, at least 18 feet from the edge of the shoulder, should be used.

This should be done not only to improve errant vehicle recovery and aesthetics, but also to promote the use of large production grading equipment, which can reduce the construction costs associated with grading on the project.

CAPITAL PAVEMENT IMPROVEMENTS TO THE STATE HIGHWAY SYSTEM

CAPM, 2R and 3R Project Decision Tree

November 19, 2007



Attachment 1

Dist – Co – Rte
PM
Project EA

2R PROJECT CERTIFICATION ^{1, 2}

A Safety Screening, as required by Design Information Bulletin Number 79, was conducted for the segment of highway identified above in the project description.



Chief, District Traffic Safety Branch

Date: _____

This project will be scoped and designed as a 2R Project per the guidance in Design Information Bulletin Number 79. The Safety Screening that was performed will be an integral part of the development of this project.

Deputy District Director for Design

Date: _____

I concur with the 2R Purpose and Need of this project.

Design Coordinator

Date: _____

I concur that this project should be scoped and designed as a 2R Project per the guidance in Design Information Bulletin Number 79 and that the Safety Screening associated with this project will be an integral part of the development of this project. Therefore, since the appropriate Purpose and Need for this project is pavement resurfacing and restoration (2R), I have determined that this project is to be delivered as a 2R Project.

District Deputy for Maintenance and Operations ³

Date: _____

Notes:

1. This certification document shall be filed in the district project history files.
2. A copy of this Certification shall be sent to Headquarters Division of Design, attention Design Report Routing.
3. District organizations with separate Deputies for Maintenance and Operations need the signatures of both individuals.