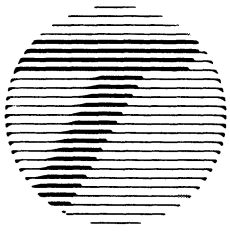
STANDARDS
FOR NON-FREEWAY

Resurfacing, Restoration and Rehabilitation Projects

July 1, 1992

Design Quality Assurance Bureau
Facilities Design Division



NEW YORK STATE DEPARTMENT OF TRANSPORTATION
MARIO M. CUOMO, Governor FRANKLIN E. WHITE, Commissioner

Standards for Non-Freeway Resurfacing, Restoration & Rehabilitation Projects

Replacement Pages

Issued with Engineering Bulletin 04-027

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Changes to Non-Freeway 3R Standards

Pages	Changes
Contents, 6, 14	Reference to Appendix K and Design Traffic Forecast Policy have been updated to reflect issuance of Project Development Manual.
7	The discussion regarding widths in the second paragraph was updated to be consistent with HDM Chapter 2.
8	Last line of note 5, “minimum” was changed to “maximum.”
9	The discussion regarding shoulder cross slope in Section D, the second paragraph, was updated to be consistent with HDM Chapter 3.
10	The discussion regarding superelevation in the second paragraph was updated to be consistent with HDM Chapters 2 and 5. Second to the last paragraph, “ft/ft” was deleted from the first and second lines.

6/25/04

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I. INTRODUCTION

A. Statement of Intent

Resurfacing, restoration and rehabilitation (3R) projects are intended to preserve and extend the service life of existing highways, primarily by preserving the existing pavement structure. Safety must be considered and improvements included where justified by existing accident experience. 3R projects should reflect the need for cost effective management of the existing highway system in order to obtain the maximum benefit from available funds.

B. Definition of 3R

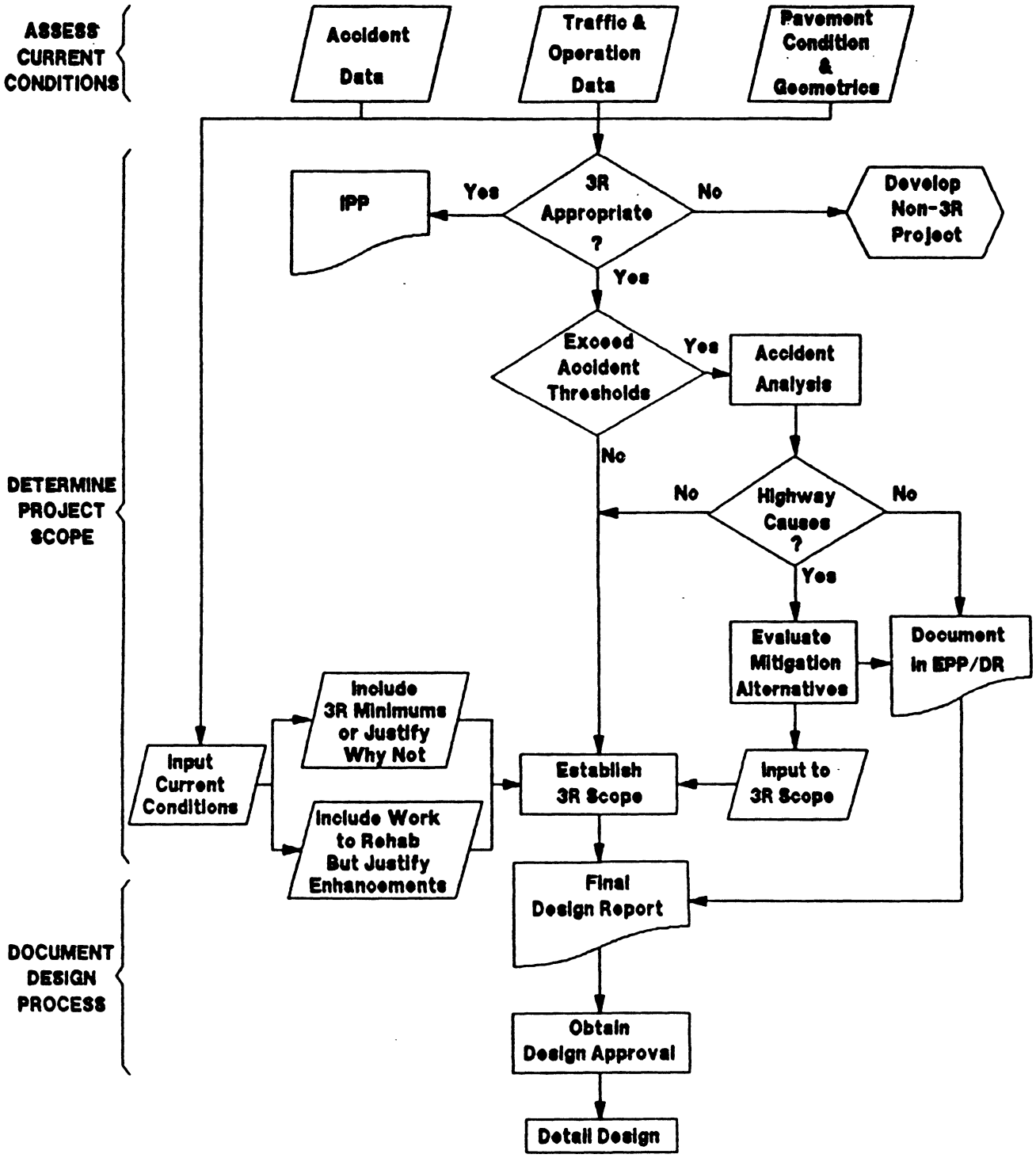
3R projects are designed to preserve an existing highway and are generally limited to pavement rehabilitation although limited pavement reconstruction should be included to remedy localized base or subbase problems or to remedy existing operation and safety problems. Widening of less than a lane may be included if necessary to increase lane widths (but not the number of continuous lanes) to an acceptable minimum. Necessary shoulder, drainage, and roadside improvements may also be included.

C. Application of the Standard

The 3R Standard applies to all classes of highways except freeways and is applicable to work meeting the definition of 3R on those highways. Major reconstruction projects which reconstruct the pavement such that full service life is restored, even if on existing alignment, do not come under the 3R Standard nor do bridge replacement/rehabilitation projects or minor reconstruction projects (such as intersection improvements or safety improvements). Likewise, the 3R Standard does not apply to miscellaneous projects such as those specifically for guiderail, traffic signals, signs, pavement markings, culvert repairs, bridge railing, slope stabilization and the like.

Refer to the *Design Traffic Forecast Policy* in Appendix A for definitions of major reconstruction, minor reconstruction and miscellaneous projects.

3R PROCESS FLOW CHART



D. Relationship to Other Policies and Standards

The 3R Standard applies to the scoping of 3R projects and to the geometric guidelines to be followed. The 3R Standard supersedes Chapter 7 of the *Highway Design Manual*.

The Standard does not provide design guidance for other features or areas such as pavement design, traffic control devices, guiderail, pedestrians and bicyclists, drainage, utilities, landscaping, driveways, etc. The design guidance for these features will continue to be the *Highway Design Manual*, appropriate Engineering Instructions, etc.

E. General

The basis for these standards is Transportation Research Board *Special Report 214, Designing Safer Roads, Practices for Resurfacing, Restoration, and Rehabilitation*, published in 1987 which states that significant improvement in safety is not an automatic byproduct of 3R projects; safety must be systematically designed into each project. Designers must deliberately seek opportunities specific to each project and apply sound safety and traffic engineering principles. On 3R projects designers have the benefit of working with existing highways whose design and operational characteristics can be observed and measured. Attention to safety and documentation of the design process will improve design decisions.

Listed below is a summary of the important steps that should be followed when developing 3R projects.

1. Assess Current Conditions
   At the beginning of a 3R project, assess the existing physical and operational conditions which may affect safety by using accident data, site inspections and by measuring existing design and traffic characteristics.

2. Determine Project Scope
   In addition to pavement repairs and geometric improvements, designers of 3R projects should consider and, where appropriate, incorporate other intersection, roadside and traffic control improvements that may be cost effective. The designer should also determine that a 3R project will actually provide the appropriate solution for the identified needs within the project area.

3. Document the Design Process
   Before obtaining design approval, designers should prepare a report or documentation package that covers existing design and operational characteristics, accident history, identified operation and safety problems; the related design options; the rationale for any proposed design exceptions; and the recommended design.

In addition to necessary pavement and shoulder work, 3R projects may include minor changes to geometric features (such as pavement widening, flattening curves and improving sight distances) when warranted based on operational or accident problems. Other types of work which may be included within the scope of a 3R project are outlined below. This listing is not in priority order, is not intended to be all inclusive and is not intended to exclude considerations of improvements not listed.

- Improve drainage.
- Repair existing sidewalks.
- Extend or replace deteriorated culverts.
- Improve traffic operations at intersections (turn lanes).
- Provide sidewalk curb ramps and other required access for the handicapped.
- Provide for bicyclists.
- Channelization of Commercial Driveways.
- Stabilize slopes.
- Removal, upgrading or installation of guiderail.
- Upgrading signs, signals and delineation.
- Pavement markings.
- Installation of end sections on drainage pipes and regrading.
- Improvement of sight distance at intersections and driveways by removing brush and/or minor regrading.
- Improvement of horizontal sight distance by removing brush and/or minor regrading.
- Improvement or protection of non-traversable ditch sections.

Based on studies by the Traffic Engineering & Safety Division which indicate that simple resurfacing projects (such as Fast Track) tend to increase run off road type accidents, the items listed below should be addressed in every project. Documentation of the disposition of these elements is to be included in the project design report. Recommendations not to include or fully achieve any of these items requires approval as a nonstandard feature.

- Superelevating curves.
- Establishing a clear zone and removing, relocating, or shielding fixed objects within the clear zone.
- Removal, upgrading or installation of guide rail.
- Pavement markings, signs and delineation.
- Treatment of hazardous drainage structures.

The following additional items are required for federal-aid 3R projects and should be included on 100% State funded 3R projects. They require approval as nonstandard features if they are not included or fully achieved as part of a federal-aid 3R project.

- Brush cutting to reestablish sight distances and maintain the clear zone, including clearing within the deflection distance of guide rail.
- Restoration or replacement of guide rail, signs, signals, delineation.
- Cleaning or reestablishing roadside ditches.

The designer is encouraged to provide a final product that will not need any basic maintenance for several years following construction. Decisions concerning how much work to include in a 3R project must be made in light of the conditions prevalent along the project and consistent with a particular Region's program decisions on how to best accomplish this work.

II. ACCIDENT DATA

Refer to Chapter 5, Section 5.3, of the Highway Design Manual for requirements and guidance regarding accident data.

III. ACCIDENT ANALYSIS

Refer to Chapter 5, Section 5.3, of the Highway Design Manual for requirements and guidance regarding accident analysis.

IV. PAVEMENT CONDITION

For any 3R project it is important to determine the primary types of deterioration, to perform a pavement evaluation, and to decide the appropriate corrective action. Refer to the *NYSDOT Comprehensive Pavement Design Manual* for requirements and guidance.

V. TRAFFIC DATA

Refer to Appendix 5 of the Project Development Manual, and Chapter 5, Section 5.3, of the Highway Design Manual for requirements and guidance regarding traffic data.

VI. GEOMETRIC ELEMENTS

A. General

The geometric elements contained in the following sections are generally based on Special Report 214. Elements which meet these criteria should generally be retained unless improvement is warranted based on existing operation or safety problems. However, existing elements in excess of these 3R values should likewise be retained unless there are factors evident that justify otherwise.

Proposals for design exceptions (i.e., nonstandard features) must be carefully analyzed and the decision rationale documented. Refer to HDM Chapter 2, Section 2.8 for requirements and guidance on justifying nonstandard features.

B. Design Speed

Refer to Chapter 2, Section 2.6.1, of the Highway Design Manual for requirements and guidance regarding design speed.

C. Lane and Shoulder Widths

The existing lane and shoulder widths shall be retained on 3R projects except as follows:

- The minimum acceptable traffic lane width is 2.7 m and the minimum acceptable shoulder width is 0.6 m.

- If the narrowness of the existing lane and shoulders is determined to be contributing to an existing accident or operational problem, the pavement should be widened to the values in Tables A, B or C, as appropriate.

The travel lanes and shoulders should not be widened greater than the table values without an explanation. However, existing widths greater than the table values should be retained with the exception that widths may be reduced to the widths in HDM Chapter 2, Section 2.7. Lane widths on highways designated for use by larger dimension vehicles should be evaluated for such use and be discussed in the design report.

TABLE A: LANE AND SHOULDER WIDTH:
TWO-LANE RURAL HIGHWAYS

Design Year AADT (vpd)	Design Speed (km/h)	Trucks [1] ≥ 10% [2]		Trucks < 10%	
		Lane Width (m)	Shoulder Width [3] (m)	Lane Width (m)	Shoulder Width [3] (m)
1 - 750	< 80 km/h	3.0	0.6	2.7	0.6
	≥80 km/h	3.0	0.6	3.0	0.6
751 - 2,000	< 80 km/h	3.3	0.6	3.0	0.6
	≥80 km/h	3.6	0.9	3.3	0.9
Over 2,000	All	3.6	1.8	3.3	1.8

FOOTNOTES TABLE A

1. Trucks are defined as heavy vehicles with six or more tires.
2. Where truck volumes substantially exceed 10% during the peak hour, consideration should be given to providing 3.3 m minimum lane widths.
3. 0.3 m less for highways on mountainous terrain except minimum lane width will be 2.7 m and minimum shoulder width will be 0.6 m.

**TABLE B: LANE AND CURB OFFSET:
URBAN HIGHWAYS**

Design Year AADT (vpd)	Design Speed (km/h)	Trucks [1] ≥ 10% [2]		Trucks < 10%	
		Lane Width [3,4] (m)	Curb Offset Width [5] (m)	Lane Width [3,4] (m)	Curb Offset Width [5] (m)
1 - 750	< 80 km/h	3.0	0.3	2.7	0.3
	≥80 km/h	3.0	0.3	3.0	0.3
751 - 2,000	< 80 km/h	3.3	0.3	3.0	0.3
	≥80 km/h	3.6	0.3	3.3	0.3
Over 2,000	All	3.6	0.3	3.3	0.3

FOOTNOTES TABLE B

1. Trucks are defined as heavy vehicles with six or more tires.
2. Where truck volumes substantially exceed 10% during the peak hour, consideration should be given to providing 3.3 m minimum lane widths.
3. The minimum parking lane width should be 2.1 m in residential areas and 2.4 m in industrial and commercial areas.
4. Lane widths of 2.7 m may be used on one-way streets or divided roadways in an urban area if at least a 0.3 m curb offset is used or if trucks and buses are prohibited.
5. Curb offset is defined as a narrow (1 m or less) shoulder adjacent to curbing. If wider shoulders are desirable, the maximum widths should be as specified under Table C.

**TABLE C: LANE AND SHOULDER WIDTH:
MULTILANE, NON-FREEWAY HIGHWAYS**

Design Year AADT (vpd)	Design Speed (km/h)	Trucks [1] ≥ 10%		Trucks < 10%	
		Lane Width (m)	Shoulder Width [2] (m)	Lane Width (m)	Shoulder Width [2] (m)
1 - 2,000	< 80 km/h	3.3	0.6	3.0	0.6
	≥80 km/h	3.3	1.2	3.3	0.9
> 2,000	All	3.6	1.8	3.3	1.8

FOOTNOTES TABLE C

1. Trucks are defined as heavy vehicles with six or more tires.
2. In curbed sections, the minimum curb offset is 0.3 m.

D. Lane and Shoulder Cross Section

The normal crown (cross slope) of a resurfaced travel lane can vary from 1.5% to 3.0% depending on existing conditions. Travel lane cross slopes of 2.0% are preferred. Parking lanes may have a cross slope of up to 6.0% to if needed to meet existing features and provide for a sufficient reveal on the curb. Shoulder slopes vary from 2.0% to 8.0%.

The rollover effect, i.e., the difference in cross slopes between the pavement and the shoulder, should not exceed 8.0% for wide shoulders (over 1.2 m) and 10% for narrow (1.2 m or less) shoulders. Refer to HDM Chapter 3, Section 3.2.5 for additional information on shoulder slopes and the use of rollover rates of up to 10%.

A uniform typical section for the length of a project may be desirable but from a practical view may not be reasonable due to excessive cost or impact. Generally, it is not desirable to vary the width of the travel lanes; therefore, variations in the roadway section may have to occur in the shoulder widths. Abrupt changes should be avoided as much as possible. Properly designed roadway widths to fit existing conditions will require field investigations and determinations which may vary station-by-station.

E. Horizontal Curvature & Superelevation

The adequacy of horizontal curves shall be determined by comparing the safe operating speed of the curve to the design speed of the highway. The safe operating speed of existing curves may be determined from Chapter 5, Section 5.7.3 of the *Highway Design Manual* based on the existing radius and superelevation.

The superelevaton of all curves which have a safe operating speed less than the design speed shall be increased to permit operation at the design speed if possible. When predicting the safe operating speed of the improved curve, refer to Chapter 5, Section 5.7.3 of the *Highway Design Manual*. For consistency with adjacent segments or to address an existing or potential accident problem, the superelevation may be increased beyond the safe operating speed to the values in HDM Chapter 2 (i.e., the AASHTO Method 5 superelevation distribution method discussed in HDM Chapter 5 Section 5.7.3.1 may be used.).

If after improving the superelevation, the safe operating speed of the curve will still be less than the design speed, the following guidelines apply:

a. Speed Difference Less Than 25 km/h.
   Where the safe operating speed will be less than 25 km/h below the design speed, no special mitigation is required beyond normal signing and delineation. If a curve in this category is identified as having an accident problem, however, the curve must be analyzed for additional improvements.
b. Speed Difference More Than 25 km/h and AADT 750 or Less.
   Where the safe operating speed will be more than 25 km/h below the design speed and the design traffic volumes are less than 750 AADT, no special mitigation is required beyond normal signing and delineation. If a curve in this category is identified as having an accident problem, however, the curve must be analyzed for additional improvements.
c. Speed Difference More Than 25 km/h and AADT More than 750.
   Where the safe operating speed of the curve will be more than 25 km/h below the design speed and the design traffic volumes are more than 750 AADT, the curve should be evaluated for reconstruction or other mitigation measures.

The maximum rate of superelevation is 0.04 in urban conditions and 0.08 under rural conditions. Rates of 0.06 may be retained if there is no accident problem associated with insufficient superelevation.

When additional superelevation is provided, superelevation runoff for simple curves without spirals will generally be applied as follows: between 50% and 70% on tangent and between 30% and 50% on curve. The length for transition from a superelevated section to a normal crown section is the same as the "Ls" distance in Chapter 5, Section 5.7.3.3 of the *Highway Design Manual*. Use of the "tangent runout" distance is not necessary.

F. Vertical Curvature and Stopping Sight Distance

When considering the adequacy of vertical curvature and stopping sight distance for a 3R project, it is not necessary to consider sag vertical curves unless they have been associated with an operational or accident problem.

Crest vertical curves should be considered for reconstruction when the curve has been associated with an accident problem attributed to the stopping sight distance of the curve or all of the following three conditions are met:

a. The hill crest hides from view major hazards such as intersections, sharp horizontal curves, or narrow bridges;

b. The AADT is greater than 1,500 vpd; and

c. The design speed of the hill crest (based on AASHTO minimum stopping sight distance criteria) is more than 30 km/h below the design speed of the highway.

G. Horizontal Clearance to Fixed Objects

A minimum clear zone distance shall be established for every 3R project. The clear zone is the unobstructed, traversable area beyond the traveled way for recovery by errant vehicles. Clear zone is measured from the edge of traveled way and should be determined based on a field review of the project area. If the accident experience does not indicate an overall problem with clear zone along the project, the minimum clear zone should be based on the predominant existing clear zone widened to what can reasonably be achieved.

All isolated roadside obstacles within the established clear zone shall be removed, relocated, shielded, made breakaway or retained as a documented nonconforming feature.

Refer to HDM Chapter 10, Section 10.3 for requirements and guidance on roadside design.

H. Grades

Existing grades shall be retained on 3R projects unless improvement is justified based on operational or safety need.

I. Bridges

Bridge projects do not come under 3R, however, bridges within a 3R project should be evaluated for rehabilitation or replacement based on their structural adequacy in accordance with current Department guidelines. The width to be provided when rehabilitating or replacing a bridge shall be determined in accordance with the Department's *Bridge Manual*, Section 2.

Roadway or structure modifications should be considered if the vertical clearance for a roadway under a bridge will be less than the vertical clearance requirements in Section 2.4 of the *Bridge Manual*.

Whenever a bridge will not have a clear roadway width less that the full approach highway width, special narrow bridge treatments, such as signing, pavement markings and delineation in accordance with the *Manual of Uniform Traffic Control Devices* should be included.

VII. GENERAL ELEMENTS

Guiderail, drainage, channelization, sidewalks, utilities, landscaping, driveway control, bicycle usage, etc. should be considered, as appropriate, on 3R projects. Normal Department standards and policies applicable to these items should be followed.

Evaluation of pedestrian accommodation on 3R projects is to be documented in the design report.

VIII. LIST OF REFERENCES

1. *A Policy on Geometric Design of Highways and Streets*, 2001, American Association of State Highway and Transportation Officials, Suite 225, 444 North Capitol Street, N.W., Washington, D.C. 20001.

2. *Americans with Disabilities Act Accessibility Guidelines*, United States Access Board, 1331 F Street NW, Suite 1000, Washington DC 20004-1111.

3. Bridge Manual, 2002, Structures Design and Construction Division, New York State Department of Transportation, State Office Campus, Albany, NY 12232.

4. Comprehensive Pavement Design Manual, 2002, Materials Bureau, New York State Department of Transportation, State Office Campus, Albany, NY, 12232.

5. Project Development Manual, New York State Department of Transportation, State Office Campus, Albany, NY 12232.

6. Highway Design Manual, Design Quality Assurance Bureau, New York State Department of Transportation, State Office Campus, Albany, NY 12232.

7. *Official Compilation of Codes, Rules and Regulations of the State of New York Title 17 Transportation (B) Chapter V*, 2001, West Group, 610 Opperman Drive, Eagan, MN 55123.

8. Safety Cost-Effectiveness of Incremental Changes in Cross-Section Design–Informational Guide. Federal Highway Administration, December, 1987.

9. Special Report 214, *Designing Safer Roads, Practices for Resurfacing, Restoration, and Rehabilitation*. Washington, D.C.: Transportation Research Board, National Research Council, 1987.

APPENDIX A
DESIGN YEAR TRAFFIC FORECASTS

Refer to Appendix 5 of the Project Development Manual for requirements and guidance regarding design year traffic forecasts.