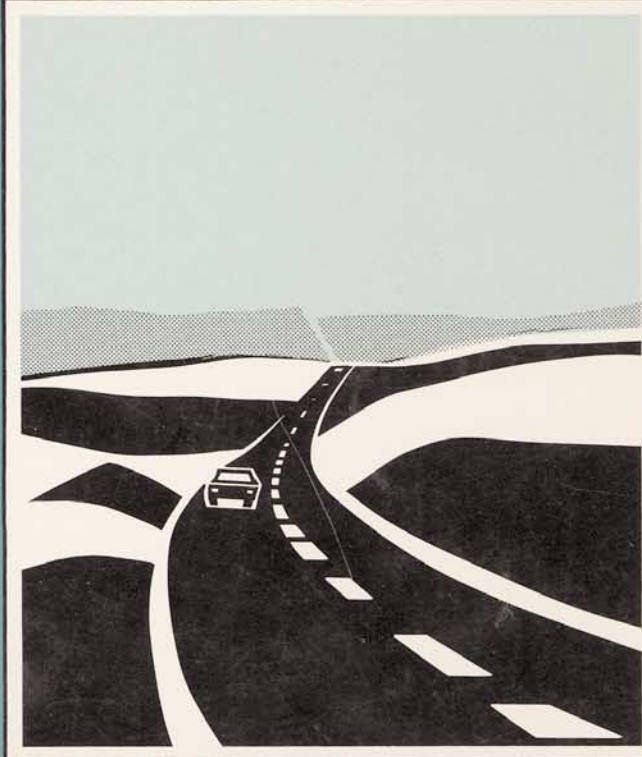


DESIGNING SAFER ROADS



Practices for Resurfacing, Restoration, and Rehabilitation



Transportation Research Board
National Research Council

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Preface

In response to a provision in the Surface Transportation Assistance Act of 1982, the Secretary of Transportation, acting through the Federal Highway Administration, requested the National Academy of Sciences to study the safety cost-effectiveness of highway geometric design standards and recommend minimum standards for resurfacing, restoration, and rehabilitation (RRR) projects on existing federal-aid highways, except freeways. Specifically, the act called for the Secretary of Transportation to enter into arrangements with the National Academy of Sciences to

conduct a study of the safety cost-effectiveness of geometric design criteria of standards currently in effect for construction and reconstruction of highways, other than highways access to which is fully controlled, to determine the most appropriate minimum standards to apply to resurfacing, restoration, and rehabilitation projects on such highways . . . and to propose standards to preserve and extend the service life of such highways and enhance highway safety.

To carry out the study, the National Research Council, the principal operating agency of the National Academy of Sciences and the National Academy of Engineering, assembled a committee of 16 experts in the various disciplines needed to develop and apply geometric design standards and assess their impact on safety, highway serviceability, cost, environment, and system administration. Committee members included individuals with experience in highway design, traffic engineering, highway safety, accident analysis, highway construction, statistics, economics, highway administration, and law.

The committee began its work with a review of RRR practices in state and local highway agencies. Committee staff visited the state highway agency and

the Federal Highway Administration offices in each of the 15 states selected for case studies and conducted telephone interviews with local highway officials representing 16 counties, 20 cities, and 3 metropolitan planning organizations. Federal, state, and local officials provided valuable information on the types of projects funded with federal aid, procedures used to select RRR projects, current design standards and their use, and the ways in which safety needs are taken into account.

The study committee sponsored critical reviews of prior research on the safety effects of key highway features and special research projects on pavement edge drops and roadside safety. The critical reviews and findings from the special research projects were used to make judgments about relationships between safety and key highway features. For several design features, the committee found sufficient evidence to support quantitative relationships between safety and design improvements. However, these relationships must be viewed as approximate in nature. Although the relationships are based on the best available data, they could be substantially changed by the results of future research.

In addition, the study committee developed relationships between cost and key highway features. These relationships are based on an examination of published cost data, cost records, and cost-estimating procedures for a sample of highway agencies throughout the country. The cost relationships provide estimates of typical costs for making geometric design improvements on RRR projects. However, the cost for a given improvement can vary considerably from site to site because of variations in site conditions, labor and material costs, design practices, and project scale. Thus, actual costs could be much greater or less than estimates developed using the cost relationships.

The safety and cost relationships were used to assess the safety cost-effectiveness of geometric design standards. The added cost per accident eliminated that can be expected for improvements to highway geometry was estimated for illustrative projects. When system data were available for existing highway conditions, the study committee examined the effects of alternative RRR standards on systemwide safety and the total expenditure needed to meet the standard on a nationwide basis or for selected states.

Drawing primarily on case studies of current RRR practices and analyses of safety cost-effectiveness, the committee has recommended a variety of practices that encompass the entire RRR process but with special focus on design. In selected instances, federal, state, and local highway agencies can use the recommendations, along with published manuals, design aids, and local experience to develop or modify minimum design standards for RRR projects. For federal-aid RRR work, the Secretary of Transportation is required by statute to ensure that projects are designed and constructed in accordance with standards that extend the service life of highways and enhance highway safety. To

accomplish this, the Secretary, acting through the Federal Highway Administration, must either set nationwide RRR standards or approve standards adopted by individual states. In either case, the committee's recommendations provide guidance. In addition, the committee has recommended various research and training activities that federal and state highway agencies can use to improve their ability to enhance safety through RRR projects.

The study was performed under the overall supervision of Dr. Damian J. Kulash and Robert E. Skinner, Jr., the former and current Directors for Special Projects. Robert E. Skinner, Jr., directed the project staff. Dr. Harry Cohen, Joseph R. Morris, Dr. John A. Deacon, Richard Margiotta, and Malcolm Quint made significant contributions.

Special appreciation is expressed to Nancy A. Ackerman, TRB Publications Manager, and Edythe T. Crump, Senior Editor, for editing the final report and to Marguerite E. Schneider, Frances E. Holland, and Margaret M. Sheriff for typing the many drafts and the final manuscript.

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