

# Preface

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A safe and efficient land transportation system is an essential element of sustainable regional or national economy. Roads have been and continue to be the backbone of the land transportation network that provides the accessibility for the required mobility to support economic growth and promote social activities. As more and more advanced and speedy modes of transportation are developed over time, and as the economic activities of the human society grow in pace and sophistication, the roles of roads have multiplied and their importance increased. At the same time, the potential adverse impacts of road development have also grown in magnitude, especially when proper planning, design, construction or management is not carried out.

To fully exploit the benefits of highway development and minimize possible adverse influences, the study of highway engineering must expand from merely meeting the basic needs of offering safe and speedy access from one point to another, to a field of study that not only covers the structural and functional requirements of highways and city streets, but also addresses the socio-economic and environmental impacts of road network development. Traditional engineering curriculum does not adequately cover these somewhat “softer” aspects of highway engineering and the societal roles of highway engineers. It is the intention of this Handbook to provide the deserved attention to these topics by devoting Part A with five chapters on issues related to highway planning and development. Few professionals will disagree that the highway engineer today must have sufficient knowledge in the areas of highway financing, access management, environmental impacts, road safety and noise. The five chapters should provide the necessary information on the social and environmental responsibilities of a highway engineer to the undergraduate student of civil engineering and the graduate research student in highway engineering. In addition, the highway engineer and the general reader would find an in-depth up-to-date account of the trend toward privatization of highway development and financing of highway projects.

Parts B and C of the Handbook cover the more traditional core aspects of highway engineering. Part B on the functional and structural design of highways is organized into 8 chapters. The chapters offer an extensive coverage on the technical issues of highway and pavement engineering. The chapter contributors have made special efforts to explain the latest developments and comment on the future trends in their respective chapters. These chapters adequately address the undergraduate and graduate curricular needs in understanding the principles and theories of highway and pavement engineering. They also update the professional highway engineer on new concepts and ideas in the field of study. The chapter on highway materials is especially timely in view of the experiences gathered since the mid 1990s from implementation of the Superpave technology in asphalt mix design and performance grading of asphalt cement. The chapters on structural design of pavements and pavement overlay design also present the concepts of the new mechanistic-empirical design approaches advanced by the 2002 Design Guide which has yet to be adopted by AASHTO. The chapter on design of concrete pavements introduces new

closed-form solutions for deflection and stress computation of multi-slab systems, and easy-to-use software is provided with the Handbook. The software is available on the CRC website.

Part C deals with construction, maintenance and management of highways. While maintenance and management of highways are of primary concern in developed countries with an established highway network, it would be unwise for developing countries to ignore them in their highway network development programs where road construction activities are taking central stage. Experience in both developing and developed countries has shown that a sustainable highway infrastructure development program must adopt a total highway management approach that takes into consideration the entire life-cycle needs of the road network. This concept is well explained in the three chapters that address highway asset management, pavement management, and bridge management, respectively. Equipment, tools and analytical techniques for condition surveys, and structural and safety performance evaluation in support of the total highway management are found in other chapters in Part C. The chapter on pavement evaluation presents useful software for non-destructive pavement structural evaluation. It contains closed-form backcalculation computer programs for both rigid and flexible pavements. The software is found on the CRC website. It should be highlighted that highway agencies have in the past decades begun to apply the concept of asset management to the development, operation and improvement of highway assets in a systematic manner. The chapter on Highway Asset Management provides the reader with the background, concepts and principles involved.

Overall, this Handbook adopts a comprehensive and integrated approach, and offers a good international coverage. It contains 22 chapters, covering the entire spectrum of highway engineering, from planning feasibility study and environmental impact assessment, to design, construction, maintenance and management. The completion of this Handbook would not have been possible without the commitment by the chapter contributors, all experts in their respective fields. The editor is most grateful to them for their efforts towards producing this meaningful Handbook, to the great benefit of the professional transportation engineers, undergraduate civil engineering students, and graduate research students specializing in highway engineering.

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