GEOMETRIC DESIGN PROJECTS FOR HIGHWAYS

An Introduction

SECOND EDITION

J.G. Schoon

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Abstract: This book provides an introduction to geometric design of highways by means of examples and projects that emphasize basic specifications, approaches to preliminary route selection, alignment, drainage, cost, and environmental concerns. Intended as a supplementary text to standard texts on highway engineering for undergraduate and post-graduate university courses, it presents projects from the initial provision of a topographic map and specifications through to the investment and user cost estimates of a particular highway. The ability to connect the various aspects of highway geometric design in terms of a complete project is stressed to assist students and practitioners to understand the design linkages inherent in the design process related to topography and design policy. While intended primarily for university instruction at undergraduate and graduate levels, the book will also be of benefit to transportation and land-use planners wishing to become familiar with the major features of geometric design as it relates to other forms of infrastructure development.

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Preface

The main purpose of this book is to assist in consolidating the many elements of highway design and linking them into a route selection and geometric design project. This second edition is based upon metric units of measurement. In addition, it enlarges upon environmental reporting concerns and presents a discussion of economic cost analysis and its application. The latter will assist in comparing different projects conducted in a class setting, and is intended to add further realism to the overall design and evaluation process. Also added are the main features of route selection and design aided by digital terrain and computerized alignment modeling. This latter approach is becoming more prominent as its cost is reduced and experience is gained in its use by highway agencies and consulting firms.

Intended for use by senior undergraduate students in civil engineering and graduate students who require a basic highway design course, the book is structured to complement highway design theory described in existing texts and design guidelines, and to supplement these in a typical highway design course. The book is also intended to assist an introductory short-course on geometric design for practicing engineers. It is assumed that the student has a working knowledge of geometry, trigonometry, soil mechanics, hydraulics, and surveying principles. These are subjects which most undergraduate civil engineering students have studied during or before their senior year.

Understanding the interrelationship between geometric design and topography is a fundamental requirement in highway engineering, for these essential elements establish the horizontal and vertical alignment of the centerline, upon which all other details of the highway and the right-of-way depend. The principles remain the same for highways ranging from a simple, two-lane, local road to a multi-lane freeway. Also, the design of any highway route is a unique undertaking in that detailed features of the terrain and other environmental conditions invariably differ; only by working through a practical example which contains the essential design elements can the student be sure of understanding the problems involved, and of developing realistic solutions.

The examples illustrate the process of conducting a preliminary highway design based upon the geometric design controls, topographic maps, and, where possible, aerial photography. Thus, the examples provide exposure to and some practice in determining