Introduction

The National Council of Examiners for Engineering and Surveying (NCEES) develops, administers, and scores the examinations used for engineering and surveying professional licensure in the United States. The PE civil exam provides the qualifying test for candidates seeking registration as civil engineers. The civil transportation exam is intended to assess your knowledge of transportation design principles and techniques of field practice.

This book is written with the exam in mind. Major topics, equations, and example problems are presented and explained, along with additional practice problems and solutions in order to develop a broad understanding of the concept so that a problem that targets specific focus on one or a few selected parts of a concept can be related to the overall process involved. National design standards are referenced throughout the chapters and used in examples and practice problems. Appropriate sections of the standards are explained and analyzed to help gain familiarity with applicable standards before using them during the exam. This book provides a comprehensive guide and reference for self-study of civil transportation engineering.

This book is organized in six chapters that approximate the development of a transportation project from planning, alternative solutions, economic analysis, community impact projection, environmental concerns, safety analysis and predictions, and finally, project construction.

The current NCEES exam specifications cover both the knowledge breadth exam and the discipline depth exam. The breadth portion of the exam covers topics that are generic to all disciplines of civil engineering, while the breadth portion of the exam covers topics specific to the discipline within civil engineering. At the time of publication, the civil transportation specifications are as follows.

I. Traffic Engineering (Capacity Analysis and Transportation Planning) (11 questions)
   Uninterrupted flow; street segment interrupted flow; intersection capacity; traffic analysis; trip generation and traffic impact studies; accident analysis; nonmotorized vehicle facilities; traffic forecast; highway safety analysis

II. Horizontal Design (4 questions)
   Basic curve elements; sight distance considerations; superelevation; special horizontal curves

III. Vertical Design (4 questions)
   Vertical curve geometry; stopping and passing sight distance; vertical clearance

IV. Intersection Geometry (4 questions)
   Intersection sight distance; interchanges; at-grade intersection layout; including roundabouts

V. Roadside and Cross-Section Design (4 questions)
   Forgiving roadside concepts; barrier design; cross-section elements; Americans with Disabilities Act (ADA) design considerations

VI. Signal Design (3 questions)
   Signal timing; signal warrants

VII. Traffic Control Design (3 questions)
   Signs and pavement markings; temporary traffic control

VIII. Geotechnical and Pavement (4 questions)
   Sampling and testing; soil stabilization techniques, settlement and compaction, excavation, embankment, and mass balance; design traffic analysis and pavement design procedures; pavement evaluation and maintenance measures

IX. Drainage (2 questions)
   Hydrology; hydraulics, including culvert and stormwater collection system design, and open-channel flow

X. Alternatives Analysis (1 question)
   Economic analysis

HOW TO USE THIS BOOK

The Transportation Depth Reference Manual provides comprehensive coverage of the major topics on the transportation depth exam and is designed to be used in conjunction with the PE Civil Reference Manual, which should be your primary breadth exam review resource. Start by reviewing the exam topics (listed in this introduction) and familiarizing yourself with the content and format of this book. Review the table of contents and the index, and flip through the chapters. Each chapter begins with a nomenclature list of the chapter’s variables and ends with practice problems covering the
chapter’s major topics. Every significant term and concept has been indexed to provide a method of finding topics and data quickly.

Create a study schedule based on your strengths and weaknesses, and on how much time you think you’ll need to spend reviewing each chapter. While chapters can be reviewed and referenced independently, each chapter builds on the topics presented previously. As you read each chapter, work the example problems and review the presented solution. At the end of the chapter, assess your understanding by following the example problems and solutions, and the end-of-chapter practice problems. The practice problems are designed to give you experience applying relevant equations, data, and design standards to a given problem. Restrain yourself from reviewing the solutions until after you’ve solved each problem, then compare your solving approach with that given in the solution. With practice, you will be able to quickly decide which design standards, data, and equations are applicable to the problem at hand.

The PPI Learning Hub (ppi2pass.com) offers online versions of this book, a quiz generator with over 900 multiple-choice, exam-like practice problems, over 350 solved problems, full-length practice exams, and learning management tools.