Introduction

ABOUT THIS BOOK

Structural Depth Reference Manual for the PE Civil Exam addresses the structural depth section of the PE civil exam administered by the National Council of Examiners for Engineering and Surveying (NCEES). The structural depth section of the exam is intended to assess your knowledge of structural design principles and practice. The problems in the exam are intended to be representative of the process of designing portions of real structures.

This book is written with the exam in mind. It is organized into six chapters, each of which corresponds to a specific material covered on the exam.

1. reinforced concrete design
2. foundations and retaining structures
3. prestressed concrete design
4. structural steel design
5. timber design
6. masonry design

Each of these chapters covers the following exam specifications.

1. Analysis of Structures (35%)
   loads and load applications; forces and load effects
2. Design and Details of Structures (50%)
   materials and material properties; component design and detailing
3. Codes and Construction (15%)
   codes, standards, and guidance documents; temporary structures and other topics

Along with covering the exam’s specifications, this book frequently references the exam-adopted codes, noted as follows. The appropriate sections of the codes are explained and analyzed in a concise and simple manner. Illustrative examples are presented, and each example focuses on one specific code issue. In addition to providing clarification and interpretation of the applicable sections of the codes, extensive reference publications are cited to reflect current design procedures. (See References and Codes Used to Prepare This Book.)

- NCEES has adopted the American Concrete Institute’s Building Code Requirements for Structural Concrete, 2014 ed. (ACI 318). The first three chapters of this book conform to the 2014 edition. For problems involving concrete design, only the strength design method may be used on the exam. The first three chapters of this book present only the strength design method.

- NCEES has adopted the American Institute of Steel Construction’s Steel Construction Manual, 14th ed. Chapter 4 of this book conforms to the 14th edition. For problems involving structural steel design, on the exam you may choose to use either the allowable stress design (ASD) method or the load and resistance factor design (LRFD) method. In Chap. 4 of this book, both methods are presented.

- NCEES has adopted the American Wood Council’s National Design Specification for Wood Construction, 2015 ed. (NDS). Chapter 5 of this book conforms to the 2015 edition. For problems involving timber design, on the exam only the ASD method may be used. In Chap. 5 of this book, only the ASD method is presented.

- NCEES has adopted the Masonry Society’s Building Code Requirements for Masonry Structures, 2013 edition. (TMS 402). Chapter 6 of this book conforms to the 2013 edition. For problems involving masonry design, on the exam only the ASD method may be used (except, strength design methods may be used for walls with out-of-plane loads). In Chap. 6 of this book, only the ASD method is presented, supplemented with the strength design method for walls with out-of-plane loads.

- NCEES has adopted the International Code Council’s International Building Code, 2015 ed. (IBC); the American Society of Civil Engineers’ Minimum Design Loads for Buildings and Other Structures, 2010 ed. (ASCE/SEI7); and the Precast/Prestressed Concrete Institute’s PCI Design Handbook: Precast and Prestressed Concrete, 7th ed. All chapters of this book conform to these editions.
Abbreviations are used throughout this book to refer to the exam-adopted codes. These codes are listed in the References and Codes section, with their abbreviations in brackets. This book also cites other references that discuss current design procedures. These references are noted by footnotes throughout the chapters, with their complete publication information listed in the References and Codes Used to Prepare This Book section of this book.

HOW TO USE THIS BOOK

*Structural Depth Reference Manual for the PE Civil Exam* provides a targeted review of the topics on the structural depth section of the PE civil exam, and it is designed to be used in conjunction with the *Civil Engineering Reference Manual* as your primary breadth exam resource.

To best use this book, start by reviewing the exam topics (listed in this Introduction). Then, familiarize yourself with where this book covers those exam topics by looking at the table of contents and the index.

Each chapter in this book corresponds to a material (e.g., concrete, steel, masonry, timber) covered on the exam. Chapters can be reviewed and referenced individually, or you may read them in order. You should read each chapter in its entirety and solve its example problems before attempting the end-of-chapter practice problems.

Refrain from reviewing solutions until you’ve tried solving the problems on your own, and use only the tools and references you’ll have with you during the exam.

The practice problems are designed to give you experience applying relevant equations, data, and theories to a given problem. Compare your solving approach against that provided in the solution.

After studying this book and solving its problems, you should be prepared to solve common concrete, steel, timber, masonry, and foundation/retaining structure problems on the exam. Use the references and codes to supplement your study as needed.