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The Structural Engineers Association of California (SEAOC) is a professional association of four regional member organizations (Southern California, Northern California, San Diego, and Central California). SEAOC represents the structural engineering community in California. This document is published in keeping with SEAOC's stated mission:

> Empower our members and Member Organizations to advance the people, practice, and position of structural engineering.

Editor

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Suggestions for Improvement

Comments and suggestions for improvements are welcome and should be sent to the following:

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Errata Notification

SEAOC has made a substantial effort to ensure that the information in this document is accurate. In the event that corrections or clarifications are needed, these will be posted on the SEAOC website at www.seaoc.org and on the ICC website at www.iccsafe.org.

SEAOC, at its sole discretion, may issue written errata.

Contents

2024 *IBC® SEAOC Structural/Seismic Design Manual*

The *IBC SEAOC Structural/Seismic Design Manual,* throughout its many editions, has served the purpose of illustrating good seismic design and the correct application of building code provisions. The manual has bridged the gap between the discursive treatment of topics in the *SEAOC Blue Book (Recommended Lateral Force Requirements and Commentary)* and real-world decisions that designers and engineers face in their practice.

The examples illustrate code-compliant designs engineered to achieve good performance under severe seismic loading. In some cases, simply complying with building code requirements may not ensure good seismic response. This manual presents various methods and procedures that extend beyond what one might use to comply with minimum code requirements and discussion of the reasons for using a specific method or procedure.

This manual comprises four volumes:

- Volume 1: Code Application Examples
- Volume 2: Examples for Light-Frame, Tilt-Up, and Masonry Buildings
- Volume 3: Examples for Concrete Buildings
- Volume 4: Examples for Steel-Framed Buildings

In general, the provisions for developing the design base shear, distributing the base-shear forces vertically and horizontally, checking for irregularities, and so on, are illustrated in Volume 1. The other volumes contain more extensive design examples that address the requirements of the material standards (for example, ACI 318 and AISC 341) that are adopted by the IBC. Building design examples in material-focused volumes intentionally omit repeating items addressed in Volume 1.

Each volume has been produced by a small group of authors under the direction of a manager. The managers have assembled reviewers to ensure numerical accuracy and coordination with other SEAOC work and publications, most notably the *Blue Book*.

This manual is a valuable tool for engineers seeking to design buildings for good seismic response.

Kevin S. Moore
Project Manager

Preface to Volume 3

Volume 3 of the 2024 *IBC SEAOC Structural/Seismic Design Manual* illustrates the design requirements for reinforced concrete shear wall and moment-frame seismic systems, parking garages, foundation systems, and diaphragm and collectors.

The design examples in this volume are governed by standards developed by the American Concrete Institute (ACI) in ACI 318, Building Code Requirements for Structural Concrete, and by modifications to that document included in the 2024 IBC. The design examples in this volume approach the solution based on the ductility expectations for the system/component and based on the desired seismic response. In most examples there are several mechanisms that can be utilized to achieve the desired ductility and required resistance, and in each example the author has chosen the appropriate option. The alternatives and the reasons for not choosing them are discussed where applicable.

The examples follow the recommendations provided in the *SEAOC Blue Book* and other SEAOC recommendations. They are intended to assist designers in developing structures and components of structures that achieve good seismic performance. This manual is not intended to be a building code, nor is it intended to provide an exhaustive list of all detailing and design approaches.

The design examples have been included in past editions of this manual and are updated in this edition.

Kevin S. Moore
Volume 3 Manager

Acknowledgments

SEAOC is the author of the *IBC SEAOC Structural/Seismic Design Manual*. Each edition comes about through the effort of highly qualified structural engineers who contribute their expertise to writing, reviewing, and updating design examples to be consistent with best practices for seismic design. Each edition contains new examples as well as revisions to previous examples. As such, it is impractical to consistently assign authorship of examples, as most are the work, in varying degrees, of the original author and multiple later reviewers and revisers. Nevertheless, SEAOC gratefully acknowledges the contributions of these members to this volume over several editions.

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How to Use This Document

Equation numbers in the right-hand margin refer to the one of the standards (e.g., ACI 318, ASCE 7 or IBC). The default standard is given in the heading of each section of each example; equation numbers in that section refer to that standard unless another standard is explicitly cited.

Abbreviations used in the "Code Reference" column are

§ – Section T – Table

F – Figure Eq – Equation