

## Reinforced concrete: mechanics and design<sup>1</sup>

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The authors succinctly state in the preface: "This book is a comprehensive university text on reinforced concrete design based on Canadian codes and standards. It is a complete revision of the senior author's very successful American text. This Canadian edition is compatible with the National Building Code of Canada (NBCC), CSA Standard A23.3-94, and Canadian metric bar sizes.

Each subject progresses from theory (based on mechanics) to a discussion of the behaviour of concrete elements, to the derivation of the design method, to practical design requirements, to completely worked-out examples. The level of presentation varies by topic, to accommodate the student learning the subject matter. Those topics normally covered in the first undergraduate course on reinforced concrete are presented at an introductory level. Those topics that would form a part of a second undergraduate course or a graduate level course are presented at a more advanced level. Always, however, the aim is to give the user the essential understanding needed to carry out design of reinforced concrete." This well-formulated introduction describes the book in a concise way.

This is the book university professors and their students have been waiting for. It reflects the senior author's vast background and experience in the development of major codes, his over 30 years of experience as a teacher, and his prominence as one of North America's leading researchers. It also shows his extensive experience as a design engineer.

The book is very well organized. It starts, logically, with general information, which serves as background for the entire book. Reinforced concrete is defined in Chapter 1, which is followed by a discussion of the structural design process in Chapter 2. In this chapter, the main design criteria (structural adequacy, economy, maintainability, and aesthetics), the different limit states, and safety concepts are presented in great detail.

The next chapter deals with materials. For the prediction of the time-dependent creep and shrinkage properties, the

models of the 1990 CEB-FIP code are presented, rather than the outdated ACI model. This chapter also contains a section that provides valuable guidance for the evaluation of the in-place concrete strength and safety of existing structures.

The following six chapters present the basic concepts of the design of individual concrete members for flexure, shear, bond, and serviceability. Chapter 6 on shear is particularly interesting in that it discusses not only the historical and general background of the simplified and general methods for shear design of the CSA code, but also the easy to understand "plastic space truss model" used in several European codes.

The basic design concepts are applied to continuous beams and slabs in Chapter 10. Examples of a real case study are used for illustration.

Chapters 11 and 12 explain the behaviour of short and long columns. The ground-breaking research of Professor MacGregor is explained in great detail in the chapter on slender columns.

The column chapters are followed by a comprehensive discussion of two-way slabs in three chapters. First moment fields for different slab configurations are presented, followed by discussions of the direct design method and the elastic frame methods. In Chapter 15, slab design is based on results of other methods of analysis such as finite elements, yield line theory or strip method. These three chapters are followed by chapters on footing design and design by shear friction.

Chapter 18 presents a comprehensive discussion of strut-and-tie models for the design of discontinuous regions in corbels, deep beams, walls, and joints. The design of walls is discussed in Chapter 19. The final chapter deals with earthquake design according to NBCC and A23.3. Four examples illustrate the seismic design.

In the Appendix, design charts for common concrete strengths are given. Up-to-date references from around the world are listed chapter by chapter containing all the key papers on the many topics.

The book is very well written and amply illustrated. Each chapter contains many design examples and a set of problems as well as a brief summary at the end. An *Instructors Solution Manual*, which is available to instructors, provides complete solutions to about 75% of the problems.

This is not only an excellent book for civil engineering students but also a complete reference book for structural designers who may have forgotten some of the intricacies of modern structural concrete design.

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