FIBER REINFORCED CEMENT AND CONCRETE COMPOSITES

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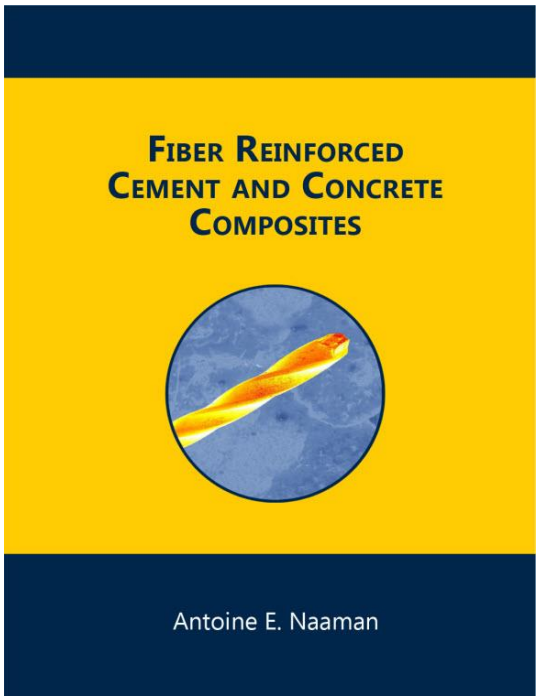
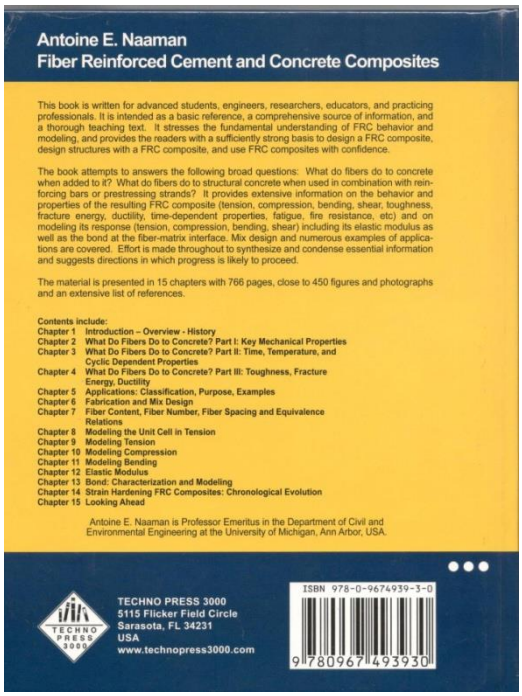


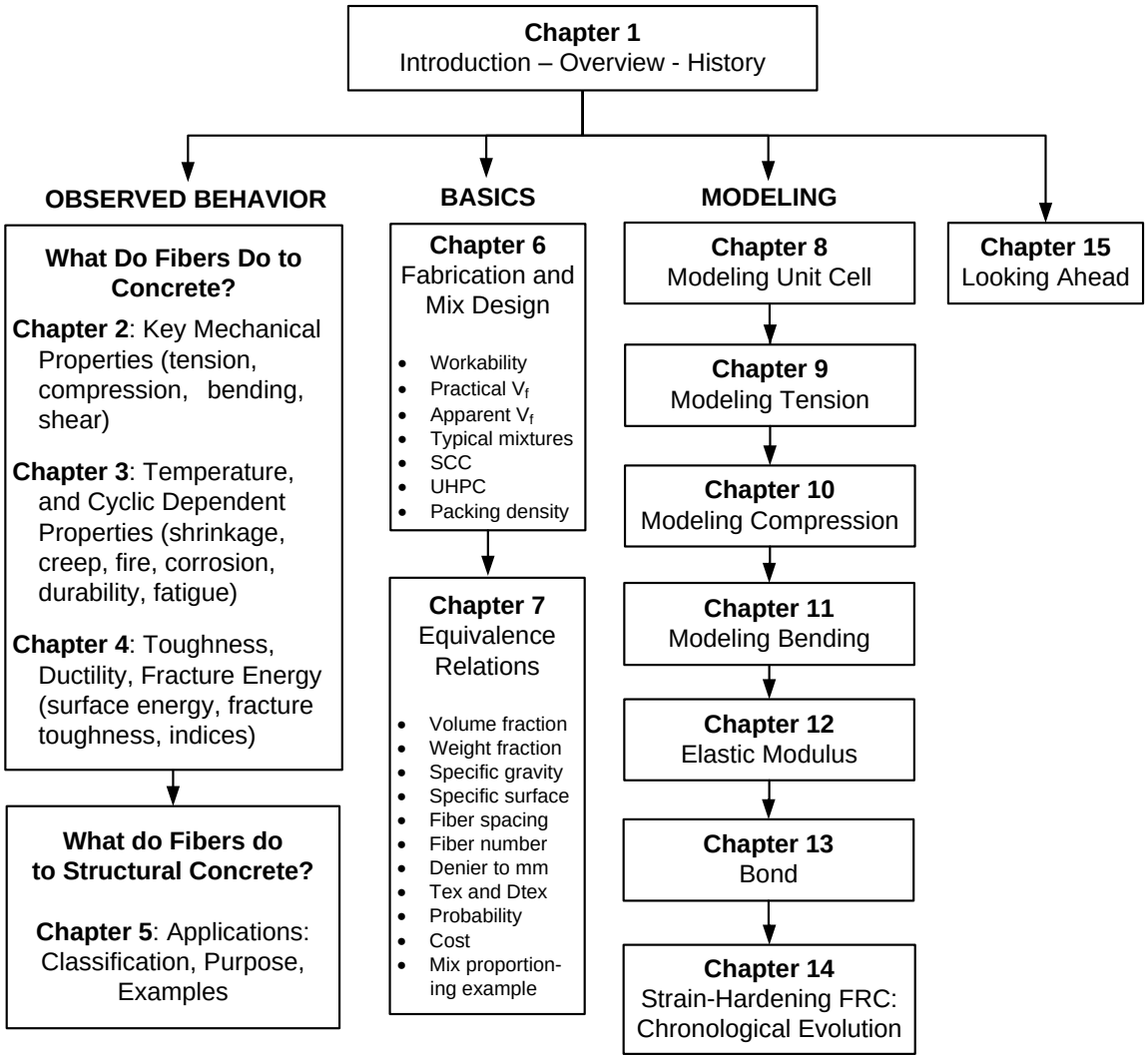


This book is written for advanced students, engineers, researchers, educators, and practicing professionals. It is intended as a basic reference, a comprehensive source of information, and a thorough teaching text. It stresses the fundamental understanding of FRC behavior and modeling, and provides the readers with a sufficiently strong basis to design an FRC composite, design structures with an FRC composite, and use FRC composites with confidence.

The book is organized into 15 chapters (see below), which can be assembled according to their intended function. Chapter 1 presents a general background and overview of historical evolution of fibers and FRC composites. The following three chapters address the question: What do fibers do to concrete as a material? They offer extensive information on the behavior and properties of the resulting composite (tension, compression, bending, shear, toughness, fracture energy, ductility, time-dependent properties, fatigue, fire resistance, etc). Chapter 5 describes different classes of applications, their purpose, and numerous examples to answer the question: What do fibers do to structural concrete? Chapter 6 deals with fabrication methods and mix design of FRC composites; potential challenges in manufacturing the composite, including proper fiber dispersion and mix workability, are addressed with suggested solutions. Chapter 7 develops the fundamental relations related to fiber and matrix volumes or weights and their fractions, fiber count, fiber spacing, specific surface, equivalence relations, and the like. Chapters 8 to 14 focus specifically on analytical modeling (tension, compression, bending, shear, elastic modulus, bond,

stress-strain relationships, etc), and Chapter 15 offers a perspective looking at the challenges ahead. This book will surely help the reader find rational answers and solutions to the many questions that arise when dealing with fiber reinforced concrete.

Whenever possible, a consistent notation and widely accepted symbols are adopted, and all symbols used in the text are defined and summarized in Appendix A. The book utilizes primarily the International System of Units (SI); however, all important tables, figures, and design information, are given in dual units (SI and US). Conversion factors from US to SI units and equivalence relations for some dimensionally inconsistent equations are given in Appendix B. An extensive list of references is given at the end of each chapter.



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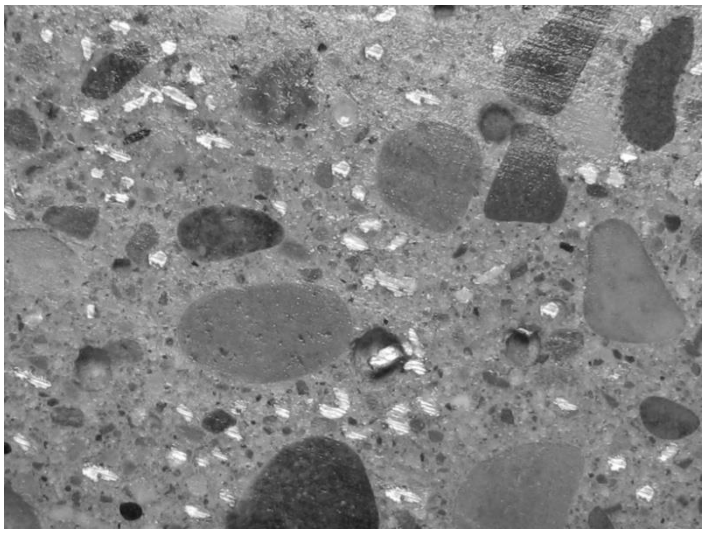

Typical sections of steel fiber reinforced concrete (top) and mortar (bottom).

Fiber Reinforced Cement and Concrete Composites

Antoine E. Naaman

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Fiber Reinforced Cement and Concrete Composites

This book is written for advanced students, engineers, researchers, educators, and practicing professionals. It is intended as a basic reference, a comprehensive source of information, and a thorough teaching text. It stresses the fundamental understanding of FRC behavior and modeling, and provides the readers with a sufficiently strong basis to design a FRC composite, design structures with a FRC composite, and use FRC composites with confidence.

The book attempts to answers the following broad questions: What do fibers do to concrete when added to it? What do fibers do to structural concrete when used in combination with reinforcing bars or prestressing strands? It provides extensive information on the behavior and properties of the resulting FRC composite (tension, compression, bending, shear, toughness, fracture energy, ductility, time-dependent properties, fatigue, fire resistance, etc) and on modeling its response (tension, compression, bending, shear) including its elastic modulus as well as the bond at the fiber-matrix interface. Mix design and numerous examples of applications are covered. Effort is made throughout to synthesize and condense essential information and suggests directions in which progress is likely to proceed.

The material is presented in 15 chapters with 766 pages, close to 450 figures and photographs and an extensive list of references.

Contents include:

Chapter 1 Introduction – Overview - History
Chapter 2 What Do Fibers Do to Concrete? Part I: Key Mechanical Properties
Chapter 3 What Do Fibers Do to Concrete? Part II: Time, Temperature, and Cyclic Dependent Properties
Chapter 4 What Do Fibers Do to Concrete? Part III: Toughness, Fracture Energy, Ductility
Chapter 5 Applications: Classification, Purpose, Examples
Chapter 6 Fabrication and Mix Design
Chapter 7 Fiber Content, Fiber Number, Fiber Spacing and Equivalence Relations
Chapter 8 Modeling the Unit Cell in Tension
Chapter 9 Modeling Tension
Chapter 10 Modeling Compression
Chapter 11 Modeling Bending
Chapter 12 Elastic Modulus
Chapter 13 Bond: Characterization and Modeling
Chapter 14 Strain Hardening FRC Composites: Chronological Evolution
Chapter 15 Looking Ahead

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