

Book Review

***Ferrocement and Laminated Cementitious Composites*, Antoine E. Naaman, Techno Press 3000, P.O. Box 131038, Ann Arbor, MI 48105, USA (2000), 372 pp. E-mail: technopress@yahoo.com; web site: www.technopress3000.com; tel/FAX: 1-734-9970969; ISBN 0-9674939-0-0; LCCN: 99-96382; hardcover (\$75)**

This unique book consolidates a broad coverage of information of interest to engineers, architects, builders and researchers, not currently available in a single volume. The author, Antoine Naaman, is professor of Civil Engineering at the University of Michigan and is a widely recognized authority on ferrocement.

Ferrocement is the oldest form of reinforced concrete, composed of a cement-based mortar or concrete matrix reinforced with a mesh of closely spaced iron rods or wires. It was invented by Joseph Louis Lambot in 1848. The development of ferrocement was rapidly surpassed by the development of conventional reinforced concrete for bridges and buildings until about the 1940s when Pier Luigi Nervi, an Italian engineer, architect and contractor, used ferrocement for the construction of aircraft hangars, boats and buildings. By the 1960s ferrocement's durability and serviceability were recognized by engineers and builders throughout the world, who endorsed ferrocement as a suitable and economical material for the construction of barges, larger vessels, tanks, and housing.

Ferrocement and Laminated Cementitious Composites is divided into 11 chapters and several appendices. Chapter 1, Introduction to Ferrocement, provides a historical background, and describes applications, parameters that distinguish ferrocement from conventional reinforced concrete, and the distinctive physical behavior of ferrocement. Chapter 2, Mechanical Properties of Ferrocement as Observed from Tests, and Chapter 3, Modeling the Tensile Properties of Ferrocement and other Brittle Matrix Composites with Continuous Fibers, relate the observed behavior of ferrocement in tension with analytical models that can be used to simulate such a behavior. The close spacing of small reinforcing elements in ferrocement results in tensile behavior that is different from that of the conventional reinforced concrete which contains widely spaced large bars or rods. Understanding the material presented in Chapters 2 and 3 is basic for the remaining chapters of the book. Chapter 4, Analysis and Design of Ferrocement in Bending, builds on the unique properties of

ferrocement in tension and develops procedures for the analysis and design of ferrocement in flexure. There is an in-depth coverage of the design philosophy based on ASD and WSD for uncracked and cracked sections and on the current trend to use USD and LRFD for flexural strength design. The influence of the different styles of steel mesh reinforcement and their spatial arrangement in the cross-section on the mechanical properties is covered in detail. The readers of the book will find the many worked examples in both SI units and inch-pound units of particular value. Chapter 5, Practical Design Guidelines, provides guidelines for design in order to satisfy ultimate strength, serviceability, durability and reliability limits. This chapter also contains many worked example problems.

Chapter 6, Construction-Fabrication of Ferrocement, describes several methods for the construction of ferrocement and shows photographs of notable structures, some detailing the step-by-step progress. Chapter 7, Testing for Reinforcement and Composite Properties, covers test methods to determine the properties essential to predicting the response of ferrocement in tension and flexure, namely: yield of the reinforcement, effective modulus of the mesh system, and the efficiency factor of the mesh system. Again, the author has provided many worked examples based on test data. Chapter 8, Cost Estimates of Typical Ferrocement Composites, is a very valuable source of cost data that is not normally found in a single source. The cost data is a significant contribution of this comprehensive volume on ferrocement. Chapter 9, Ferrocement in Housing and Related Applications, covers examples of ferrocement housing and construction methods. Chapter 10, Advanced Materials and Concepts, considers ferrocement as a high performance hybrid composite material replacing the metallic mesh with FRP meshes and discontinuous fibers of PVA, Carbon, Kevlar, Spectra, etc. These high performance composites demonstrate a unique range of properties that thin cement based composites could develop. Chapter 11, Prospects for Ferrocement Materials, Application, and Technology, provides, with an eye on the future, an overall summary of the properties of ferrocement whether the reinforcement is a metallic or synthetic mesh, or a hybrid woven material with discrete fibers.

The appendices contain a complete list of notations used in the book, unit conversions, a very extensive list of references, engineering data on wire mesh and rods

and a table of common beam formulas. The Index is adequate to locate the topics covered in the text.

The author has provided a much needed single source textbook on ferrocement that can be used by students, architects, engineers or contractors, whether for information on current applications, or for design, construction, cost, the state-of-the-art of ferrocement, and/

or the potential of hybrid cementitious thin sheet composites.

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