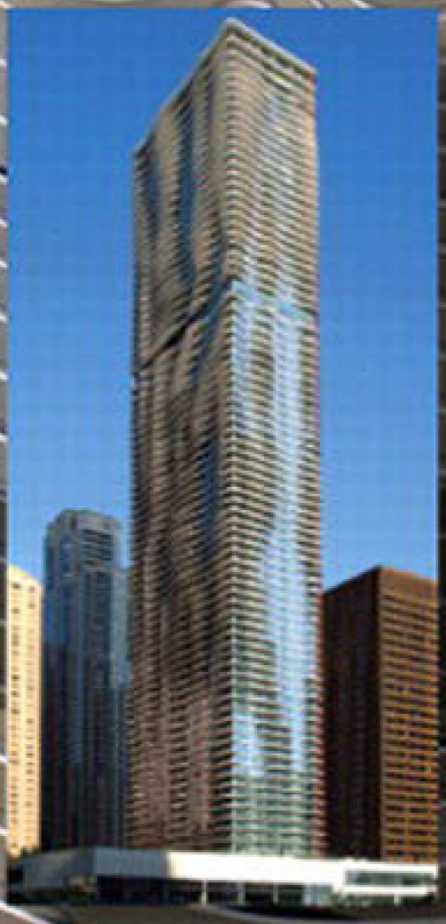
JAMES K. WIGHT
JAMES G. MACGREGOR



REINFORCED CONCRETE
MECHANICS & DESIGN 6E

This page intentionally left blank

REINFORCED CONCRETE
Mechanics and Design

About the Cover

The photos that appear on the cover of this book are of the Aqua Tower, an 82-story multiuse high-rise in downtown Chicago, Illinois. Its undulating façade gives it a distinct appearance and demonstrates both architectural and technical achievements. Architect: Studio Gang Architects.

REINFORCED CONCRETE Mechanics and Design

SIXTH EDITION

James K. Wight

F. E. Richart, Jr. Collegiate Professor
Department of Civil & Environmental Engineering
University of Michigan

James G. MacGregor

PhD, P. Eng., Honorary Member ACI
D. Eng. (Hon.), D.Sc. (Hon.), FRSC
University Professor Emeritus
Department of Civil Engineering
University of Alberta

PEARSON

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto
Delhi Mexico City Sao Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Vice President and Editorial Director, ECS: *Marcia J. Horton*
Executive Editor: *Holly Stark*
Editorial Assistant: *William Opaluch*
Vice President, Production: *Vince O'Brien*
Senior Managing Editor: *Scott Disanno*
Production Liaison: *Irwin Zucker*
Production Editor: *Pavithra Jayapaul, TexTech International*
Operations Specialist: *Lisa McDowell*
Executive Marketing Manager: *Tim Galligan*
Market Assistant: *Jon Bryant*
Art Editor: *Greg Dulles*
Art Director: *Kenny Beck*
Cover Images: *Photos of Aqua Building, Chicago IL: Close-up photo: MARSHALL GEROMETTA/AFP/Getty Images/Newscom; Full view photo of building: © Wilsons Travels Stock / Alamy*
Composition/Full-Service Project Management: *TexTech International*

Library of Congress Cataloging-in-Publication Data

Wight, James K.
Reinforced concrete : mechanics and design / James K. Wight, F.E. Richart, Jr., James G. Macgregor. – 6th ed.
p. cm.
Rev. ed. of: Reinforced concrete / James G. MacGregor, James K. Wight. 5th ed. 2009.
ISBN-13: 978-0-13-217652-1
ISBN-10: 0-13-217652-1
I. Richart, F. E. (Frank Edwin), 1918– II. MacGregor, James G. (James Grierson), 1934– III. MacGregor, James G. (James Grierson), 1934– Reinforced concrete. IV. Title.
TA683.2.M34 2011
624.1'8341—dc23

2011019214

10 9 8 7 6 5 4 3 2 1

PEARSON

ISBN-13: 978-0-13-217652-1
ISBN-10: 0-13-217652-1

Contents

This page intentionally left blank

Preface

Reinforced concrete design encompasses both the art and science of engineering. This book presents the theory of reinforced concrete design as a direct application of the laws of statics and mechanics of materials. It emphasizes that a successful design not only satisfies design rules, but is capable of being built in a timely fashion for a reasonable cost and should provide a long service life.

Philosophy of Reinforced Concrete: Mechanics and Design

A multitiered approach makes *Reinforced Concrete: Mechanics and Design* an outstanding textbook for a variety of university courses on reinforced concrete design. Topics are normally introduced at a fundamental level, and then move to higher levels where prior educational experience and the development of *engineering judgment* will be required. The analysis of the flexural strength of beam sections is presented in Chapter 4. Because this is the first significant design-related topic, it is presented at a level appropriate for new students. Closely related material on the analysis of column sections for combined axial load and bending is presented in Chapter 11 at a somewhat higher level, but still at a level suitable for a first course on reinforced concrete design. Advanced subjects are also presented in the same chapters at levels suitable for advanced undergraduate or graduate students. These topics include, for example, the complete moment versus curvature behavior of a beam section with various tension reinforcement percentages and the use strain-compatibility to analyze either over-reinforced beam sections, or column sections with multiple layers of reinforcement. More advanced topics are covered in the later chapters, making this textbook valuable for both undergraduate and graduate courses, as well as serving as a key reference in design offices. Other features include the following:

1. Extensive figures are used to illustrate aspects of reinforced concrete member behavior and the design process.

2. Emphasis is placed on logical order and completeness for the many design examples presented in the book.