SECOND EDITION

STRUCTURAL, CIVIL, AND PIPE DRAFTING

DAVID L. GOETSCH

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Structural, Civil, and Pipe Drafting, 2nd Ed.
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Cover image: ©iStockphoto.com/ Francesco Carucci

Library of Congress Control Number: 2012952123

ISBN-13: 978-1-133-94939-8

ISBN-10: 1-133-94939-8

Delmar
5 Maxwell Drive
Clifton Park, NY 12065-2919
USA

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Printed in the United States of America
1 2 3 4 5 6 7 17 16 15 14 13

Dedicated to:
The Drafting and Design Program of Northwest Florida State College — past, present, and future

PREFACE

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Structural, civil, and pipe drafting are specialized drafting fields. The old adage "it must be drawn before it can be built" is particularly true in these fields. This book is designed to assist the drafting student in developing the knowledge and skills necessary to begin a career in these drafting fields at a productive level.

Students completing all of the reinforcement activities contained in this textbook will have developed skills equivalent to those possessed by a CAD technician with at least one full year of work experience. The text is divided into seven sections with a total of 30 units of instruction. The first five units provide background information pertinent to the study of drafting. Unit 6 through Unit 28 are knowledge and skills development lessons. Unit 29 teach the student how to find, get, and keep a job in drafting after acquiring the necessary skills. Unit 30 contains advanced drafting projects.

The book is designed for self-directed, individualized instruction so that any course relying on it as the required textbook can be offered on a multilevel basis with other drafting courses. Each unit contains performance objectives, a presentation of the material, original drawings prepared by the author, a summary, review questions, and application activities.

The accompanying website contains a student version of the Structural Engineering Visual Encyclopedia (SEVE); this supplement was originally developed by Robert M. Henry at the University of New Hampshire with the support of a grant from National Science Foundation. Dr. Henry is an Associate Professor of Civil Engineering and a registered professional structural engineer. For the past 25 years, he has been actively engaged in the development of interactive structural engineering software and virtual reality modeling of structural systems. His wife, Nancy, and two sons, Mark and Brian, provided technical support during the development of SEVE. In 1998, the UNH version of SEVE won the Premiere Award for Excellence in Engineering Education Courseware.

The author, Dr. David L. Goetsch, has worked in drafting for more than 40 years. He has owned his own drafting and design consulting service and taught drafting at the high school, vocational school, and community college levels for over 36 years. He is currently Emeritus Vice-President of Northwest Florida State College in Niceville, Florida. His drafting program was selected for inclusion in the Florida Department of Education's Catalogue of Innovative Programs and maintains a 95 percent successful placement record of its graduates. In 1984, his program was selected as "Outstanding Technical Program" in Region IV of the United States by the U.S. Secretary of Education and, as a result, received the U.S. Secretary of Education's Award for technical programs.

NEW TO THIS EDITION

- Updated photographs throughout.
- Added material on solid modeling to Unit 1.
- Added material on coordinate systems, electronic data collection, ground-scan radar, and GPS to Unit 25.
- Added a new unit on quantity takeoffs of calculations (Unit 27); material from the old Unit 27 (GIS) was moved to Unit 25.
- Added material on plastic and concrete pipe to the unit on pipe drafting (Unit 28).
- Combined old Units 29 and 30 into an updated Unit 29, which covers finding a job in drafting in the age of the Internet.

SUPPLEMENTS

The Companion Web Site to Accompany Structural, Civil, and Pipe Drafting offers free resources for instructors to enhance the educational experience. The website contains the following features:

- Slides created in that outline key concepts from each chapter.
- Test bank to evaluate student learning.
- Review questions and answers.
- Structural Engineering Visual Encyclopedia (SEVE), which presents textural information, sketches, photographs, CAD drawings, three-dimensional solid models, and animations to assist students in learning to read and interpret civil engineering construction drawings using engineering terms.

ACKNOWLEDGMENTS

Jackson Smith/Getty Images

CONTRIBUTORS OF PHOTOGRAPHS AND TECHNICAL MATERIAL

The author wishes to thank those people, organizations, and companies that provided materials for use in this book. Sources of such materials are:

American Institute of Steel Construction: Appendix A
Design-Build Systems
Southern Prestressed Concrete Company, Inc.
Charles D. Willis
Billy Queysen, Sherrell Helm, Tom Benton, Clark Williams, Dieter Maucher, Roger Tonnessen, and Doug Smith of Southern Prestressed Concrete, Inc.
Mark Barrett of Design-Build Systems, Inc.
Linden Lyons of Mallet Engineering Company

The author also wishes to thank his wife Deb for providing valuable photographic and illustration assistance and Caroline McCoy for word processing of the manuscript.

CLASSROOM TESTING

The material in this text was classroom tested at Northwest Florida State College, Niceville, Florida.

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A technical review of the text was completed by:

Jeff Levy, Pulaski County Technical Center, Dublin, VA

Adam A. Dailide, ITT Technical Institute, Dearborne, MI

Michael Chesebro, Denver Institute of Technology, Denver, CO

A special acknowledgment is due to the following instructors who reviewed the chapters in detail:

Larry Lamont, Moraine Park Technical College, Fond du Lac, WI

Art Leonard, Universal Technical Institute, Phoenix, AZ

James Overton, Southeast College of Technology, Memphis, TN

Malcolm Roberts, Southeast College, Mobile, AL

Keven Standiford, Arkansas State Teacher's Retirement System, Little Rock, AR

INTRODUCTION

Jackson Smith/Getty Images

OVERVIEW OF STRUCTURAL, CIVIL, AND PIPE DRAFTING

This book prepares students for careers in three closely related fields of drafting: structural, civil, and pipe. Drafting in these fields is the act of documenting design and planning information so that something can be built, laid out, remodeled, recorded for legal purposes, or fabricated. CAD technicians in these fields work with engineering personnel in developing plans for buildings, bridges, parking decks, stadiums, and other structures; roads, canals, highways, utility lines, sewer lines, water lines, and other entities that involve cutting into the earth; and piping systems that process, transport, and store liquids and gases. Figure I.1 through Figure I.8 are examples of the types of work that require comprehensive design and drawing packages.

A typical engineering team in the modern workplace includes one or more engineers, CAD technicians, and experienced CAD technicians who serve as checkers. A checker is usually a CAD technician who has gained sufficient experience to be able to check the work of other drafting personnel to ensure that it complies with the engineer's instructions and all applicable codes, regulations, and standards.

Although most CAD technicians eventually work exclusively in one of the three fields covered in this book—structural, civil, or pipe drafting—it is wise to study all three fields. A knowledge of one field will broaden students' understanding of the others and will also increase their employability (the ability to secure a good job). Many consulting engineering firms have departments that correspond to all three of these fields. Consequently, versatility on the part of a job applicant is viewed positively by those who do the hiring in such firms. In addition, a knowledge of all three fields will help students make a more informed decision when deciding which field they like best or which has the best career potential.

Structural CAD technicians typically work in such settings as consulting engineering firms that have a structural engineering department, prestressed and precast concrete companies, structural steel companies, and firms that specialize in the construction of prefabricated metal buildings. Civil CAD technicians typically work in such settings as consulting engineering firms that have a civil engineering department, surveying companies, government engineering departments (e.g., county road departments, city or county engineering departments, and state road departments), and local property appraisers' offices, as well as full-service architectural and engineering firms. Pipe CAD technicians typically work in consulting engineering firms that have a mechanical engineering department that specializes in pipe, construction companies that specialize in building piping systems, processing companies, and water and sewer departments of local governments.

This book is designed to help students studying to be CAD technicians learn to develop the types of documentation needed in structural, civil, and pipe drafting settings. This book assumes that students have basic CAD skills as well as basic mechanical drawing skills (e.g., orthographic projection, sectioning, and dimensioning).

Photo by author

Figure I.1 The plans for this structure were developed by CAD technicians.

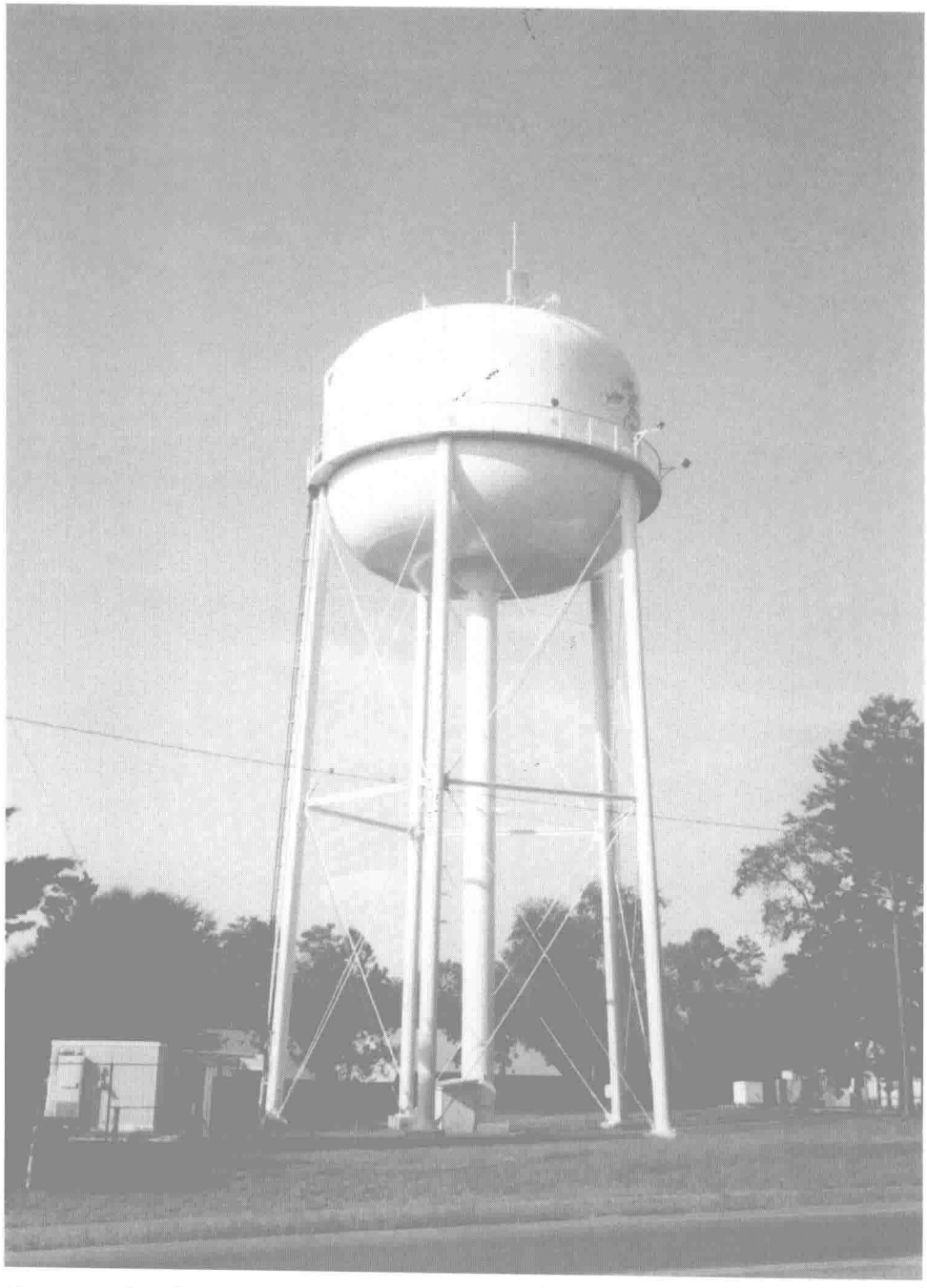

Photo by author

Figure I.2 The plans for this water tower were developed by CAD technicians.

Photo by author

Figure I.3 The plans for this student center were developed by CAD technicians.

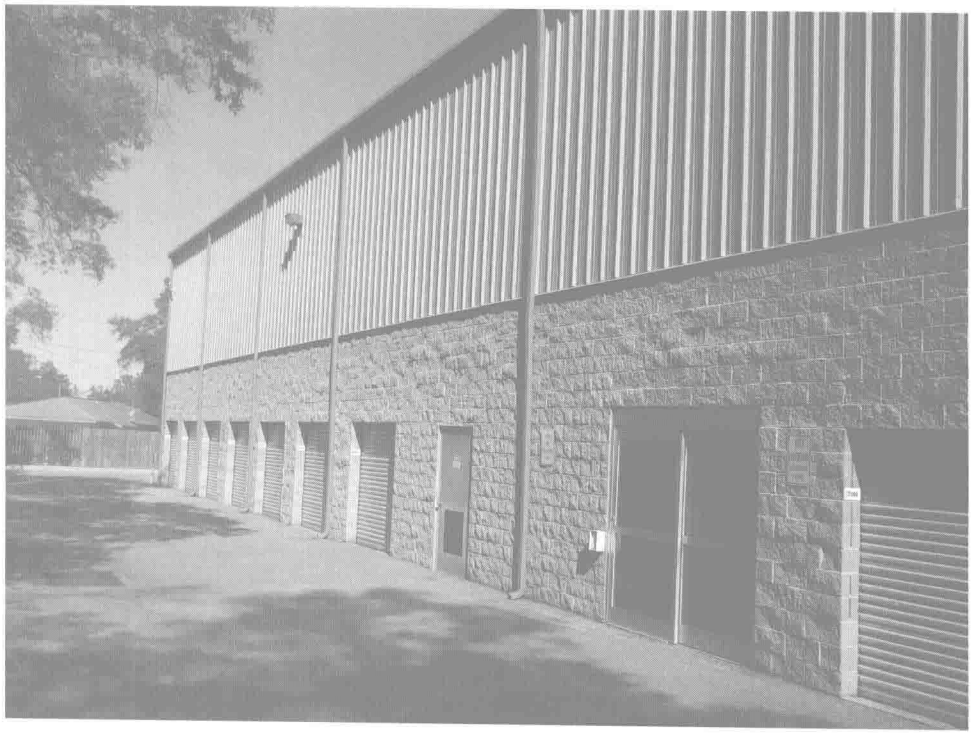

Photo by author

Figure I.4 The plans for this prefabricated metal building were developed by CAD technicians.

Photo by author

Figure I.5 The site work plan for this building was developed by CAD technicians.

Photo by author

Figure I.6 The plans for this parking lot were developed by CAD technicians.

Figure I.7 The plans for this pipe system were developed by CAD technicians.

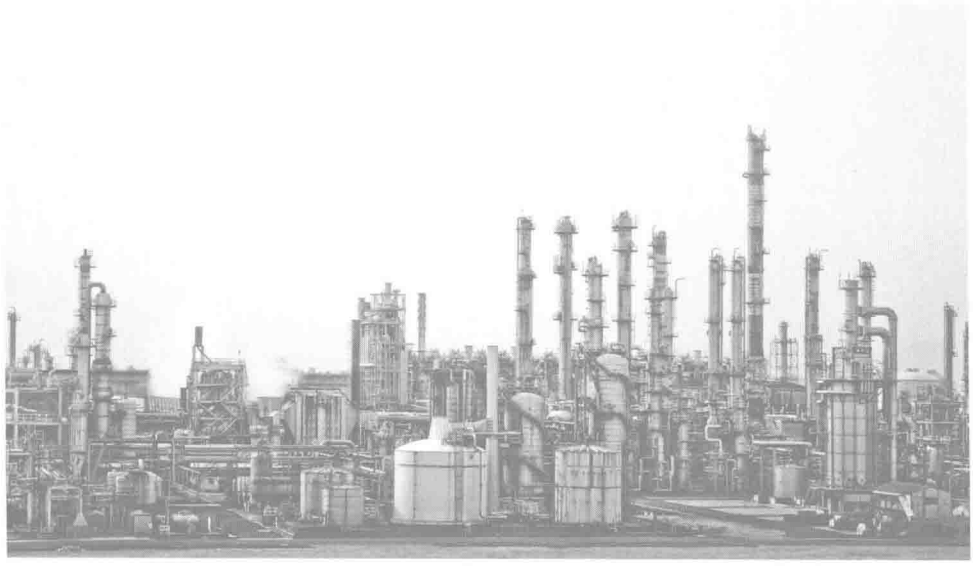

Figure I.8 The plans for this refinery were developed by CAD technicians.

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