时代教育·国外高校优秀教材精选

McGraw Hill Education

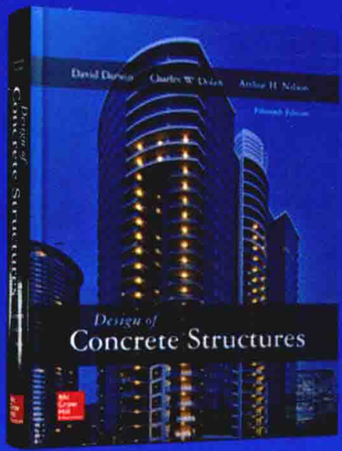
英文版·原书第15版

混凝土结构基本原理

戴维·达尔文（David Darwin）（University of Kansas）
[美] 查尔斯 W.多兰（Charles W. Dolan）（University of Wyoming） 著
亚瑟 H.尼尔逊（Arthur H. Nilson）（Cornell University）

Basic Principles of Concrete Structures

机械工业出版社
CHINA MACHINE PRESS



《混凝土结构设计》(Design of Concrete Structure)是在国际土木工程领域具有重要影响的一本教材，在世界各地高校广泛使用。该书于1923年首版，由康奈尔大学结构工程专业的Leonard C. Urquhart 和 Charles E. O’ Rourke教授所著。在其问世的近百年历史中，该书紧跟时代的科学研究、建材改良、新的分析和设计方法及时修订再版。第15版由ASCE杰出委员、ACI和SEI会员、美国堪萨斯大学特聘教授戴维·达尔文(David Darwin)，ACI名誉委员、PCI会员、美国怀俄明大学名誉教授查尔斯 W.多兰（Charles W. Dolan），ACI名誉委员、ASCE会员、康奈尔大学教授亚瑟 H.尼尔逊（Arthur H. Nilson）修订。根据我国高校混凝土结构基本原理课程的实际教学内容，删除了《混凝土结构设计》（第15版）与我国混凝土结构设计课程、基础工程课程相关的混凝土梁、板、墙、基础、挡土墙、节点设计、抗震设计及混凝土锚固相关的内容，并以《混凝土结构基本原理》（Basic Principles of Concrete Structures）的名称出版。

书籍特色

- 覆盖面广，内容丰富，图文并茂，可读性、系统性强。
- 抓住了钢筋混凝土结构的特点，便于读者建立对混凝土结构性能的清晰认识。
- 注重理论与实践相结合，紧密结合2014ACI建筑规范，便于读者提高实际工程设计的能力。
- 紧跟时代，及时反映混凝土结构研究的最新成果，便于读者不断掌握新的知识，适应未来土木工程的挑战。
- 附有大量例题、习题，例题都给出了详细的解答步骤，便于读者理解和巩固。
- 配套有教学相关资源，便于我国高校教师开展双语教学和读者自学使用。

地址：北京市百万庄大街22号
邮政编码：100037
电话服务
服务咨询热线：010-88379833
读者购书热线：010-88379649
网络服务
机工官网：www.cmpbook.com
机工官博：weibo.com/cmp1952
教育服务网：www.cmpedu.com
金书网：www.golden-book.com
封面无防伪标均为盗版

机工教育微信服务号

Mc Graw Hill Education
http://www.mheducation.com

ISBN 978-7-111-58877-1
策划编辑◎**马军平** / 封面设计◎**张静**

上架指导 教材／土木工程

ISBN 978-7-111-58877-1

9 787111 588771 >

定价：79.80元

时代教育·国外高校优秀教材精选

混凝土结构基本原理

（英文版·原书第15版）

Basic Principles of Concrete Structures

［美］ 戴维·达尔文（David Darwin）（*University of Kansas*）
查尔斯 W. 多兰（Charles W. Dolan）（*University of Wyoming*） 著
亚瑟 H. 尼尔逊（Arthur H. Nilson）（*Cornell University*）

机 械 工 业 出 版 社

《混凝土结构基本原理》（Basic Principles of Concrete Structures）是根据我国混凝土结构基本原理课程的实际教学内容和特点，由美国堪萨斯大学戴维·达尔文（David Darwin）教授、怀俄明大学查尔斯 W. 多兰（Charles W. Dolan）教授、康奈尔大学亚瑟 H. 尼尔逊（Arthur H. Nilson）教授所著的《混凝土结构设计》（Design of Concrete Structures）第15版删减而成。本书紧跟时代，深度结合2014ACI建筑规范，主要内容包括：混凝土材料，混凝土结构设计和基本假定，梁的受弯分析和设计，梁中的剪切和斜向受拉，黏结、锚固及延伸长度，混凝土构件的适用性，扭转分析与设计，短柱，细长柱，预应力混凝土。

本书可作为土木工程专业本科生和研究生的教材，也可作为大学教师和工程技术人员的参考书。

采用本书做教材的教师可向麦格劳-希尔（亚洲）教育出版公司北京代表处联系，索取教学相关资源，传真：010-59575582；电子邮件：instructorchina@ mheducation. com。

David Darwin, Charles W. Dolan, Arthur H. Nilson
Design of Concrete Structure
978-0-07-339794-8

图书在版编目（CIP）数据

混凝土结构基本原理：原书第15版：英文/（美）戴维·达尔文（David Darwin），（美）查尔斯 W. 多兰（Charles W. Dolan），（美）亚瑟 H. 尼尔逊（Arthur H. Nilson）著. —北京：机械工业出版社，2017. 12
书名原文：Design of Concrete Structures, 15th edition
时代教育·国外高校优秀教材精选
ISBN 978-7-111-58877-1

Ⅰ. ①混… Ⅱ. ①戴… ②查… ③亚… Ⅲ. ①混凝土结构—高等学校—教材—英文 Ⅳ. ①TU37

中国版本图书馆 CIP 数据核字（2017）第 329198 号

机械工业出版社（北京市百万庄大街22号 邮政编码 100037）
策划编辑：马军平 责任编辑：马军平 李 帅 责任印制：孙 炜
北京中兴印刷有限公司印刷
2018年1月第1版第1次印刷
200mm×254mm ·28. 5 印张 ·1150 千字
标准书号：ISBN 978-7-111-58877-1
定价：79. 80 元

凡购本书，如有缺页、倒页、脱页，由本社发行部调换

电话服务	网络服务
服务咨询热线：010-88379833	机 工 官 网：www. cmpbook. com
读者购书热线：010-88379649	机 工 官 博：weibo. com/cmp1952
	教育服务网：www. cmpedu. com
封面无防伪标均为盗版	金 书 网：www. golden-book. com

影印版序

《混凝土结构设计》（Design of Concrete Structure）是在国际土木工程领域具有重要影响的一本教材，在世界各地高校广泛使用。该书于 1923 年首版，由康奈尔大学结构工程专业的 Leonard C. Urquhart 和 Charles E. O’Rourke 教授所著。在其问世的近百年历史中，该书紧跟时代的科学研究、建材改良、新的分析和设计方法及时修订再版。经过第 2 ~4 版的不断改进，将其打造成了土木工程领域基础课程的主导教材。康奈尔大学的 George Winter 教授与 Urquhart 教授一起进行了第 5 和第 6 版的修订。Winter 教授和康奈尔大学的 Arthur H. Nilson 教授在第 7 ~9 版的修订中，大幅度提升了该书的广度和深度。在 1982 年 Winter 教授去世后，Nilson 教授负责了第 10 ~ 12 版的修订工作。堪萨斯大学的 David Darwin 教授和怀俄明大学的 Charles Dolan 教授从第 13 版开始与 Nilson 教授一起负责该书的修订。这三位教授是美国混凝土协会（ACI）或美国土木工程师协会（ASCE）规范编写团队的成员，在钢筋混凝土和预应力混凝土的教学和科研中都有很深的造诣。最新的版本是由这三位教授紧密结合 2014ACI 建筑规范修订而成的第 15 版。

为了让我国读者能够顺利地阅读这本经典著作，机械工业出版社适时引进了这本优秀教材。根据我国高校混凝土结构基本原理课程的实际教学内容，删减了《混凝土结构设计》第 15 版中与我国混凝土结构设计课程、基础工程课程相关的混凝土梁、板、墙、基础、挡土墙、节点设计、抗震设计及混凝土锚固相关的内容，缩编后以《混凝土结构基本原理》（Basic Principles of Concrete Structures）的名称出版。

作为一本具有国际影响力的混凝土结构原理及设计方面的教材，与已有的国内外同类教材相比，本书有很多独特之处，主要反映在如下几个方面：

（1）抓住了钢筋混凝土结构的基本特点，便于读者建立对混凝土结构性能的清晰认识。钢筋混凝土结构是以混凝土和钢筋（预应力筋）为材料的复合结构，虽然钢筋混凝土结构构件的承载力、变形分析和计算是以材料力学为基础的，但因其自身材料构成的特点，承载力、变形分析和计算并不是材料力学简单的改进和延伸，而是已独立发展成一个专门的学科——钢筋混凝土结构基本理论。该书从简单的混凝土梁的受力分析，到钢筋混凝土梁的弹性分析，再到钢筋混凝土梁的极限分析，根据钢筋混凝土梁力学特性的变化，

阐述了钢筋混凝土结构成为一门独立学科的原因；了解钢筋混凝土结构学科的发展和演变，是学习钢筋混凝土结构理论和设计方法的出发点。

（2）注重理论与实践相结合，便于读者提高实际工程设计的能力。混凝土结构设计作为一个理论性和实践性都很强的学科，其理论体系是在试验、理论分析和工程实践的基础上形成的，工程经验的总结是这门学科发展和完善不可缺少的重要方面。该书紧密结合 ACI 建筑规范，既有混凝土基本理论的阐述，又有结构设计方法和步骤的讲解，特别是书中大量计算实例为学生掌握混凝土构件设计的方法提供了帮助。作者具有丰富的教学和工程设计经验，将混凝土结构设计理论与实践高度融合在一起。

（3）及时反映混凝土结构研究的最新成果。作为一本教材，该书在其近百年历史中，不断引入新的概念和相对成熟的研究成果，使学生们不断掌握新的知识，适应未来土木工程的挑战。例如，该书第 15 版增加了混凝土结构抗剪设计的修正压力场理论。该理论目前已经得到国际上比较广泛的认可，被 2012 版的美国《荷载与抗力系数桥梁设计规范》（AASHTO LRFD）和 2010 版的国际混凝土联合会《混凝土结构模式规范》采用，成为解决解决混凝土结构抗剪计算的新方法。

总之，本书传承久远，紧跟时代，深度结合 2014ACI 建筑规范，系统性、可读性强，是一本优秀的原版教材，不但可以作为土木工程专业本科生和研究生的教材，而且也可以作为大学教师和工程技术人员的参考书。

贡金鑫

大连理工大学土木工程学院

About the Authors

David Darwin has been a member of the faculty at the University of Kansas since 1974, where he has served as director of the Structural Engineering and Materials Laboratory since 1982 and currently chairs the Department of Civil, Environmental, and Architectural Engineering. He was appointed the Deane E. Ackers Distinguished Professor of Civil Engineering in 1990. Dr. Darwin served as President of the American Concrete Institute in 2007–2008 and is a member and past chair of ACI Committees 224 on Cracking and 408 on Bond and Development of Reinforcement. He is also a member of ACI Building Code Subcommittee 318-B on Anchorage and Reinforcement and ACI-ASCE Committee 445 on Shear and Torsion. Dr. Darwin is an acknowledged expert on concrete crack control and bond between steel reinforcement and concrete. He received the ACI Arthur R. Anderson Award for his research efforts in plain and reinforced concrete, the ACI Structural Research Award, the ACI Joe W. Kelly Award for his contributions to teaching and design, and the ACI Foundation – Concrete Research Council Arthur J. Boase Award for his research on reinforcing steel and concrete cracking. He has also received a number of awards from the American Society of Civil Engineers, including the Walter L. Huber Civil Engineering Research Prize, the Moisseiff Award, and the State-of-the-Art of Civil Engineering Award twice, the Richard R. Torrens Award, and the Dennis L. Tewksbury Award, and has been honored for his teaching by both undergraduate and graduate students at the University of Kansas. He is past editor of the ASCE *Journal of Structural Engineering*. Professor Darwin is a Distinguished Member of ASCE and a Fellow of ACI and the Structural Engineering Institute of ASCE. He is a licensed professional engineer and serves as a consultant in the fields of concrete materials and structures. He has been honored with the Distinguished Alumnus Award from the University of Illinois Civil and Environmental Engineering Alumni Association. Between his M.S. and Ph.D. degrees, he served four years with the U.S. Army Corps of Engineers. He received the B.S. and M.S. degrees from Cornell University in 1967 and 1968 and the Ph.D. from the University of Illinois at Urbana-Champaign in 1974.

Charles W. Dolan is a consulting engineer and emeritus faculty member of the University of Wyoming. At the University of Wyoming from 1991 to 2012, he served as Department Head from 1998 to 2001 and as the first H. T. Person Chair of Engineering from 2002 to 2012, for which he received the University of Wyoming's John P. Ellbogen lifetime teaching award. A member of American Concrete Institute (ACI) Committee 318 Building Code for Concrete Structures for 12 years, he has chaired the Building Code Subcommittees on Prestressed Concrete and Code Reorganization. He has served as chair of the ACI Technical Activities Committee, ACI Committee

358 on Transit Guideways, and ACI-ASCE Committee 423 on Prestressed Concrete. A practicing engineer for over 40 years, including 20 years at Berger/ABAM, he was the project engineer on the Walt Disney World Monorail, the Detroit Downtown Peoplemover guideway, and the original Dallas–Fort Worth Airport transit system guideway. He developed the conceptual design of the Vancouver BC SkyTrain structure and the Dubai Palm Island monorail. He received the ASCE T. Y. Lin Award for outstanding contributions to the field of prestressed concrete, the ACI Arthur R. Anderson award for advancements in the design of reinforced and prestressed concrete structures, and the Prestress/Precast Concrete Institute's (PCI) Martin P. Korn award for advances in design and research in prestressed concrete. An Honorary Member of ACI and a Fellow of PCI, he is internationally recognized as a leader in the design of specialty transit structures and development of fiber-reinforced polymers for concrete reinforcement. Dr. Dolan is a registered professional engineer and lectures widely on the design and behavior of structural concrete. He received his B.S. from the University of Massachusetts in 1965 and his M.S. and Ph.D. from Cornell University in 1967 and 1989.

The late **Arthur H. Nilson** was engaged in research, teaching, and consulting relating to structural concrete for over 40 years. He was a member of the faculty of the College of Engineering at Cornell University from 1956 to 1991 when he retired and was appointed professor emeritus. At Cornell he was in charge of undergraduate and graduate courses in the design of reinforced concrete and prestressed concrete structures. He served as Chairman of the Department of Structural Engineering from 1978 to 1985. Dr. Nilson served on many professional committees, including American Concrete Institute (ACI) Building Code Subcommittee 318-D. His pioneering work on high-strength concrete has been widely recognized. He was awarded the ACI Wason Medal for materials research in 1974, the ACI Wason Medal for best technical paper in 1986 and 1987, and the ACI Structural Research Award in 1993. Professor Nilson was an Honorary Member of ACI and a Fellow in the American Society of Civil Engineers (ASCE). He was honored by the civil engineering student body at Cornell for outstanding teaching. Professor Nilson was a registered professional engineer in several states and, prior to entering teaching, was engaged in full-time professional practice. He received the B.S. degree from Stanford University in 1948, the M.S. from Cornell in 1956, and the Ph.D. from the University of California at Berkeley in 1967.

目　　录

Contents

1 Introduction

1.1 CONCRETE, REINFORCED CONCRETE, AND PRESTRESSED CONCRETE

Concrete is a stonelike material obtained by permitting a carefully proportioned mixture of cement, sand and gravel or other coarse aggregate, and water to harden in forms of the shape and dimensions of the desired structure. The bulk of the material consists of fine and coarse aggregate. Cement and water interact chemically to bind the aggregate particles into a solid mass. Additional water, over and above that needed for this chemical reaction, is necessary to give the mixture the workability that enables it to fill the forms and surround the embedded reinforcing steel prior to hardening. Concretes with a wide range of properties can be obtained by appropriate adjustment of the proportions of the constituent materials. Special cements (such as high early strength cements), special aggregates (such as various lightweight or heavyweight aggregates), admixtures (such as plasticizers, air-entraining agents, silica fume, and fly ash), and special curing methods (such as steam-curing) permit an even wider variety of properties to be obtained.

These properties depend to a very substantial degree on the proportions of the mixture, on the thoroughness with which the various constituents are intermixed, and on the conditions of humidity and temperature in which the mixture is maintained from the moment it is placed in the forms until it is fully hardened. The process of controlling conditions after placement is known as *curing*. To protect against the unintentional production of substandard concrete, a high degree of skillful control and supervision is necessary throughout the process, from the proportioning by weight of the individual components, through mixing and placing, until the completion of curing.

The factors that make concrete a universal building material are so pronounced that it has been used, in more primitive kinds and ways than at present, for thousands of years, starting with lime mortars from 12,000 to 6000 BCE in Crete, Cyprus, Greece, and the Middle East. The facility with which, while plastic, it can be deposited and made to fill forms or molds of almost any practical shape is one of these factors. Its high fire and weather resistance is an evident advantage. Most of the constituent materials, with the exception of cement and additives, are usually available at low cost locally or at small distances from the construction site. Its compressive strength, like that of natural stones, is high, which makes it suitable for members primarily subject to compression, such as columns and arches. On the other hand, again as in natural stones, it is a relatively brittle material whose tensile strength is low compared with its compressive strength. This prevents its economical use as the sole building material in structural members that are subject to tension either entirely (such as in tie-rods) or over part of their cross sections (such as in beams or other flexural members).