

ICT Book Series No. 2: Pioneer of Intelligent Construction - Intelligent Compaction



Background

In a critical period of digital transformation for the traditional infrastructure industry, intelligent compaction (IC) technology, with its complete "perception-analysis-decision-execution" closed loop, is redefining the quality control paradigm for subgrade, subbase, and pavement construction. As the "fourth revolution in road construction technology," intelligent compaction has evolved from theory to a practical field solution in the past 40-plus years. The book "***Pioneers of Intelligent Construction: Intelligent Compaction***," written by IC experts Guanghui Xu, Dongsheng Wang, and George K. Chang, provides a systematic, in-depth account of this journey. This book is also the second in the "***Intelligent Construction Technologies for Transport Infrastructure – A Book Series***" from the International Society for Intelligent Construction (ISIC), following the first,

“Introduction to Intelligent Construction Technologies for Transport Infrastructure”, published in 2022.

This book breaks away from the typical technical book framework, using the core logic of intelligent construction as its main thread. Starting with the basic characteristics of fill engineering, the discussion gradually unfolds into the theoretical system of intelligent compaction, implementation methods, and prospects. It is not only an introduction to IC but also an in-depth explanation of the entire ICT framework and its inherent characteristics. Thus, as the book title suggests, IC serves as a pioneer in intelligent construction technologies.

Using modulus/stiffness as the control index, the book not only clarifies the generational differences between continuous compaction and intelligent compaction but also deeply analyzes key technical aspects, including mechanical mechanisms, sensor testing, intelligent modeling, and feedback control during compaction.

Particularly valuable is the authors' discussion, both in the main body text and appendices, of the technical requirements and coordination methods for the three major control elements: compaction degree, compaction stability, and compaction uniformity based on three decades of research and field experience. They provide a complete implementation path and real-world case studies, allowing readers to clearly understand the entire process from IC system setup to on-site implementation. In addition, the book presents several extended applications of intelligent compaction. The appendix not only answers common problems encountered in practice but also provides a detailed discussion of the technical classification of Intelligent Compaction technologies.

About the Authors

Prof. Guanghui Xu, Ph.D., has worked in railway design and research institutes in the early days. He later joined Harbin Institute of Technology and other universities to engage in scientific research and teaching. His research interests include road and railway engineering dynamics theory, testing and information analysis technology, and intelligent technology applications. Prof. Xu is the co-founder of ISIC. He has consistently adhered to the principle of paying equal attention to theoretical and applied research and to practical results. He has organized and led a multidisciplinary scientific research team and carried out long-term, independent research and development of intelligent construction monitoring technology. Prof. Xu also produced a series of research results with intellectual property rights. In 2011 and 2017, he oversaw the development of China's first industry construction standards and product standards for intelligent compaction (IC) technology.

Prof. Dongsheng Wang, Ph.D., is a Road and Railway Engineering Department professor at Harbin Institute of Technology, China. Prof. Wang is also an ISIC Steering Committee member and a member of the Heilongjiang Youth Federation. His primary research areas include pavement mechanics, structural design theory, pavement materials, and constitutive models. He has led over nine projects, including those funded by the National Natural Science Foundation of China, and won the second prize of the Jilin Province Science and Technology Progress Award and the first prize of the China Highway Society Science and Technology Award. Prof. Wang has contributed to the development of many industry standards. He was selected for Harbin Institute of Technology's top-notch teaching talent program.

George K. Chang, Ph.D., P.E., is a world expert on pavement smoothness and intelligent compaction/construction technologies. Dr. Chang co-founded ISIC and has served as its president since 2016. His research, teaching, specification development, and software tools have helped make significant technological advancements in the above fields. The websites he develops and maintains, Profile Viewing and Analysis—ProVAL (www.RoadProfile.com) and Intelligent Construction Technologies & Veta software (www.IntelligentConstruction.com), have evolved into the one-stop shop for pavement smoothness and intelligent compaction/construction. He has been leading the International Roughness Index (IRI) US national deployment effort with ProVAL since 2001, and the intelligent compaction research and implementation effort with Veta since 2007.

The authors have combined more than 70 years of IC research, education, software development, and practical application across various projects worldwide, making this book both theoretically profound and practically insightful. The methods described in the book have all been validated in hundreds of field engineering projects worldwide and are highly practical and implementable.

Target Audience

This book targets the following readers:

- **Engineering technicians and managers:** Systematically master intelligent compaction implementation methods and quality control key points.
- **Engineering machinery R&D teams:** Gain a deep understanding of the theoretical basis and interaction logic of intelligent equipment.
- **University teachers and students:** Obtain cutting-edge and systematic teaching and research reference materials in the field of intelligent construction.

- **Industry decision-makers and planners:** Gain insights into road construction technology development trends and industrial upgrading paths.

The book uses clear, concise language and is richly illustrated, making it easy to read, even for engineers without a background in intelligent construction technologies. Therefore, this book is truly practical work, "**derived from engineering and applied to engineering.**"

ICT Book Series Overview

This book is a part of the "Intelligent Construction Technologies for Transport Infrastructure – A Book Series," a seven-volume series. This book series comprehensively constructs a knowledge system for intelligent construction, spanning theoretical frameworks, sensing foundations, analysis and decision-making, and execution and control. The other volumes are:

- Introduction to Intelligent Construction Technologies for Transportation Infrastructure
- The Foundation of Sensing Methods: One-Dimensional Dynamics and Applications in Engineering
- The Foundation of Machine Analysis and Decision-Making: A Journey into Machine Learning
- A Powerful Tool for Engineering Quality: Sensing and Data
- The Assistant for Execution: Control Technology in Engineering

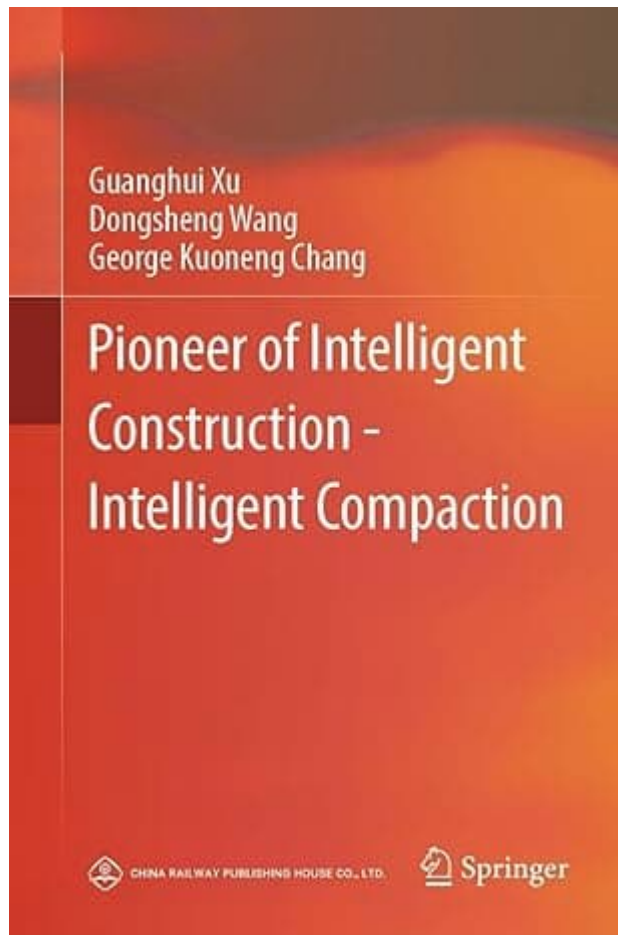
This book series is jointly authored by a team of experts from the International Society for Intelligent Construction (ISIC). With both Chinese and English versions released, it aims to provide systematic intellectual tools and practical references for the intelligent transformation of the transportation infrastructure industry.

In today's construction industry, moving towards "smart+" technologies, this book, "Pioneers of Intelligent Construction: Intelligent Compaction," not only presents a key technology but also demonstrates a systematic transformation in the engineering paradigm. It is a valuable resource for every technical professional committed to advancing the industry, serving as both a real-time reference tool and a window into future technological innovation.

Publication Information

Both the English and Chinese versions of this book are now available. Please note that the book's appendices differ slightly. The English version expanded the Q&As and added another one for the technical classification of IC.

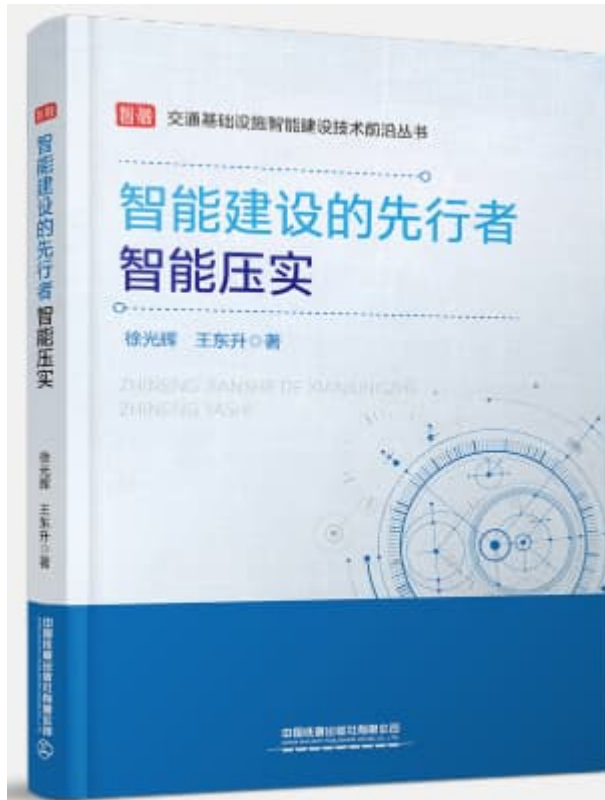
English Version



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- [Amazon online bookstore](#)
- [Barnes and Noble online bookstore](#)
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Chinese Version



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