ULTRA-HIGH PERFORMANCE CONCRETE

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A SIMPLER APPROACH

JACOB LIM LOK GUAN
ROSZILAH HAMID
SUDHARSHAN RAMAN

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Contents

List of Tables & Figures

List of Abbreviations

ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
C3S	Tricalcium Silicate
C2S	Dicalcium Silicate
CNF	Carbon Nanofibre
CNT	Carbon Nanotube
CSH	Calcium silicate hydrates
DIF	Dynamic Factor
EC2	European Design Code 2
FA	Fly-Ash
fib	International Federation for Structural Concrete
GGBS	Ground-Granulated Blast-Furnace Slag
MSF	Micro Steel Fibers
MIP	Mercury Intrusion Porosimetry
NaCl	Sodium Chloride
NaOH	Sodium Hydroxide
OPC	Ordinary Portland Cement
RCPT	Rapid Chloride Penetration Test
SEM	Scanning Electron microscopy
SiO2	Silicon Dioxide
SP	Superplasticiser
TGA	Thermogravimetric analysis
UHPC	Ultra-high performance concrete
UHPCC	Ultra-high performance cementitious composite
w/b	water to binder ratio
w/c	water to cement ratio
XRD	X-Ray Diffraction

Preface

Ultra-High Performance Concrete: A Simpler Approach is designed to bridge gaps in knowledge, equipping researchers, practitioners, and students with practical insights into UHPC. This book is driven by the pursuit of sustainable and efficient building materials that not only meet the increasing structural requirements but also contribute to long-term environmental objectives. The book begins with an overview of concrete's evolution in *Chapter 1*, tracing its development and significance in construction history. *Chapter 2* explores the applications of Ultra-High Performance Concrete (UHPC), highlighting its impact on modern engineering. In *Chapter 3*, the engineering properties of UHPC, such as strength and durability. Building on this, *Chapter 4* discusses the specific characteristics of a newly designed Ultra-High Performance Cementitious Composite (UHPCC). *Chapter 5* explores into the properties of UHPCC, emphasizing its advanced performance metrics. *Chapter 6* covers design considerations and methodologies for optimizing UHPCC. The book concludes with *Chapter 7*, examining the potential and future prospects of UHPCC, suggesting directions for innovation and expanded use in construction.

The authors acknowledge the support and testing facilities provided by the Concrete Laboratory of both Department of Civil Engineering and Department of Architecture and Built Environment of Universiti Kebangsaan Malaysia. The research work undertaken in this book was supported through research grants granted by the Ministry of Higher Education, Malaysia (FRGS/1/2015/TK01/UKM/02/01) and Universiti Kebangsaan Malaysia (DLP-2014-005, GGPM-2023-078 & DPB-2023-109). The authors would like to acknowledge these grants for allowing the experimental and analytical work to be performed for this book.

The authors dedicate this book to advancing the field of construction materials and nurturing a deeper understanding of UHPCC, hoping it will inspire new research and applications in civil engineering, architecture, and beyond.

Jacob Lim Lok Guan
Roszilah Hamid
Sudharshan Raman