

ULTRA-HIGH PERFORMANCE CONCRETE

ULTRA-HIGH PERFORMANCE CONCRETE

A SIMPLER APPROACH

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Contents

	<i>List of Tables & Figures ...</i>	<i>7</i>
	<i>Lists of Abbreviations ...</i>	<i>13</i>
	<i>Preface ...</i>	<i>15</i>
CHAPTER 1	History of Concrete ...	17
CHAPTER 2	Application of Ultra-High Performance Concrete ...	22
CHAPTER 3	Engineering Properties of Ultra-High Performance Concrete ...	41
CHAPTER 4	Characteristic of the New Designed Ultra-High Performance Cementitious Composite ...	64
CHAPTER 5	Properties of Ultra-High Performance Cementitious Composite ...	100
CHAPTER 6	Design of Ultra-High Performance Cementitious Composite ...	137
CHAPTER 7	Potential and Future Prospective ...	159
	<i>References ...</i>	<i>165</i>
	<i>Index ...</i>	<i>179</i>

List of Tables & Figures

TABLE 2.1	Material characteristics of types of UHPC compared to normal strength concrete (NSC) ... 23
TABLE 2.2	Typical composition of various type of UHPC (percentage by weight) ... 25
TABLE 2.3	Typical composition of various type of UHPC (percentage by ratio) ... 25
TABLE 2.4	Dimension, mechanical, thermal and electrical properties of CNFs and CNTs ... 31
TABLE 2.5	Published results of studies related to CNTs/CNFs reinforced concrete ... 38
TABLE 3.1	Effect of curing on UHPC compressive strength ... 42
TABLE 3.2	Classification of the degradation process ... 53
TABLE 3.3	Classification of pore sizes in hydrated cement pastes ... 54
TABLE 3.4	Effect of w/b and curing regime on UHPC porosity ... 54
TABLE 3.5	Electric charge through UHPC specimens ... 55
TABLE 4.1	Chemical composition of cement ... 67
TABLE 4.2	Properties of CNFs and CNF suspension ... 70
TABLE 4.3	The density and flow value of all the fresh UHPCC mix design ... 72
TABLE 4.4	Void Analysis from ImageJ ... 81
TABLE 4.5	Weight loss of the degradation ... 91
TABLE 4.6	Pore intrusion volume of the UHPCC ... 94
TABLE 5.1	Modulus of Elasticity without CNF ... 118
TABLE 5.2	Modulus of Elasticity with CNF ... 118
TABLE 5.3	The coefficients of each UHPCC corresponded to the CEB (1988) and proposed model for the DIF ... 132
TABLE 6.1	Properties of carbon nanofibres ... 139
TABLE 6.2	Dispersion technique of CNFs ... 139
TABLE 6.3	Mix proportions (% by weight based on 1450 kg/m ³ of cement) ... 143
TABLE 6.4	Tests and specimens for Quasi-static ... 144

- FIGURE 1.1 The development of nano-particle in concrete technology ... 20
- FIGURE 2.1 Optimum packing of UHPC design ... 27
- FIGURE 2.2 Representation of CNFs (a) Stacked form; (b) Herringbone form and CNTs (c) MWCNTs ... 31
- FIGURE 2.3 TEM image of poor dispersion of carbon nanomaterials in water ... 34
- FIGURE 2.4 SEM image of poor dispersion of carbon nanomaterials in water ... 34
- FIGURE 2.5 Crack bridging observed in cement-CNT composites ... 35
- FIGURE 2.6 Ultrasonication bath for dispersion of CNFs in water ... 35
- FIGURE 2.7 Chemical reactions between carboxylated carbon nanomaterial and cement hydration products (CSH and $\text{Ca}(\text{OH})_2$) ... 36
- FIGURE 2.8 Damaged test samples without (a) and with (b) CNFs ... 37
- FIGURE 3.1 Grid in concrete cross-sectional analysis ... 49
- FIGURE 3.2 Binary imaging in UHPC cross-sectional analysis, (a) lower entrapped air UHPC, (b) higher entrapped air UHPC ... 49
- FIGURE 3.3 UHPC a) without quartz powder, (b) with quartz powder ... 51
- FIGURE 3.4 SEM images of a nano cracks bridged by CNFs ... 51
- FIGURE 3.5 Microstructural of UHPC enhanced with CNT ... 51
- FIGURE 3.6 Dispersion of CNT in UHPC matrix (a) poor (b) good (c) nano-bridging ... 52
- FIGURE 3.7 Various load cases with corresponding strain rates ... 57
- FIGURE 3.8 Modified model for DIF modulus of rupture ... 60
- FIGURE 3.9 DIFs for modulus of rupture ... 61
- FIGURE 4.1 SEM imaging of graded silica sand ... 65
- FIGURE 4.2 The grading curve of cement from various source and graded sand ... 66
- FIGURE 4.3 Particle grading of UHPCC mixes ... 66
- FIGURE 4.4 XRD pattern of the Cement A, Cement B and Cement C ... 68

- FIGURE 4.5 Types of CNFs suspensions produced ... 69
- FIGURE 4.6 Morphology of CNF-A ... 70
- FIGURE 4.7 Morphology of CNF-B ... 70
- FIGURE 4.8 Hydration reaction of a) contribution of CNF-A
b) The contribution of CNF-B ... 74
- FIGURE 4.9 The peak heat of CNF A and CNF B at same
percentage ... 75
- FIGURE 4.10 Transformation of an ideal denser microstructure ... 77
- FIGURE 4.11 Void distribution at cross-sectional on vary particle
grading ... 78
- FIGURE 4.12 Void distribution at cross-sectional on types of
cement ... 79
- FIGURE 4.13 Void distribution at cross-sectional on CNFs type and
dispersion ... 80
- FIGURE 4.14 Void distribution at cross-sectional on hybrid micro-,
nano-fibres ... 81
- FIGURE 4.15 SEM imaging of UHPCC-PG4 ... 83
- FIGURE 4.16 SEM imaging of UHPCC-CNFA3 ... 84
- FIGURE 4.17 SEM imaging of UHPCC-CNFA4 ... 85
- FIGURE 4.18 SEM imaging of UHPCC-CNFB3 ... 86
- FIGURE 4.19 SEM imaging of UHPCC-CNFB4 ... 87
- FIGURE 4.20 Distribution of CNF A and CNF B in the UHPCC
matrix ... 88
- FIGURE 4.21 TGA observation of UHPCC incorporating CNF ... 90
- FIGURE 4.22 Pore distribution of UHPCC ... 93
- FIGURE 4.23 Autogenous shrinkage of UHPCC ... 96
- FIGURE 4.24 Drying shrinkage of UHPCC ... 97
- FIGURE 4.25 Water permeability relation to chloride permeability ... 99
- FIGURE 5.1 Compressive strength of UHPCC mixes produced with
different w/c ratio ... 101
- FIGURE 5.2 Compressive strength of UHPCC mixes produced with
different particle grading ... 102
- FIGURE 5.3 Compressive strength of UHPCC mixes produced with
different types of cement ... 104
- FIGURE 5.4 Workability and compressive strength of UHPCC mixes
produced with different percentages of CNFs ... 105
- FIGURE 5.5 Compressive strength of UHPCC mixes produced with
CNFs ... 106

- FIGURE 5.6 Compressive strength of UHPCC mixes produced with hybrid micro-nano-fibre ... 108
- FIGURE 5.7 Flexural strength of UHPCC with different particle grading ... 110
- FIGURE 5.8 Flexural strength of UHPCC with different source of cement ... 112
- FIGURE 5.9 Flexural strength of UHPCC incorporating with CNF-A and CNF-B ... 114
- FIGURE 5.10 Flexural strength of UHPCC incorporating with micro-, nano-scaled fibres ... 116
- FIGURE 5.11 Stress-strain behaviour of the CNF-A and CNF-B ... 120
- FIGURE 5.12 Stress-strain behaviour of the hybrid fibred system ... 121
- FIGURE 5.13 Proposed UHPCC strength models for compressive strength at early age and mature age ... 124
- FIGURE 5.14 UHPCC equation for flexural strength ... 125
- FIGURE 5.15 Proposed UHPCC equation for modulus of elasticity ... 127
- FIGURE 5.16 The correlation between entrapped air and mechanical properties ... 128
- FIGURE 5.17 DIF from vary strain rates ... 130
- FIGURE 5.18 Validation of the proposed DIF model for UHPCC ... 131
- FIGURE 5.19 DIF for tensile characteristic of UHPCC at varying strain rates and the curve fit of the proposed DIF model ... 135
- FIGURE 6.1 X-ray diffraction equipment ... 138
- FIGURE 6.2 Laser granulometry analyser ... 138
- FIGURE 6.3 Ultrasonication of CNF ... 140
- FIGURE 6.4 Ultrasonic dispersion of CNF-A Sample 1: without surfactants; Sample 2: with surfactants; Sample 3: ultrasonic dispersion of CNF-B without surfactants Water and Superplasticiser ... 140
- FIGURE 6.5 Mix design of (a) typical conventional UHPC, (b) optimised version of UHPCC ... 141
- FIGURE 6.6 Mixing sequence for UHPCC ... 141
- FIGURE 6.7 Flow measurement device ... 144
- FIGURE 6.8 8-channels hydration cells ... 145
- FIGURE 6.9 Setup of compression testing ... 147
- FIGURE 6.10 Setup of 3-points bending ... 147

- FIGURE 6.11 Setup of modulus of elasticity ... 147
- FIGURE 6.12 Setup of optical imaging device ... 148
- FIGURE 6.13 (a) Cross-section of UHPCC specimens; (b) Binary analysis ... 149
- FIGURE 6.14 Scanning electron microscope equipment ... 149
- FIGURE 6.15 Thermal gravimetric analysis equipment ... 150
- FIGURE 6.16 Setup of shrinkage monitoring devices for (a) autogenous shrinkage real time monitoring (b) total shrinkage ... 152
- FIGURE 6.17 Permeability Test (a) Rapid chloride penetration test (b) Water permeability test ... 154

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
SiO ₂	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.

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