Introdu	
Object	ives and Composition of the Design Guidelines008
Chapte	er 1
Low Ene	ergy Housing with Validated E ectiveness and Energy Conservation ·······011
1.1	What is Low Energy Housing with Validated Effectiveness?012
1.2	Actual Situation of Energy Consumption during Occupancy and Tasks014
1.3	Indoor Environment Performance that Low Energy Housing with Validated Effectiveness Aims for015
1.4	Climate and Housing Characteristics in Hot Humid Regions
Chapte	er 2
Design Pro	ocess of Low Energy Housing with Validated E ectiveness and Outline of Elemental Technologies · · · O19
2.1	Design Flow of Low Energy Housing with Validated Effectiveness ·······020
2.2	Outline of Elemental Technologies ·········022
2.2.1	List of Elemental Technologies and Methods · · · · · · 022
2.2.2	Uses of Energy to be Reduced ············024
2.3	Outline of Design Procedures ···········026
2.3.1	Understanding Design Requirements of Low Energy Housing with Validated Effectiveness ··· 026
2.3.2	Setting Target Design Model of Low Energy Housing with Validated Effectiveness029
2.3.3	Basic Items to be Considered for Designing Low Energy Housing with Validated Effectiveness034
2.3.4	Examining Application of Elemental Technologies · · · · · · · · · · · · · · · · · · ·
2.3.5	Feasibility Study036
2.4	Energy Efficiency Indication Method ·······037
2.4.1	Meaning of Levels · · · · · · · · · · · · · · · · · · ·
2.4.2	Energy Saving Effects and Levels of Elemental Technologies · · · · · · · · · · · · · · · · · · ·
Chapte	er 3
-	Energy Application Technology (Elemental Technology Application Method 1) ···· 039
3.1	Use and Control of Wind ····································
3.1.1	Purpose and Key Points of Wind Utilization ······040
3.1.2	Energy Conservation Target Levels for Wind Utilization ··········041
3.1.3	Steps for Examining Wind Utilization Technology ·······049
3.1.4	Wind Utilization Methods ····································
3.1.5	Considerations for Planning and Designing Openings · · · · · · · · · · · · · · · · · · ·
3.1.6	Method for Calculating Cooling Energy Reduction Rate by Room ·······064
3.2	Daylight Utilization (Sunlight Utilization 1)
3.2.1	Purpose and Key Points of Daylight Utilization ·······066
3.2.2	Energy Conservation Target Levels for Daylight Utilization
3.2.3	Steps for Examining Daylight Utilization Technology and Prerequisites069

Design Guidelines for Low Energy Housing with Validated Effectiveness: Hot Humid Region Edition

	3.2.4	Daylight Utilization Methods ····································
	3.3	Photovoltaic Power Generation (Sunlight Utilization 2) ············084
	3.3.1	Purpose and Key Points of Photovoltaic Power Generation
	3.3.2	Energy Conservation Target Levels for Photovoltaic Power Generation · · · · · · · · · · · · · · · · · · ·
	3.3.3	Photovoltaic Power Generation · · · · · · · · · · · · · · · · · · ·
	3.3.4	Test Calculation of Photovoltaic Power Generation Costs · · · · · · · · · · · · · · · · · ·
	3.4	Solar Radiation Heat Utilization (Solar Heat Utilization 1) for Zone V ·······090
	3.4.1	Purpose and Key Points of Solar Radiation Heat Utilization ······090
	3.4.2	Energy Conservation Target Levels for Solar Radiation Heat Utilization091
	3.4.3	Steps for Examining Solar Radiation Heat Utilization Technology ······095
	3.4.4	Solar Radiation Heat Utilization Methods · · · · · · · · · · · · · · · · · · ·
	3.4.5	Estimating Effects of Adopting Solar Radiation Heat Utilization Methods · · · · · · · 100
	3.5	Solar Water Heating (Solar Heat Utilization 2) ······102
	3.5.1	Purpose and Key Points of Solar Water Heating ······102
	3.5.2	Energy Conservation Target Levels for Solar Water Heating ······104
	3.5.3	Steps for Examining Solar Water Heating and Prerequisites ······105
	3.5.4	Solar Water Heating Methods ······106
	3.5.5	Solar Water Heating Planning and Considerations for Use · · · · · · · · · · · · · · · · · · ·
	3.5.6	Explanation of Solar Water Heating Systems ······118
A	Chapte	r 4
	Heat Con	trol Technology of Building Envelopes (Elemental Technology Application Method 2) ····123
7	4.1	Insulated Building Envelope Planning for Zone V ······124
_	4.1.1	Purpose and Key Points of Insulated Building Envelope Planning ······124
	4.1.2	Energy Conservation Target Levels for Insulated Building Envelope Planning · · · · · · · · 128
	4.1.3	Steps for Examining Insulated Building Envelope Planning and Setting Target Levels · · · · · · 129
	4.1.4	Examining Insulation Planning · · · · · · · · · · · · · · · · · · ·
	4.1.5	Examining Insulation Technology ······134
	4.1.6	Examples of Insulation Planning ······155
	4.2	Solar Shading Methods for Zone VI ······164
	4.2.1	Purpose and Key Points of Solar Shading ······164
	4.2.2	Energy Conservation Target Levels for Solar Shading Schemes ······164
	4.2.3	Steps for Examining Solar Shading Technology and Confirmation of Site Conditions174
	4.2.4	Solar Shading Methods · · · · · · 177
	4.3	Solar Shading Methods for Zone V ······188

4.3.1 Purpose and Key Points of Solar Shading · · · · · · 188 4.3.2 Energy Conservation Target Levels for Solar Shading Schemes190 Steps for Examining Solar Shading Technology and Setting Target Levels195 4.3.3 Solar Shading Methods · · · · · 197 4.3.4 Chapter 5 Energy-e cient Equipment Technology (Elemental Technology Application Method 3) ··· 207 Cooling System Planning for Zone VI ------208 5.1 5.1.1 Purpose and Key Points of Cooling System Planning208 5.1.2 5.1.3 Steps for Considering Cooling System Planning and Factors for Selecting Cooling System ·· 210 Energy Saving Methods in Cooling System Planning · · · · · · 211 5.1.4 5.1.5 5.2 Heating and Cooling System Planning for Zone V216 5.2.1 Purpose and Key Points of Heating and Cooling System Planning216 5.2.2 Energy Conservation Target Levels for Heating and Cooling System Planning217 5.2.3 Energy Saving Methods in Heating and Cooling System Planning230 5.2.4 Selecting Auxiliary Heater243 5.2.5 Ventilation System Planning ······244 **5.3** Purpose and Key Points of Ventilation System Planning244 5.3.1 5.3.2 Energy Conservation Target Levels for Ventilation System Planning245 5.3.3 Energy Saving Methods in Ventilation System Planning249 5.3.4 Considerations for Ventilation System Planning and Designing · · · · · · 257 5.3.5 Domestic Hot Water System Planning ······264 **5.4** Purpose and Key Points of Domestic Water Heating System Planning264 5.4.1 Energy Conservation Target Levels for Domestic Hot Water System Planning265 5.4.2 Steps for Considering Domestic Hot Water System Planning and Requirements for Selecting System Type ... 267 5.4.3 Energy Saving Methods in Domestic Hot Water System Planning271 5.4.4 Lighting System Planning · · · · · 288 5.5 Purpose and Key Points of Lighting System Planning · · · · · · 288 5.5.1 Energy Conservation Target Levels for Lighting System Planning289

Steps for Considering Lighting System Planning290

Energy Saving Methods in Lighting System Planning291

5.5.2

5.5.3

5.5.4

5.6	Adopting High-efficiency Consumer Electronics ······	·····310
5.6.1	Key Points for Adopting or Replacing High-efficiency Consumer Electronics	310
5.6.2	Energy Conservation Target Levels for Adopting High-efficiency Consumer Electronic	es ····310
5.6.3	Characteristics of Consumer Electronics and Points of Caution for Usage	316
5.6.4	Estimating Running Cost of Adopting High-efficiency Consumer Electronics · · · · · · · · · · · · · · · · · · ·	320
5.7	Treatment and Efficient Use of Water and Kitchen Waste ·····	322
5.7.1	Purpose and Key Points of Treatment and Efficient Use of Water and Kitchen Waste \cdot	322
5.7.2	Target Levels and Methods for Treatment and Efficient Use of Water and Kitchen Was	ste …323
5.7.3	Steps for Considering Treatment and Efficient Use Technology for Water and Kitchen Wast	te …325
5.7.4	Methods of Treatment and Efficient Use for Water and Kitchen Waste · · · · · · · · · · · · · · · · · · ·	326
5.7.5	Estimating Effects of Using Water Saving Devices · · · · · · · · · · · · · · · · · · ·	335
Chapte	er 6	
Energy	y Saving E ect Evaluation and its Utilization in Design	337
6.1	Energy Saving Effect Using Elemental Technologies and Calculation Method	
6.1.1	Summary of Energy Saving Effect Using Elemental Technologies ······	338
6.1.2	Given Conditions Related to Determination of Energy Saving Effect	343
6.1.3	Basis for Determination of Energy Saving Effect · · · · · · · · · · · · · · · · · · ·	350
6.1.4	Methods of Calculating Energy Consumption, CO ₂ Emissions, and Costs · · · · · · · · · · · · · · · · · ·	352
6.2	Evaluation of Energy Performance, Global Warming Impact, and Cost through Application of Elemental Technologie	
6.2.1		
6.2.2	Evaluation Results in Zone V	360
6.3	Energy Consumption Estimation Methods and Design Calculation Examples	
6.3.1	Overview of Energy Consumption Estimation Methods · · · · · · · · · · · · · · · · · · ·	367
6.3.2	Energy Consumption Estimation Methods and Design Calculation Examples in Zone V	/I ····368
6.3.3	Energy Consumption Estimation Methods and Design Calculation Examples in Zone V	7 ·····376
Appendi	lix ·····	
Apper	endix 1 Zone Classification Data · · · · · · · · · · · · · · · · · ·	384
Apper	endix 2 Color Images of Illustrations that Appear in Black and White	
Apper	endix 3 Weather Data ·····	
Apper	endix 4 List of References ······	396
Index ··		398
Idat -f A	Authors	400
LIST OF A	NUUVIS	402