Contents

Foreword	8	An overview of building energy standards	42
The Aktivhaus Principle	10	Efficiency House	42
		Passivhaus	43
Design	15	Nearly zero-energy and zero-energy house	46
		Efficiency House Plus	48
Principles	16	Active House	50
Basic needs of building and living	16	MINERGIE® standard	52
The role of energy	17	Italy	55
Consequences of energy use	18	Beyond energy	56
Population growth and resource conservation	19	Life cycle considerations	56
The price of energy	20	2,000-watt society	56
Energy in the building sector	22	Other energy balance fields	58
Building energy standards in selected countries	23	Sustainability evaluation	59
Energy in a broader sense	24		
Electrical energy	24	Aktivhaus design	60
Embodied energy	24	Fundamental requirements of the building project	61
Contributing to sustainable development	26	Interior requirements	61
Efficiency	26	External boundary conditions	66
Eco-effectiveness	26	Development of a conceptual idea	74
Sufficiency	26	Design strategies	76
Aktivhaus	28	Building design	77
Strategies	29	Building envelope design	80
Programme	29	Energy supply	81
Construction measures	29	Examples of integrated design	82
Building services	29	New building	82
Energy generation	29	Refurbishment	96
One planning strategy – no energy standard	30		
Emotions	31	Toolkit	100
		Building envelope	100
Energy balance	32	Receiving and retaining heat	102
Developing the building energy balance	32	Insulation	103
Principles of an energy balance	33	Windows and glazing	108
Balance scope	34	Ventilation	112
Balance criterion	36	Solar shading	112
Balance boundaries	38	Building envelope qualities	114
Balance interval	39	Minimising cold bridges	114
Balance regulations	41	Airtightness	115



Storage mass	116	Home for Life, Aarhus (DK)	185
Generating energy	118	Residential and office buildings, Zurich (CH)	189
Photovoltaics	118	Kraftwerk B, Bennau (CH)	193
Solar thermal technology	118	Multifamily dwelling, Dübendorf (CH)	197
Geothermal technology	118	Solar-Werk 01, Kassel (DE)	201
Heat pumps	118		
Lighting	119	Positions and Perspectives	207
Natural lighting/daylight	119		
Artificial lighting	120	Positions	208
Qualities and details	121	Which is the more sustainable solution:	
Building services	122	the passive or the active building concept?	
Collecting and converting renewable energies	122	Interview with Dr. Winfried Heusler	208
Solar radiation	122	Tomorrow's sustainable buildings,	
Biomass	127	today: a holistic approach	
Water, groundwater, ground	128	Interview with Michael K. Rasmussen	212
Wind	129	Energy efficiency in the heating market	
Outside air	130	Interview with Prof. Martin Viessmann	216
Waste heat	135		
Generation of electrical energy, heat and cold	136	Perspectives	218
Storage and distribution	146	Performance	219
Heat	146	Aktiv-Stadthaus, Frankfurt (DE)	220
Cold	147	Users and operation	221
Moisture	147	The Aktivhaus in existing contexts	221
Electricity	148	From Aktivhaus to Active City	223
Heat and cold transfer	148	Sustainable building as model	225
Control and regulation	154	Choice of materials	225
Installation systems	156	Construction	225
User intervention	157	Site selection	226
Load management, smart grid	160	Building programme	226
Monitoring	162	Planning and design	226
		Conclusion	226
Projects	165		
Presentation of the projects	167	Appendix	227
Energy-Plus House Luchliweg, Münsingen (CH)	169	Glossary	228
LichtAktiv Haus, Hamburg (DE)	173	Bibliography and Illustration credits	236
Zero-Energy House, Driebergen (NL)	177	Index	238
Energy Flex House, Taastrup, Copenhagen (DK)	181	Authors	239