Building for a Changing Culture and Climate World Atlas of Sustainable Architecture

Ulrich Pfammatter

Revised and expanded edition Translated by Jim Hudson



Contents

Foreword Stefan Behnisch.

Preface Ulrich Pfammatter-Brugger_

Genius Loci – Unique Places in a		1.1 On the Place-ment of Building – New Identities	.22
State of Change	16		
		Overview.	-23
Introduction _	.18		
		A The Context and the Design of the Unique Place	24
		A/i References to the Cultural Landscape and History	24
		A/2 References to Cityscapes and Urban Contexts	27
		A/3 References to the Natural Environment	32
		B Processes of Transformation –	
		Generating New Identities	-38
		B/i Industrial Landscapes and Industrial Archaeology_	-38
		B/2 The Reinvention of Former Docks	41
		B/3 Urban Redevelopment Areas	44
		C Virtual Reference and Meaning Systems_	.46
		C/i Construction of a District	-46
		C12 Reinforcing Existing Character.	-51
		C/3 Implanting A Virtual World	-54

.10

1.2 Contextual Building Typologies in a Changing Culture and Climate

59'

Overview

Overview

A A/i A/2 A/3	Atria of the Future Atria as NewCommunication Spaces The Atrium as an Extension of Urban Space The Atrium as Polyvalent Functional Zone
В	Arcades and Urban Networks
B/i	Arcades Conquer Vertical Space
B/2	Integrating Arcades into the Urban Fabric
B/3	The Network as an Engine for Development
C	City Malls-New Building Types for a Communication Society
C/i	Urban Interiors - Urban Extensions
C/2	"Solitary forms" as New Icons for a District
C/3	Temporary and Ephemeral Structures
	Making a Memorable Place

1.3 Regional Identity and Cultural Techniques in Space, Construction, Material and Form

А	Building in Alpine and Mountainous Zones	92.
A/i	Reinterpretation of Traditional Building Forms	92
A/2	Developing Older Cultural Techniques	95
4/3	The Transformation of Village and Building Structure	es 98
3	The Place and the Role of Material "As Found"	102
3/i	Inter-cultural Construction Technology	102
8/2	Earth Architecture	105
3/3	The Dramatisation of Local Scenery	108
2	"Plus/minus 40 Degrees Latitude"	112
C/1	Learning from the Vernacular -	
	a Perspective for the Future	112
C/2	Reconstruction and Traditional Cultural Techniques	115
C/3	Imitation and Interpretation	118

2.1 Adaptation Scenarios.

.128	
------	--

Building in Extreme Situations.	.122		
		Overview.	129
Introduction.	124		
		A Flood Resistance and Mobility.	130
		A/i Reconstruction Projects	130
		A/2 Preventive Structures and Scenarios.	133
		A/3 Learning from the Vernacular	136
		B Living with, and Resisting, Desertification	140
		B/i Earth Architecture: Resistance Against Sand Storms	_140
		B/2 Ancient Cultural Techniques	143
		B/3 Visionary Projects	146
		C Flexibility in the Event of an Earthquake	150
		C/i High-tech Solutions	150
		C/2 Light-tech Strategies	-153
		C/3 Temporary Low-tech Structures.	156

3 Space, Structure and the Climate Challenge _ 220

Introduction.

.222

3.1 Frameworks – Separation of Systems – Resource Conservation 226

Ove	rview.	.227
A'	Constants and Variables.	.228
Ah	Structural Frame Systems as a Programme.	.228
A/2	Vernacular Architecture as a Source of Inspiration	231
A/3	Separation of Systems as a Sustainable Strategy	237
В	Structuralism - Cultural and	
	Environmental Influences on "Patterns of Life".	.242
B/l	Socio-cultural Foundations	.242
B/2	Spatial and Use Systems: Founding Principles -	
	Development - Perspectives	-245
B/3	Spatial and Constructional Typologies and Materia	ality 248
	Strategies for enduring spatial concepts,	
	adaptable to future uses.	
C/i	Flexibility of Use and Life Cycle Strategies	
$\alpha \alpha$		0.5.5

- C/2 Variable Spatial and Constructional Typology. —255
- C/3 Adaptability to Functional and Socio-cultural Change $\,258$

2.2 "Avoidance strategies" – Prevention and Adaptation 160

Overview 161 Reconstructable BuildingStructures А for EmergencySituations 162 All Non-locally Based Systems 162 A/2 Flexibility and Modularisation 165 A/3 Adaptable Structures for Polyvalent Uses 167 В Hybrid Systems for Extreme Climates 170 B/i Systems, Modules and Elements 170 B/2 Constants and Variables 172 B/3 Synthesis: Low-tech and High-tech 174 С Global Modelsand Regional Translations 178 C/i Temporary Infrastructure Projects 178 C/2 Shelter and Society 181 C/3 "Settled Nomads" 184

3.2 Spatial Topology – Adaptation Strategies

Ove	Overview	
A	Environmental factors as "drivers of innovation"	264
A/1	Shading Concepts	264
A/2	Natural and Supported Ventilation Principles	267
A/3	Climate Protection Scenarios	270
В	Building Typology as a Mirror of Cultural	
	and Climatic Dynamics	274
B/i	Spatial and UseScenarios:	
	Cultural Change and Environmental Influences	274
B/2	"Transparency" – Space and Circulation Zones –	
	Spatial Experience	277
B/3	Box Spaces and Spatial Economy: The "Raumplan"	
	("Space Plan") of the Future?	280
С	Spatial and Use Concepts for the Future	284
C/i	The Conquestof Space and Time	284
C/2	The "Continuous Space"	287
C/3	Experiments with Structured Spatial Forms	290

2.3 The Resistance of Structures to Environmental Forces, Natural Disasters and Other Events

Ove	rview	189
А	Buildings as a Part of the Environmental Dynamic	190
A/i	Traditional Cultures and their Technologies	190
A/2	Building Types for Extreme Climatic Fluctuations	192
A/3	Material Resistance and Technological Intelligence	e:
	Alpine Experiments for Protection Against	
	Environmental Extremes	194
В	Earthquakes, Storms, Catastrophes	198
\mathbf{B}/\mathbf{i}	Self-stabilising BuildingSystems	198
B/2	Earthquake Resistance: Concepts for Retro-fitting	
	and Upgrading	201
B/3	Sustainable Experiments: Requirements for Skyscrap	ers 204
С	Bulwarks Against Natural Hazards	208
C/i	Responsive and Symbolic Form Generation	208
C/2	Power Plants - Powerful Resistance:	
	"Don't fight forces - use them!" (Buckminster Fuller)	214
C/3	Resistance of BuildingStructures, Materials and	
	Technology in ExtremeSituations	* 217

3.3 Spatial Climate Control

262

263	Ove	rview	295
264 ·	А	The Buildingas an Integrated System	296
264	All	Concepts of Integration	296
267	A/2	High-tech versus Low-tech	302
270	A/3	Green buildings – Eco Cities	308
	В	Spatial Climate Zoning	326
274	B/i	"Form follows climate impact"	326
	B/2	Building "Profiling"	329
274	B/3	Spatial Climate Layers –	
		"Structure follows climate impact"	332
277		-	
	С	Building Envelopes Under "Climatic Stress"	336
280	C/i	The Climate-EnvelopeConcept and	
		the "SustainabilityAesthetic"	336
284	C/2	Spatial Climate Conditioning, DaylightComfort	
284		and Environmental Dynamics	339
287	C/3	From Building Envelope to "Active Breathing Skin"	342
290			

188

4 The Nature of Materials – and the Future of Materials Technology 346

Introduction_

348

.460

4.1 Building Materials and Technology in Transition

rview.	353
The Modellingof Natural Building Materials.	-354
Timber as a Building Material	-354
Bamboo, Straw and Reeds	-357
Designing with Natural Stone Techniques.	-364
Building Materials from Nature_	-368
Loam Construction Techniques_	-368
Iron -Steel -Aluminium: over 200 Years of	
Innovative Development_	-371
Glass technology, Systems of Space and Form.	-377
Composite Technologies	384
Metal-reinforced TimberConstruction,	
and Paper Tubes	-384
Pre-stressed Structures.	-388
Hybrid Typologies	-395
	The Modellingof Natural Building Materials. Timber as a Building Material Bamboo, Straw and Reeds Designing with Natural Stone Techniques. Building Materials from Nature Loam Construction Techniques Iron – Steel – Aluminium: over 200 Years of Innovative Development Glass technology, Systems of Space and Form. Composite Technologies Metal-reinforced Timber Construction, and Paper Tubes Pre-stressed Structures. Hybrid Typologies

352

5.1 Industrial Heritage and Sustainable Industrial Archaeology 464

Overview.	
A' Criteria for Evaluating Industrial Heritage A/i Transport and Mobility–Influences on the Transfor-	.466
mation of Iconic Buildings of the Industrial Age	.466
A/2 Economic Change – Presenting Traces of Memory.	.469
A/3 The Re-evaluation of Former Industrial Areas	-472
B Transformation models: Growth –	
Reintroducing Nature - Densification.	.476
B/1 Growth Engines for Urban Developments	-476
B/2 Bringing Nature and Integrated Spaces back to	
Urban Areas	.480
B/3 Densification Scenarios: Effective and Efficient	
Resource Use and Functional Representation	-483
C The Reinterpretation and Re-evaluation of	
Architectural Memory	.488
C/i Ecological Concepts.	.488
C/2 Space – Time – Architecture: Historyas Reference	490
C/3 Climate-oriented Reinterpretation	492

5 Architectural Memory: Industrial Culture and Transformation Strategies 458

Introduction.

4.2 Cultural Techniques: Resource Effectiveness + Resource Efficiency 402

Ove	rview	4°3
A	Construction Typology	404
A/i	More for Less - the Tendency Towards Efficiency	
	and Lightness	4°4
A/2	Appropriate Materials, and Material-based	
	Constructions :	4°7
A/3	Light-tech – Transcultural Learning in the Area	
	of Tension Between High-tech and Low-tech	409
В	Materiality – Sensitivity to Material	412
B/i	Trends in Timber Technology - a Question of Scale -	-412
B/2	Green Future – Clean Future?	416
B/3	The Potential of Hybrid Layered Materials	418
С	Production, Manufacturingand	
	Assembly Techniques	420
C/i	Traditional Cultural Techniques and	
	the State-of-the-art – from Low-tech to High-speed	420
C/2	Transfers and Applications from NewFields	426
C/3	Future-orientated Experiments	428

5.2 Revitalization

and Life Cycle Strategies 496

0	
()vei	view
0.0	

А	The Regeneration of Historical Traces -	
	the Tension Between History and the Future	498
Ah	Urban Economic Development	498
A/2	Socio-cultural Transition	501
A/3	Transition Points in History	504
В	The Visual Representation of Urban Processes	508
B/i	The Integration of Historical Layers	508
B/2	Revitalising the Urban Fabric	511
B/3	³ The Conversion of "Urban Anomalies"	
С	Prolongation of Lifespan Through Transformation -	-518
C/i	From Industrial Zone to Cultural Landscape	518
C/2	From Technology Parks to Event Scenarios	520
C/3	From Commercial Site to University Campus	522

4.3 Learning from Nature – Biomimicry: Inspiration and Challenge for a Forthcoming Building Culture 430

Overview	431
A Biomimetic Strategies and Construction Methods:	
Imitation - Reproduction - "Translation" - Inspirati	on 432
A/i The Replication of Natural Forms and	
Structures Through Technology	432
A/2 Phenomena and their"Translations"	435
A/3 Methodological LearningModels	438
B Building with Nature – Construction and	
Organizational Examples Imitating Nature	442
B/i Strategies, Programs, Scenarios	442
B/2 Adaptive Systems	444
B/3 Responses to the Unleashed Forces of Nature:	
Fire – Air – Earth – Water	446
C Synthesis: Expanding the Boundaries –	
Macro and Micro Worlds	450
CI1 Systems, Components, Modules	450
C/2 Deformations	453
C/3 Metamorphoses and Hybrid Material Technologies	s455

5.3 Rebuilding in the Context of Urban Culture and Environmental Conditions 526

Over	rview	527
А	Overlaying and the "Collage City" - Transparency -	
	Spatial Simultaneity	528
A/i	Urban Scenarios	528
A/2	Historically-Oriented Metamorphoses	531
A/3	Visionary Project Approaches	534
В	"Creative Disturbances" and the Spatio-Temporal	
	Dialogue Between Old and New	538
B/i	Implants	538
B/2	Dialogue-Based Concepts	541
B/3	Creative Contrasts	546
С	Space – Time – Memory	550
C/i	"Real-time" Interventions	550
C/2	Urban Space and History	553
C/3	Envisaging the Future	556

Appendix		Journals and Monographs	573
Glossaiy_	560	Project Index	574
Literature & Sources	566	People & Organisations Index	578