Preface  7

1 Introduction  9
   History  9
   Earth as a building material: the essentials  11
   Improving indoor climate  13
   Prejudices against earth as a building material  16

2 The properties of earth as a building material  17
   Composition  17
   Tests used to analyse the composition of loam  19
   Effects of water  22
   Effects of vapour  27
   Influence of heat  29
   Strength  30
   pH-value  33
   Radioactivity  33
   Shelter against high-frequency electromagnetic radiation  33

3 Preparing of loam  34
   Soaking, crushing and mixing  34
   Sieving  36
   Mechanical slurrying  36
   Water curing  36
   Thinning  36

4 Improving the earth’s characteristics by special treatment or additives  37
   Reduction of shrinkage cracks  37
   Stabilisation against water erosion  38
   Enhancement of binding force  40
   Increasing compressive strength  41
   Strength against abrasion  45
   Increasing thermal insulation  45

5 Rammed earthworks  50
   Formwork  51
   Tools  52
   Method of construction  53
   Shaping of openings  53
   New wall construction techniques  54
   Rammed earth domes  57
   Drying  57
   Labour input  58
   Thermal insulation  58
   Surface treatment  58

6 Working with earth blocks  59
   History  59
   Production of earth blocks  60
   Material composition  63
   Laying earth blocks  63
   Surface treatment  64
   Fixing fasteners to walls  65
   Lightweight loam blocks  65
   Special acoustic green bricks  66

7 Large blocks and prefabricated panels  67
   Large blocks  67
   Prefabricated wall panels  68
   Floor slabs  68
   Floor tiles  69
   Extruded loam slabs  69

8 Direct forming with wet loam  70
   Traditional wet loam techniques  70
   The “Dünne loam loaf” technique  72
   The stranglehm technique  73

9 Wet loam infill in skeleton structures  78
   Thrown loam  78
   Sprayed loam  78
   Rolls and bottles of straw loam  79
   Lightweight loam infill  80
   Infill with stranglehm and earth-filled hoses  80
   Sprayed loam in steel-reinforced walls and ceilings  81

10 Tamped, poured or pumped lightweight loam  83
    Formwork  83
    Tamped lightweight straw loam walls  83
    Tamped lightweight wood loam walls  84
    Tamped, poured or pumped lightweight mineral loam walls  85
    Pumped lightweight mineral loam floors  88
    Loam-filled hollow blocks  89
    Loam-filled hoses  90

11 Loam plasters  92
   Preparation of ground  92
   Composition of loam plaster  92
   Guidelines for plastering earth walls  94
   Sprayed plaster  95
   Lightweight mineral loam plaster  95
   Thrown plaster  95
   Plastered straw bale houses  95
   Wet formed plaster  96
Protection of corners 96
Stabilized loam plasters 97
Characteristics of different loam plasters 98

12 Weather protection of loam surfaces 100
Consolidating the surface 100
Paints 100
Making surfaces water-repellent 103
Lime plasters 103
Shingles, planks and other covers 105
Structural methods 105

13 Repair of loam components 106
The occurrence of damage in loam components 106
Repair of cracks and joints with loam fillers 106
Repair of cracks and joints with other fillers 107
Repairing larger areas of damage 107
Retrofitting thermal insulation with lightweight loam 108

14 Designs of particular building elements 109
Joints 109
Particular wall designs 110
Intermediate floors 112
Rammed earth floorings 114
Inclined roofs filled with lightweight loam 117
Earth-covered roofs 117
Earth block vaults and domes 119
Earthen storage wall in winter gardens 131
Loam in bathrooms 132
Built-in furniture and sanitary objects from loam 133
Wall heating systems 134
Passive solar wall heating system 134

15 Earthquake-resistant building 135
Structural measures 136
Openings for doors and windows 140
Bamboo-reinforced rammed earth walls 141
Steel-reinforced spayed loam walls 143
Steel-reinforced adobe wall system 143
Domes 144
Vaults 145
Textile walls with loam infill 147
Steel-reinforced earth walls 149

16 Built examples 150
Residences
Two semi-detached houses, Kassel, Germany 150
Residence cum office, Kassel, Germany 152
Residence, Palo Alto, California, USA 154
Weekend house, Ajijic, Mexico 156
Residence, Phoenix, Arizona, USA 158
Residence and studio, Gallina Canyon, New Mexico, USA 160
Low compound, Scottsdale, Arizona, USA 162
Residence, Des Montes, near Taos, New Mexico, USA 164
Casa Nuanarpoq, Taos, New Mexico, USA 166
Residence and office, Bowen Mountain, New South Wales, Australia 167
Vineyard residence, Mornington Peninsula, Victoria, Australia 168
Residence, Helensville, New Zealand 170
Residence, Merrijig, Victoria, Australia 172
Farmhouse, Wazirpur, India 174
Residence, Santiago, Chile 175

Cultural, Educational and Sacred Buildings
Kindergarten, Sorsum, Germany 176
School, Rudrapur, Bangladesh 178
Kindergarten and nursery of Druk White Lotus School, Ladakh, India 180
Youth centre at Spandau, Berlin, Germany 182
National Environment Centre at Thurgoona Campus, Albury, New South Wales, Australia 184
WISE Centre for Alternative Technology, Machynleth, Wales, Great Britain 186
Chapel of the central clinic, Suhl, Germany 188
Chapel of Reconciliation, Berlin, Germany 190
Center of Gravity Foundation Hall, Jemez Springs, New Mexico, USA 192
School, Solvig, Järna, Sweden 194

Commercial and Hospitality Buildings
Rivergreen Centre, Aykley Heads, Durham, Great Britain 195
Printing plant, Pielach, Austria 196
Office building, Santiago, Chile 198
Feng shui office building, Suhl, Germany 199
High Country Visitor Information Centre, Mansfield, Victoria, Australia 200
Twelve Apostles Visitor Amenity Building, Port Campbell, Victoria, Australia 202
Mii Amo Spa, Sedona, Arizona, USA 204

Bibliographical references 206
Illustration credits 207
Acknowledgements 207