

MODERN CONSTRUCTION HANDBOOK

ANDREW WATTS

THIRD EDITION

1

2

3

INTRODUCTION

4 MATERIALS

18 WALLS

82 ROOFS

201

| | | | | | | | |
|-------------------------------|----|---------------------------------|----|---------------------------|-----|-----------------------------|-----|
| Introduction to third edition | 4 | Tectonics in metal | 20 | Trends in facade design | 84 | Trends in roof design | 202 |
| Structure and envelope | 8 | Steel | 22 | | | | |
| Parametric design | 14 | Aluminium | 26 | Generic wall types | 90 | Metal roofs | |
| | | Copper, zinc and lead | 28 | | | 1 Metal standing seam | 206 |
| | | | | Metal | | 2 Profiled metal sheet | 210 |
| | | Tectonics in glass | 30 | 1 Sheet metal | 92 | 3 Composite panels | 214 |
| | | Glass | 32 | 2 Profiled cladding | 36 | 4 Rainscreens | 218 |
| | | | | 3 Composite panels | 100 | 5 Metal louvres | 222 |
| | | Tectonics in concrete | 36 | 4 Rainscreens | 104 | | |
| | | Concrete | 38 | 5 Mesh screens | 108 | Glass roofs | |
| | | | | 6 Louvre screens | 112 | 1 Greenhouse glazing | |
| | | Tectonics in masonry | 44 | | | and capped systems | 226 |
| | | Masonry | 46 | Glass systems | 116 | 2 Silicone-sealed glazing | |
| | | Concrete block | 48 | 1 Stick systems | 120 | and rooflights | 230 |
| | | Stone | 50 | 2 Unitised glazing | 124 | 3 Bolt fixed glazing | 234 |
| | | Brick | 52 | 3 Clamped glazing | 128 | 4 Bonded glass rooflights | 238 |
| | | | | 4 Bolt fixed glazing | 132 | | |
| | | Tectonics in plastics | 54 | 5 Glass blocks | | Concrete roofs | |
| | | Plastics and composites | 56 | and channels | 136 | 1 Concealed membranes | 242 |
| | | | | 6 Steel windows | 140 | 2 Exposed membranes | 246 |
| | | Tectonics in timber | 60 | 7 Aluminium windows | 144 | 3 Planted roof | 250 |
| | | Timber | 62 | 8 Timber windows | 148 | | |
| | | | | | | Timber roofs | |
| | | Fabrics and membranes | 64 | Concrete | | 1 Flat roof: mastic asphalt | |
| | | | | 1 Cast in-situ | 152 | coverings | 254 |
| | | Materials for interior finishes | | 2 Storey height precast | 156 | 2 Flat roof: bitumen-based | |
| | | 1 Internal partitions | 68 | 3 Small precast panels | 160 | sheet membranes | 258 |
| | | 2 Plaster and wallboard | 70 | | | 3 Pitched roof: tiles | 262 |
| | | 3 Internal floors | 72 | Masonry loadbearing walls | 164 | | |
| | | 4 Internal ceilings | 74 | | | Plastic roofs | |
| | | | | Masonry cavity walls | | 1 GRP rooflights | 266 |
| | | Performance testing of | | 1 Brick | 168 | 2 GRP panels and shells | 270 |
| | | facade material systems | 76 | 2 Stone and block | 172 | | |
| | | | | | | Fabric systems | |
| | | Performance testing of | | Masonry cladding | 176 | 1 LIFt cushions | 274 |
| | | roof material systems | 80 | | | 2 Single membrane: | |
| | | | | Masonry rainscreens | 180 | cone-shaped roof | 278 |
| | | | | | | 3 Single membrane: | |
| | | | | Plastic | | barrel-shaped roof | 282 |
| | | | | 1 Plastic-based cladding | 184 | | |
| | | | | 2 Plastic rainscreens | 188 | | |
| | | | | | | | |
| | | | | Timber | | | |
| | | | | 1 Timber frame | 192 | | |
| | | | | 2 Cladding panels | 196 | | |

CONTENTS

4

5

B

| | | | | | | | |
|---|------------|--------------------------------------|------------|---|------------|-------------------|-----|
| STRUCTURE | 286 | ENVIRONMENT | 354 | APPLICATIONS | 412 | | |
| Material systems for structures | 288 | Environmental studies for envelopes | 356 | 1 Working with industry | 414 | Glossary of terms | 496 |
| Elements of structures | 290 | Analysis for design | | 2 Triangular panels for twisted facades | 416 | Authorship | 500 |
| 1 Braced frames | | 1 Solar radiation | 360 | 3 Twisted panels with flat glass for curved facades | 418 | Photo credits | 501 |
| Reinforced concrete | 292 | 2 Daylight | 364 | 4 Solar shading louvres | 424 | Index | 502 |
| Steel | 296 | 3 Thermal performance | 366 | 5 Double-skin facades | 428 | | |
| Timber | 300 | 4 Wind | 368 | 6 Precast concrete panels for facades of complex geometry | 430 | | |
| 2 Portal frames | 304 | 5 Solar shading | 370 | 7 Exoskeleton facades of complex geometry | 434 | | |
| 3 Loadbearing boxes | | 6 Double skin facades | 375 | 8 Diagrid structures | 436 | | |
| Reinforced concrete | 308 | 7 Natural ventilation | 384 | 9 Hybrid systems forming facades of complex geometry | 438 | | |
| Brick | 312 | 8 Thermal mass | 386 | 10 Opaque cladding interface with full-height glazing | 442 | | |
| Glass | 316 | Low energy material systems | | 11 Complex curved glazed roofs | 444 | | |
| 4 Trusses | 320 | 1 Embodied energy | 388 | 12 Large-scale glazed facades | 448 | | |
| 5 Arches and shells | 324 | 2 Straw bales and hemp | 392 | 13 Panelisation of complex building surface geometry | 450 | | |
| 6 Space grids | 328 | 3 Rammed earth, cob and adobe bricks | 394 | 14 Opaque rainscreen cladding | 454 | | |
| Floor structures | | 4 Green wood and bamboo | 396 | 15 Full-height glazing with GRP-clad structural frame | 456 | | |
| 1 Cast in-situ / cast-in-place concrete | 332 | 5 Green walls | 398 | 16 GRC cladding interfaces | 458 | | |
| 2 Precast concrete | 334 | Active design | | 17 Full-height entrance glazing | 460 | | |
| 3 Steel and steel mesh | 336 | 1 Solar power and solar heating | 400 | 18 GRP louvres on stick glazing system | 462 | | |
| 4 Timber | 338 | 2 Electrical lighting | 402 | 19 GRC cladding | 468 | | |
| 5 Glass | 342 | Support services | | 20 Windows in GRC cladding | 470 | | |
| Stairs | | 1 Maintenance and cleaning | 404 | 21 Windows and unitised glazing with GRC cladding | 474 | | |
| 1 Concrete | 346 | 2 Lifts | 410 | 22 Unitised glazing with GRC cladding | 476 | | |
| 2 Steel | 348 | | | 23 Complex glazed roofs with supporting steel structure | 478 | | |
| 3 Timber | 350 | | | 24 Glazed roofs with complex geometry | 482 | | |
| 4 Glass | 352 | | | 25 Louvres and stick glazing | 484 | | |
| | | | | 26 Tiled cladding | 488 | | |
| | | | | 27 Rainscreens | 490 | | |