

Building Maintenance

Brian Wood, DipArch MCMi RIBA MRICS MBIFM FCIoB

Department of Real Estate and Construction

School of the Built Environment

Oxford Brookes University

WILEY-BLACKWELL

A John Wiley & Sons, Ltd., Publication

Contents

<i>Foreword by Professor Jim Smith</i>	xiii
<i>Preface</i>	xiv
<i>Acknowledgements</i>	xv
1 Introduction	1
Arrangement of this book	1
Problems	2
Checklists	2
Maintenance: what is it; what is it for?	3
Definitions	3
Shortcomings of definitions	5
Purposes of building maintenance	6
Context of building maintenance	7
Political	8
Economic	13
Social	14
Technological	15
Environmental	17
Summary	18
References	19
2 Design temptations	21
Design standards	27
Design team	29
Design quality	33
Summary	35
References	35
3 Maintenance planning	36
Strategy	36
What, where, when, how, (and how often), who and why	40
Why a maintenance plan?	40
What?	41

Where?	42
When?	42
How?	44
Who?	46
Communication	49
Case study: estate strategy in a UK university	50
Background	50
Issues	50
Proposal	51
Progress	51
Assessment	52
Summary	53
References	53
4 The client	54
The key decision maker	54
Reminder: the client pays the bills	55
Wants and needs	56
How to determine and differentiate wants and needs	58
Practical application: example scenario	60
Seeking advice	64
When to seek advice?	64
How often to seek advice	65
How soon to seek advice	65
From whom to seek advice	65
Giving advice	66
Taking advice	66
Summary	67
References	67
Useful websites	67
5 Expectations	68
Functionality	68
Standards	69
Overproduction	70
Transportation	70
Waiting	71
Inventory	71
Motion	72
Overprocessing	72
Defects and rework	73
Other 'wastes'	73
Customer service	74
Needs of the future: looking ahead	77
A worked example - developing a checklist related to expectations	79
Case study: maintenance delivery in a UK university	79
Organisational context	79
Priorities	81
Monitoring and reporting	82

Reflection	82
Summary	83
References	83
Websites	84
Day-to-day prioritisation	85
Basics	85
Getting by	85
Putting off	86
Maintenance and building inheritance	87
Heritage	87
The helpdesk	88
Today's needs	89
Tomorrow	89
Possible future scenarios	89
Major works	90
Minor works	91
The Intermediate form	92
Capital projects	92
Revenue works	93
Capitalised repairs	93
Planned maintenance	94
Response maintenance	94
Checklist application	95
Budgets, costs and contracts	96
Contracts	97
Procurement	98
Decision making and recording	98
Summary	100
References	100
Deterioration	102
Weather and climate	102
Processes	103
Rain and snow	104
Damp	105
Wind	107
Sun/ultraviolet light	108
Temperature changes	108
Durability	110
Decay	111
Wear and tear	113
Projecting from past performance	114
Data vs. information	115
Limitations	116
Functional obsolescence	117
Case study: a local authority	118
Background	118
Issues	119

Action	119
Findings	120
Reflection	120
Summary	121
References	121
8 Building defects and avoidance	122
Avoidance of defects	123
Defects at the inception/pre-design stage	123
Defects at the design stage	124
Defects occurring during the construction stage	127
Defects while the building is in occupation	130
How to avoid defects	131
'Zero defects'	131
Repair/replace decisions	134
Specifications	135
Summary	137
References	138
Useful websites	138
9 Organising maintenance works	139
Organisation	139
Direct labour	139
Specialist contractors	142
General contractors	143
Selecting contractors	143
Procurement	144
Prices and pricing	144
Schedules of rates	145
Tenders and tendering	147
Contracts	147
Service level agreements	148
Case study: innovative building maintenance in a supermarket chain	148
Background	148
Context	148
Issues	149
Findings	149
Wider application	149
Statutory requirements	150
Development control: town and country planning	150
Building control: Building Regulations	151
Health and safety: Construction Design and Management Regulations	151
Work in progress	152
Supervision	153
Inspection	153
Payments	154
Feedback	154
Summary	155
References	155

10 Defect recognition and rectification: General	157
Inspection	157
Why?	158
How?	158
When?	159
Where?	160
Who should inspect?	160
What is to be done?	160
Recognition	161
Recording	162
Reporting	162
Recognising, recording and reporting condition	163
Extent	164
Priority	164
Rectification	165
Defect rectification specifications	166
Execution	166
Follow-up	167
Checklist: defect recognition and rectification	167
Summary	167
References	169
11 Defect recognition and rectification: Foundations, basements and external works	170
Outline: general arrangement	170
Symptoms	170
Possible causes	171
Rectification	171
Avoidance	172
Foundations	172
Cracks	173
Ground conditions	173
Underpinning	175
Avoidance of problems in future	176
Basements and cellars	176
Water table	176
Underground streams	177
Cracked pipes and drains	178
Tree roots	178
Ventilation	179
Sloping sites	179
External works	180
Freestanding walls	180
Retaining walls	181
Fences	182
Paths	183
Steps and ramps	184
Parking	186
Soft landscaping	187
Common areas generally	188

Summary	189
References	189
Useful websites	190
12 Defect recognition and rectification: External walls, doors and windows	191
External walls and frames	191
Symptoms and possible causes	191
Rectification work	201
Concrete	203
Claddings	205
Windows and external doors	207
Swelling and sticking	207
Shrinkage and gaps	210
Distortion	210
Weathering and detailing	210
Metal windows	211
Bay windows	212
Doors	212
Glass and glazing	213
Double and triple glazing; replacement doors and windows; PVCu	213
Cills, heads, reveals and canopies	214
Decorations	214
Summary	216
References	216
13 Defect recognition and rectification: Chimneys, roofs and roofspaces, rainwater disposal	219
Chimneys	219
Pitched roofs	221
Slates	222
Clay tiles	224
Concrete tiles	225
Asbestos-cement slates and sheets	226
Fibre-cement	227
Sheet metal roofs	227
Other roofing materials	227
Roof forms and related details	227
Valleys	228
Eaves	228
Dormer windows and other penetrations	231
Steps - flashings	232
Gables	233
Attics and roofspaces	233
Pitched roof structures	233
Flat roofs	236
Lead	236
Felt	236
Asphalt	237
Insulation	238

Protection	238
Green roofs	239
Rainwater disposal	239
Summary	244
References	245
Helpful website	246
14 Defect recognition and rectification: Floors, stairs and internal walls	247
Ground floors	247
Floor finishes	248
Intermediate floors	249
Stairs	250
Handrails and balustrading	250
Means of escape; protected routes	251
Internal walls and finishes	251
Summary	252
References	252
15 Defect recognition and rectification: Building services	254
Plumbing: water, waste and soil	254
Gas	258
Gas usage	258
Electrical and communication systems	259
Heating, ventilation and air-conditioning	260
Fire, security and other specialist services	261
Security	262
Summary	262
References	262
16 Upgrading and improvement	264
Changing standards	264
Incremental change	265
Exponential change	266
Step change	266
Local or international standards	268
What do we want?	269
Similar organisations	270
How to decide?	271
How far to go?	271
Move or improve?	272
Mini case study	273
Checklist	274
Summary	274
References	274
17 The rehabilitation process	276
Preparation	276
Briefing	276
Time: the essence	277

Place	278
Specifications	279
Decanting	279
Work in progress	281
Preparing to move back	282
Check	283
Summary	283
References	284
18 New life in the building	285
How was it for you?	285
The learning organisation	286
Techniques and timings	286
Periodic overview	287
Annual review	289
Formal feedback	291
Post-occupancy evaluation (POE)	292
Pros and cons: why POE?	293
Who should do POE?	294
Monitoring and refreshing	295
Documentation	296
Refreshing the building	296
Refreshing the organisation and staff	297
Time and tide	298
Checklist	298
Summary	299
References	299
<i>Index</i>	301