BUILDING TECHNOLOGY

By the same author

Building Economics

Building Maintenance

Building Quantities Explained, Third edition

Civil Engineering Quantities, Third edition

Civil Engineering Specification, Second edition

Local Government Explained

Municipal Engineering Practice

Outdoor Recreation and the Urban Environment

Planned Expansion of Country Towns

BUILDING TECHNOLOGY

IVOR H. SEELEY

B.Sc., M.A., Ph.D., F.R.I.C.S., C.Eng.,
F.I.Mun.E., F.I.Q.S., M.I.O.B., M.I.H.

*Head of Department of Surveying
and Dean of the School of
Environmental Studies,
Trent Polytechnic, Nottingham*

Second Edition

M

© Ivor H. Seeley 1974, 1980

Softcover reprint of the hardcover 2nd edition 1980

All rights reserved. No part of this publication
may be reproduced or transmitted, in any form or by
any means, without permission.

First edition 1974

Reprinted 1975, 1976, 1977, 1978, 1979

Second edition 1980

Published by

THE MACMILLAN PRESS LTD

London and Basingstoke

Associated companies in Delhi Dublin

Hong Kong Johannesburg Lagos Melbourne

New York Singapore and Tokyo

ISBN 978-0-333-30718-2

ISBN 978-1-349-16371-7 (eBook)

DOI 10.1007/978-1-349-16371-7

Typeset in Great Britain by

STYLESET LIMITED

Salisbury, Wiltshire

This book is sold subject to the standard
conditions of the Net Book Agreement.

The paperback edition of this book is sold subject to the
condition that it shall not, by way of trade or otherwise,
be lent, resold, hired out, or otherwise circulated without
the publisher's prior consent, in any form of binding or
cover other than that in which it is published and without
a similar condition including this condition being imposed
on the subsequent purchaser.

This book is dedicated to my wife for her continual interest in building matters and for producing such a good design for our new bungalow, where some of the constructional methods described in the book have been put into practice

CONTENTS

<i>List of illustrations</i>	ix	5 FIREPLACES, FLUES AND CHIMNEYS	66
<i>List of tables</i>	xi	General principles of design; hearths; fireplace construction; flues and chimneys; chimney stacks and flue outlets; curing smoky chimneys.	
<i>Preface</i>	xiii	6 FLOORS	77
<i>Acknowledgements</i>	xv	Function of floors; solid ground floors; suspended ground floors; upper floors; timber: properties, types, conversion, seasoning, defects, jointing; floor finishings.	
1 THE BUILDING PROCESS AND SITEWORKS	1	7 ROOFS	98
Choice of site; site investigation; groundwater drainage; setting out; control of building work; sequence of building operations; problems in design and construction of buildings.		General principles of design; choice of roof types; pitched roof construction; pitched roof coverings; flat roof construction; flat roof coverings; roof drainage; thermal insulation; principal materials used in roofs.	
2 BUILDING DRAWING	12	8 WINDOWS	120
Drawing instruments and materials; layout and presentation of drawings; sketches; working drawings.		General principles of window design; wood-casement windows; double-hung sash windows; defects in wood windows; metal windows; glass and glazing; double glazing and double windows; patent glazing.	
3 FOUNDATIONS	23	9 DOORS	132
Identification and characteristics of soils; design of foundations; foundation types and their selection; excavation and trench timbering; concrete; cements; aggregates; site testing of materials; concrete mixes; concreting operations; reinforced concrete; prestressed concrete; basement construction.		General principles of design of doors; door types; door frames and linings; metal doors; ironmongery.	
4 WALLS	41	10 STAIRS AND FITTINGS	144
Functions of walls; bricks and blocks; mortars; building brick and block walls; cavity walls; damp-proof courses; scaffolding; arches and lintels; external treatments to walls; stone walls; crosswall construction; internal partitions.		Staircase design; timber staircase construction; stairways in other materials; wood trim; simple joinery fittings; panelling.	

11 FINISHINGS	155	14 EXTERNAL WORKS	192
Internal wall finishings; internal ceiling finishings; external renderings; painting.		Road design, road construction; road drainage; footpaths and paved areas; landscape work; fencing; gates.	
12 WATER SERVICES AND SANITARY PLUMBING	165	<i>Appendix</i> : Metric conversion table	202
Cold water supply; hot water supply; sanitary appliances; sanitary pipework above ground; low-pressure hot-water central heating systems.		<i>Index</i>	203
13 DRAINAGE	178		
Design of drains; choice of pipes; pipe laying; drainage layout; interceptors; manholes and inspection chambers; testing of drains; cesspools; small domestic sewage treatment works.			

LIST OF ILLUSTRATIONS

Figure 1.1	Groundwater drainage	4	Figure 7.6	Roof slating and asbestos cement sheeting	108
Figure 1.2	Setting out	6	Figure 7.7	Timber and concrete flat roofs	112
Figure 2.1	Drawing instruments	13	Figure 7.8	Lead flat roofs	113
Figure 2.2	Presentation of drawings	18	Figure 7.9	Zinc and copper flat roofs	115
Figure 2.3	Styles of lettering and working drawings	20	Figure 8.1	Wood-casement windows and open space requirements	122
Figure 2.4	Isometric and axonometric projections	21	Figure 8.2	Inward-opening, pivoted and bullseye wood windows	123
Figure 3.1	Minimum width of strip foundations	26	Figure 8.3	Double-hung sash windows	126
Figure 3.2	Foundation types	28	Figure 8.4	Metal windows, double glazing and double windows	128
Figure 3.3	Timbering to excavations	33	Figure 9.1	Panelled and glazed doors	134
Figure 3.4	Basement construction	39	Figure 9.2	Panelled door details	135
Figure 4.1	Brick and pointing details	48	Figure 9.3	Flush door details	137
Figure 4.2	Brick bonds — English and Flemish	50	Figure 9.4	Door frames and linings	139
Figure 4.3	Brick bonds — setting out, angles and alternative bonds	51	Figure 9.5	Door ironmongery	141
Figure 4.4	Brick bonds — piers and reveals	52	Figure 10.1	Design of timber staircases	145
Figure 4.5	Cavity wall details	54	Figure 10.2	Timber staircase details	147
Figure 4.6	Parapets, scaffolding and stud partitions	57	Figure 10.3	Stairs in alternative forms and wood trim	150
Figure 4.7	Arches and lintels	59	Figure 10.4	Kitchen fitments	152
Figure 4.8	Masonry and crosswalls	62	Figure 10.5	Built-in wardrobes and panelling	153
Figure 5.1	Fireplaces and flues 1	68	Figure 12.1	Cold water supply	166
Figure 5.2	Fireplaces and flues 2	69	Figure 12.2	Hot water supply and soil appliances	169
Figure 5.3	Fireplaces and flues 3	71	Figure 12.3	Sanitary appliances	172
Figure 5.4	Chimney stacks and flue outlets	74	Figure 12.4	Sanitary pipework above ground and low-pressure hot-water central heating systems	175
Figure 6.1	Solid ground floors	79	Figure 13.1	Drain laying, jointing and protection	180
Figure 6.2	Suspended ground floors	82	Figure 13.2	House drainage layout, intercepting chamber and petrol interceptor details	183
Figure 6.3	Timber upper floors	84	Figure 13.3	Manholes and inspection chambers	185
Figure 6.4	Timber conversion, sound insulation of wood joist floors, double timber floors and jointing timbers	86	Figure 13.4	Cesspools and small domestic sewage treatment works	189
Figure 6.5	Fire-resisting floors	88	Figure 14.1	Roads and footways	193
Figure 7.1	Pitched roof construction	100	Figure 14.2	Fencing and gates	200
Figure 7.2	TRADA timber roof trusses and trussed rafters	102			
Figure 7.3	Timber and steel roof trusses	103			
Figure 7.4	Trimming pitched roof around chimney stack	105			
Figure 7.5	Roof tiling	106			

LIST OF TABLES

Table 2.1	Recommended scales	15
Table 3.1	Soil identification	24
Table 3.2	Typical bearing capacities of soils	27
Table 3.3	Choice of foundation	31
Table 3.4	Concrete mixes and strength requirements	36
Table 4.1	Suitable mortar mixes for various brick strengths	41
Table 4.2	Mortar mixes (proportions by volume)	47
Table 4.3	Selection of mortar groups	47
Table 4.4	Materials for damp-proof courses	55
Table 6.1	Timbers in common use	90
Table 7.1	Imposed roof loadings	98
Table 7.2	Minimum slopes for pitched roof coverings	104
Table 7.3	Flow capacities (litres/second) for level gutters with outlet at one end	116
Table 7.4	Minimum downpipe sizes for various eaves gutters	116
Table 7.5	Effective areas drained by level eaves gutter with outlet at one end at a rate of rainfall of 75 mm/h	116
Table 11.1	Characteristics of plaster finishes	156
Table 11.2	Mixes suitable for rendering	161
Table 11.3	Recommended mixes for external renderings in relation to background materials, exposure conditions and finish required	161
Table 13.1	Minimum internal dimensions for man-holes and inspection chambers	186
Table 14.1	Comparison of constructional methods for roads	195
Table 14.2	Comparison of constructional methods for footpaths	196

PREFACE TO THE SECOND EDITION

THIS BOOK EXAMINES the general principles of building construction and applies them to practical examples of constructional work throughout all parts of simple domestic buildings. Consideration is also given to the choice of materials and implications of Building Regulations, British Standards, Codes of Practice and current government research.

The principal aim is to produce a comprehensive, simply explained and well-illustrated text which will form a basic construction textbook for first- and second-year students in a variety of disciplines, including architects, quantity surveyors, valuers, auctioneers, estate agents, building and mineral surveyors, builders, housing managers, environmental health officers, building control officers and clerks of works. It should also prove of value to those working for TEC certificates and diplomas in construction; degrees in architecture, building, quantity surveying and estate management; and the General Certificate of Education in building construction.

All drawings and building data are fully metricated and, although BS 1192 has been largely used as a basis for the preparation and presentation of drawings, it was decided to omit 'm' and 'mm' symbols from all descriptions as well as dimensions on the drawings, to avoid constant repetition of units of measurement. It is unlikely that any confusion will arise as a result of this. A metric conversion table is produced in an appendix to help readers who wish to make comparisons between imperial and metric measures. The abbreviations BRE, for Building Research Establishment, and DOE, for Department of the Environment, have been used extensively throughout the book. DOE Advisory Leaflets are sometimes referred to as Property Services Agency (PSA) leaflets.

This second edition has been considerably extended and updated to include the latest developments.

IVOR H. SEELEY

ACKNOWLEDGEMENTS

THE author acknowledges with gratitude the willing co-operation and assistance received from many organisations connected with the building industry – manufacturing, research and contractual.

The Controller of Her Majesty's Stationery Office has given permission to incorporate extracts from *The Building Regulations 1976* and the *First Amendment 1978*. Crown copyright material is also reproduced from BRS and BRE Digests by permission of the Director of the Building Research Establishment; in this connection it should be mentioned that copies of the digests quoted are obtainable from Her Majesty's Stationery Office, PO Box 569, London SE1, or any bookseller.

Extracts from British Standards and Codes of Practice are reproduced by permission of the British Standards Institution, 2 Park Street, London W1A 2BS. The Institution allows a discount of 40 per cent on sales of publications to students and educational bodies and BS Handbook 3 contains useful summaries of British Standards for building, which are updated periodically.

The quality and usefulness of the book has been very much enhanced by the large number of first-class drawings which do so much to bring the subject to life. Ronald Sears devoted many hundreds of hours to the painstaking preparation of the final drawings, for which he deserves special appreciation. The author also expresses his gratitude to Malcolm Stewart of the publishers, for his continual guidance and encouragement throughout the preparation and production of the book. Thanks are due to those readers, particularly D. J. Fisher and M. P. Fisby, who wrote to the author with helpful comments.