BUILDING TECHNOLOGY

By the same author

Advanced Building Measurement

Building Economics, Third edition

Building Maintenance

Building Quantities Explained, Third edition

Building Surveys, Reports and Dilapidations

Civil Engineering Contract Administration and Control

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

Quantity Surveying Practice

BUILDING TECHNOLOGY

IVOR H. SEELEY

BSc (Est Man), MA, PhD, FRICS,
CEng, FICE, MCIQB

*Emeritus Professor of Trent Polytechnic,
Nottingham*

Third Edition

M
MACMILLAN

© Ivor H. Seeley 1974, 1980, 1986

Reprint of the original edition 1986

All rights reserved. No reproduction, copy or transmission of this publication may be made without written permission.

No paragraph of this publication may be reproduced, copied or transmitted save with written permission or in accordance with the provisions of the Copyright Act 1956 (as amended).

Any person who does any unauthorised act in relation to this publication may be liable to criminal prosecution and civil claims for damages.

First edition 1974

Reprinted 1975, 1976, 1977, 1978, 1979

Second edition 1980

Reprinted 1981, 1982, 1983, 1985

Third edition 1986

Published by
MACMILLAN EDUCATION LTD
Houndmills, Basingstoke, Hampshire RG21 2XS
and London
Companies and representatives
throughout the world

British Library Cataloguing in Publication Data
Seeley, Ivor H.

Building technology.—3rd ed.
(Macmillan building and surveying series)

1. Building

I. Title

690 TH145

ISBN 978-0-333-43350-8 ISBN 978-1-349-09223-9 (eBook)

DOI 10.1007/978-1-349-09223-9

Series Standing Order

If you would like to receive future titles in this series as they are published, you can make use of our standing order facility. To place a standing order please contact your bookseller or, in case of difficulty, write to us at the address below with your name and address and the name of the series. Please state with which title you wish to begin your standing order. (If you live outside the United Kingdom we may not have the rights for your area, in which case we will forward your order to the publisher concerned.)

Customer Services Department, Macmillan Distribution Ltd
Houndmills, Basingstoke, Hampshire, RG21 2XS, England.

This book is dedicated to my wife for her continual interest in building matters and for producing such a good design for our 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	78
<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 to the third edition</i>	xiii		
<i>Acknowledgements</i>	xiv	6 FLOORS	89
		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	112
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; condensation; principal materials used in roofs.	
2 BUILDING DRAWING	13	8 WINDOWS	136
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	24	9 DOORS	149
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	43	10 STAIRS AND FITTINGS	161
Functions of walls; bricks and blocks; mortars; building brick and block walls; cavity walls; cavity wall insulation; damp-proof courses; scaffolding; arches and lintels; external treatments to walls; stone walls; crosswall construction; non-traditional housing; timber frame construction; internal partitions.		Staircase design; timber staircase construction; stairways in other materials; wood trim; simple joinery fittings; panelling.	

11 FINISHINGS	173	14 EXTERNAL WORKS	214
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	184	15 BUILDING IN WARM CLIMATES	225
Cold water supply; hot water supply; sanitary appliances; sanitary pipework above ground; low-pressure hot-water central heating systems.		Factors influencing overseas building; design of buildings for warm climates; construction of buildings in warm climates; behaviour of building materials; special structural problems.	
13 DRAINAGE	199		
Design of drains; choice of pipes; pipe laying; drainage layout; interceptors; manholes and inspection chambers; testing of drains; cesspools; small domestic sewage treatment works.		<i>Appendix: Metric conversion table</i>	243
		<i>Index</i>	244

LIST OF ILLUSTRATIONS

Figure 1.1	Ground-water drainage	4	Figure 7.6	Roof slating and asbestos cement sheeting	123
Figure 1.2	Setting out	6	Figure 7.7	Timber and concrete flat roofs	127
Figure 2.1	Drawing instruments	14	Figure 7.8	Lead flat roofs	129
Figure 2.2	Presentation of drawings	19	Figure 7.9	Zinc and copper flat roofs	130
Figure 2.3	Styles of lettering and working drawings	21	Figure 8.1	Wood casement windows and open space requirements	138
Figure 2.4	Isometric and axonometric projections	22	Figure 8.2	Inward-opening, pivoted and bullseye wood windows	140
Figure 3.1	Minimum width of strip foundations	27	Figure 8.3	Double-hung sash windows	142
Figure 3.2	Foundation types	30	Figure 8.4	Metal windows, double glazing and double windows	145
Figure 3.3	Timbering to excavations	35	Figure 9.1	Panelled and glazed doors	152
Figure 3.4	Basement construction	40	Figure 9.2	Panelled door details	153
Figure 4.1	Brick and pointing details	54	Figure 9.3	Flush door details	154
Figure 4.2	Brick bonds — English and Flemish	56	Figure 9.4	Door frames and linings	156
Figure 4.3	Brick bonds — setting out, angles and alternative bonds	57	Figure 9.5	Door ironmongery	158
Figure 4.4	Brick bonds — piers and reveals	58	Figure 10.1	Design of timber staircases	162
Figure 4.5	Cavity wall details	60	Figure 10.2	Timber staircase details	165
Figure 4.6	Parapets, scaffolding and stud partitions	63	Figure 10.3	Stairs in alternative forms and wood trim	168
Figure 4.7	Arches and lintels	67	Figure 10.4	Kitchen fitments	170
Figure 4.8	Masonry and crosswalls	72	Figure 10.5	Built-in wardrobes and panelling	171
Figure 5.1	Fireplaces and flues 1	80	Figure 12.1	Cold water supply	185
Figure 5.2	Fireplaces and flues 2	81	Figure 12.2	Hot water supply and soil appliances	188
Figure 5.3	Fireplaces and flues 3	83	Figure 12.3	Sanitary appliances	193
Figure 5.4	Chimney stacks and flue outlets	85	Figure 12.4	Sanitary pipework above ground and low pressure hot water central heating systems	196
Figure 6.1	Solid ground floors	91	Figure 13.1	Drain laying, jointing and protection	201
Figure 6.2	Suspended ground floors	94	Figure 13.2	House drainage layout, intercepting chamber and petrol interceptor details	205
Figure 6.3	Timber upper floors	97	Figure 13.3	Manholes and inspection chambers	208
Figure 6.4	Timber conversion, sound insulation of wood-joist floors, double timber floors and jointing timbers	99	Figure 13.4	Cesspools and small domestic sewage treatment works	211
Figure 6.5	Fire-resisting floors	101	Figure 14.1	Roads and footways	215
Figure 7.1	Pitched roof construction	114	Figure 14.2	Fencing and gates	222
Figure 7.2	TRADA timber roof trusses and trussed rafters	116			
Figure 7.3	Timber and steel roof trusses	117			
Figure 7.4	Trimming pitched roof around chimney stack	119			
Figure 7.5	Roof tiling	121			

LIST OF TABLES

Table 2.1	Recommended scales	16
Table 3.1	Soil identification	25
Table 3.2	Typical bearing capacities of soils	28
Table 3.3	Choice of foundation	32
Table 3.4	Grades of concretes	37
Table 4.1	Suitable mortar mixes for various unit strengths	43
Table 4.2	Exposed walls: minimum insulation thickness	46
Table 4.3	Mortar mixes (proportions by volume)	53
Table 4.4	Selection of mortar groups	53
Table 4.5	Materials for damp-proof courses	64
Table 6.1	Timbers in common use	103
Table 7.1	Minimum slopes for pitched roof coverings	119
Table 7.2	Calculation of drained roof area	131
Table 7.3	Gutter sizes and outlets sizes	131
Table 11.1	Characteristics of plaster finishes	174
Table 11.2	Mixes suitable for rendering	179
Table 11.3	Recommended mixes for external renderings in relation to background materials, exposure conditions and finish required	179
Table 13.1	Maximum spacing of access points to drains in metres	202
Table 13.2	Minimum internal dimensions for man-holes and inspection chambers	207
Table 14.1	Comparison of constructional methods for roads	217
Table 14.2	Comparison of constructional methods for footpaths	218
Table 15.1	Thermal capacity and insulation requirements	227
Table 15.2	Factors affecting the performance of building materials in warm climates	234

PREFACE TO THE THIRD 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 BTEC 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 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.

This third edition has been considerably extended and updated to include latest developments, including the requirements of the Building Regulations 1985 and their application. A new chapter has been added covering the principal problems encountered, and the building techniques and materials used in warm climates, which it is hoped will be of value to readers both in the United Kingdom and overseas.

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 contracting.

The Controller of Her Majesty's Stationery Office has given permission to incorporate extracts from *The Building Regulations* 1985, and supporting Approved Documents (Crown Copyright). Crown copyright material is also reproduced from BRE Digests and other publications, 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 the Building Research Establishment, Garston, Watford, Herts WD2 7JR, and Building Centres.

Extracts from British Standards and Codes of Practice are reproduced by permission of the British Standards Institution, Linford Wood, Milton Keynes, MK14 6LE. The Institution allows a discount 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 the publishers, for their continual assistance throughout the production of the book. Thanks are due to those readers who wrote to the author with helpful comments, and to Charles Hardwick of Trent Polytechnic Library for his prompt and valuable assistance.