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# EXPERIMENTAL BUILDING SCIENCE

VOLUME ONE

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BY

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## VOLUME ONE

### INTRODUCTION TO SCIENCE AS APPLIED IN BUILDING

*This volume will be found sufficient for the first two years' work in Building Science in National Certificate Courses*

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# PREFACE

BUILDING SCIENCE is a term which may be conveniently used to cover the selection, arrangement and development of scientific knowledge and experience which has, or which may have, a bearing upon the practical problems of architecture and building.

For the present, however, it is with the more limited definition of the term as applied to a subject for class instruction that we are concerned, although the purpose and necessity for such instruction is only clearly realised in the light of the full possibilities of the scientific treatment of building problems.

In the past the lack of some such instruction has not only greatly restricted the field of work possible in the Building Departments of the technical schools of this country, but has also rendered ineffectual much of the knowledge gained by building students in other and more technical subjects.

In preparing this volume the author has assumed that students will possess some knowledge of elementary science and simple calculations; but even where such is not the case no insuperable difficulties need arise for the careful and thoughtful student, particularly if he is fortunate in working under the guidance and inspiration of a skilful and enthusiastic teacher.

In approaching the subject for the first time the chief object to be aimed at is to obtain a grounding in all essential elementary science and to become familiar with the practical, experimental and mathematical methods of investigation adopted. Next the student should endeavour to obtain, by experiment and by actual handling, an intimate and reliable acquaintance with the nature and properties of the chief building materials. Finally it ought to be possible, by means of the knowledge and experience gained in working through this and the succeeding volumes, to understand, discuss and possibly investigate some of the larger problems

which arise in connection with the production and use of building materials and the design and occupation of buildings.

To gain the maximum benefit it is necessary that many, if not all, of the experiments described should be carried out, particularly in the early stages of the instruction, and the student should supplement this with close and persistent observation of building operations and the behaviour of building materials in actual use. He should be instructed at an early stage in the fact that different degrees of accuracy are possible or necessary under different circumstances, and the experimental results obtained should always be the best possible under the particular conditions of each experiment. The numerous numerical results set out in full should serve to show on what lines a laboratory notebook should be kept. Such notes should always be made up and completed at the time of the experiment. From time to time also the teacher should explain the main principles which a series of minor facts and experiments is intended to support, and he should at the same time emphasise all interesting and useful links between the work in the laboratory, in the mathematics and construction classes and in the actual processes of building.

While much of the work dealt with in this volume is necessarily common to most books on elementary science, the elimination of all work not absolutely essential to the building student, the close association from the first with building interests and the experimental treatment of many simple building problems should go far to economise time, improve the instruction and retain the student's interest throughout. The association with building terms, problems and materials must of course be obvious and truthful and in such a form as to appeal to the young student, whose acquaintance with actual building practice may be slight.

The details of construction have not been touched upon in this volume, although the importance of many of the experimental illustrations and investigations given is only fully realised when the practical aspects of the problem to be faced are fully understood. Hence it is essential that the study of construction should run concurrently with the study of building science, and a companion volume in this series, *Architectural Building Construction*, will be found to provide an excellent book for this purpose, since it has

been written with the production of such a book as this volume in view and should hence form a link between the science and the art of building of a most interesting and satisfactory nature.

In closing this preface the author would like to express his thanks to Mr F. E. Drury, F.I.S.E., M.C.I., Mr W. R. Jaggard, F.R.I.B.A., Mr J. B. Johnston, B.Sc. (Lond.), and Mr L. Rowland, B.Sc. (Lond.), A.M.I.C.E. During the strange times of the past two years, when it has been exceedingly difficult to concentrate on a task of this character and when more immediate tasks have greatly restricted the time available for its completion, the generous and informed assistance rendered by each of these gentlemen has gone far to make it possible to produce the book now with, the author hopes, a minimum of error or mis-statement. For whatever that is faulty the author must alone be held responsible, but he hopes that such blemishes will not be sufficient to defeat his endeavour to render, in as simple, interesting and instructive a form as possible, a statement of those items of elementary science which go far to make even the simplest operations of building work more interesting and more attractive. It is not unreasonable to hope that if instruction in this subject be developed systematically and intelligently it will help to improve both the standing and the powers of accomplishment of the building industry in the future.

J. LEASK MANSON.

*January*, 1917

# PREFACE TO SECOND EDITION

THE years which have elapsed since the issue of the first volume of this book have seen a great expansion of the subject of Building Science, as a subject of technical instruction, as a matter for scientific research and in its practical applications in architecture and building. Some of the items introduced in an elementary form in the first edition have been developed almost beyond recognition, and there is now a wealth of advanced technical knowledge and experimental material not previously available. The problem of selection therefore becomes increasingly difficult. In this connection attention is drawn to the "List of Experiments" given at the end of this volume. This will serve as an example of the way in which this important but difficult problem of selection can be tackled. Where the field is so wide it is inevitable that others will draw up lists which will differ from this to a considerable extent. Some methodical basis of selection should be adopted.

Experience has shown that a sound knowledge of elementary chemistry is of great value in the early stages of the subject. The opportunity has been taken therefore to add a further chapter so as to complete the treatment of elementary chemistry. A chapter has also been added giving a simple introduction to the important subject of loaded beams. This should bring the student to the interesting stage where he is able to calculate the sizes of timber and steel beams for simple cases. With these additions the volume should cover the work generally asked for in the first two years of study in National Certificate Courses in Building, and in a similar period in courses for architectural and other professional students. It should in fact provide a suitable general basis for more specialised studies in the later years of these courses.

A number of problems have been added to those given at the ends of the chapters. An up-to-date set of examination papers has also been added, including some devised for students of the separate building trades. While these latter students are not normally expected to cover the whole field of Building Science, they should find various sections of it to be of great value in relation to the work of their particular trades.

J. L. M.

*November*, 1939

# CONTENTS