THE GLASGOW TEXT BOOKS.
REINFORCED CONCRETE RAILWAY STRUCTURES

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J. D. W. BALL & C. MONCUR

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Trieste

THE GLASGOW TEXT BOOKS OF CIVIL ENGINEERING. EDITED BY G. MONCUR, B.Sc., M.I.C.E., *Professor of Civil Engineering at the Royal Technical College, Glasgow*

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BY

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1914

Transpon.

EDITOR'S PREFACE

ALTHOUGH Reinforced Concrete has been hitherto more extensively utilised for railway purposes on the Continent and in America, it has of recent years been more largely adopted in this country for certain classes of structures. It is not claimed in this book that this material is universally applicable or suitable for all kinds of construction, and in many cases the nature of the site or the conditions of erection might render it inadvisable to use it; but, on the other hand, it has many desirable features, more especially durability and economy of maintenance. These advantages and deficiencies have been clearly set forth by the Author in the opening chapter.

The formulæ given are comparatively few in number, are reduced to simple forms for facility of practical application, and by the aid of the curve diagrams calculations can be made with ease and expedition. A considerable number of worked-out examples have been included, covering the great majority of the problems which would occur in practice, and it is hoped that this will simplify the application of the formulæ. For convenience of reference the notation adopted and the formulæ have been collected together in the last chapter, and an explanation is there given of the method of using the diagrams.

G. M.

AUTHOR'S PREFACE

It has been the author's aim to describe in this book the generally accepted principles and processes upon which the design and construction of reinforced concrete structures depend, and more especially those structures which come within the practice of the railway engineer.

The use of complicated formulæ and calculations with which the literature of this subject has so frequently been associated has, as far as possible, been avoided, and attention has been concentrated upon arriving at results as simply as possible and presenting them in a convenient manner for use in the design of the various structures. The reader's attention is drawn to Figs. 10, 11, 14, 15 and 17, and the explanatory notes at the end of Chapter X., which the author has found useful and speedy for proportioning the parts of beams and other members subjected to bending. They are quite sufficiently accurate for all practical purposes, for it must not be forgotten that in applying the theory of bending to reinforced concrete beams in the generally accepted manner, very broad assumptions are made.

On the other hand, the careful determination of reactions and bending moments, in the case of many reinforced concrete structures, is rendered very necessary, and at the same time more difficult, owing to their monolithic character. In this connection, and in determining the stresses in arches, for instance some of the problems presented have necessarily required mathematical treatment, but, where possible, graphic methods of procedure have been adopted.

The method of dealing with flat arches, and the determination of the stresses in sleepers, have been previously described by the author in *The Engineer* and *The Engineering Review* and his thanks are due to the Editors of these periodicals for

permission to reproduce some of the illustrations and descriptive matter here.

Much of the matter relating to materials and labour has been given in the form of extracts from specifications of some of the works described, with a view to making this part of the book of the greatest practical utility.

For the illustrations and descriptions of some of the works described the author is indebted to the engineers or architects of the railways concerned, to the partners of the late Mr. L. G. Mouchel in the case of works carried out in Hennebique ferro concrete and to the Indented Bar and Concrete Engineering Company and the Trussed Concrete Steel Company in the case of structures reinforced with their respective specialities and carried out to their designs.

J. D. W. B.

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