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STRUCTURAL DETAILING

For Architecture, Building and Civil Engineering

Peter H. Newton

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Second Edition

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PREFACE TO THE FIRST EDITION

Structural detailing consists of transforming the work of a structural engineer into working drawings for the use of the builder. It sounds quite simple. That it is not is evidenced by the many 'bog-ups' and even failures, that are constructed. The author has spent half a lifetime working for consulting engineers, contractors and government organisations, at home and abroad, and writes from experience. He has spent the last decade instructing young people in, among other things, the art of detailing.

In the first place, not all designers have enough knowledge of how things are done, and in the second, not all contractors appreciate the reasons behind the design. It is for the detailer to bring these two together and to produce working drawings that do not frustrate the intentions of the designer and are easy for the contractor to follow, simply and economically.

The detailer should, ideally, have a good understanding of both design and construction. But the intended reader of this book is often young and inexperienced and has not yet mastered bending moments and shearing forces, principal stresses and limit states, areas of steel and equivalent lengths. For this reason the book has been written for the reader with little or no prior knowledge of structural mechanics and simple explanations are given of the behaviour of structural components in service.

Similarly it is assumed that the reader will have had little or no site experience and, in any case, will have little real understanding of the processes that are going on (don't worry, some of the older hands haven't either!). Here, again, an attempt has been made to describe the construction process, insofar as it affects the work of the detailer. At the same time, the reader should lose no opportunity to visit sites of construction, watch steelwork being erected, reinforcement fixed, concrete placed and roofs constructed — all, of course, with the permission of the agent and/or engineer.

Detailing is a game played to rules. In the first place the materials are standard — standard steel sections, standard reinforcement, standard timber sizes, standard quality. Non-standard materials can be used, but they are not readily available and usually cost a lot more.

In the second place methods are standard — standard projections, standard scales, standard symbols and notation, standard scheduling and listing. Standard methods are understood by all parties to the process, so reducing the risk of

error due to faulty communication.

Finally the techniques are standard — standard hole sizes and spacings, standard edge distances and cover, to name but a few. These have evolved from decades of practical experience to ensure adequate standards of construction and, hence, good service and safety.

It may all sound rather boring, but think how difficult God would have found it making a man from a Picasso.

The rules are contained in a number of documents. Some are British Standards, some proprietary handbooks and others are reports and recommendations of learned bodies. The practising detailer will need to be in possession of up-to-date copies of all the documents pertaining to the discipline in which he or she works. It is unlikely that it will include structural steelwork, reinforced concrete and timber simultaneously, but the cost of the documents will still be considerable.

For the student of all three, this book provides sufficient reference information (with the approval of the copyright holders) for a start to be made with detailing. Throughout the text appropriate clauses and tables are quoted and, in part III, extracts are given, which will enable the reader to practise detailing other structures in steel, concrete and timber, following the examples given in each chapter.

The assumption has been made throughout the book that the design considerations have been made — the sizes of the sections have been determined; the number and sizes of nails, bolts and welds have been calculated; the types, sizes and distribution of reinforcement are known. This is not a reference book and it is not exhaustive. It is a textbook leading the reader, with little prior knowledge, gently through the art of basic detailing, not architectural detailing, but structural detailing.

It is hoped that students following the book assiduously will acquit themselves with distinction in the B/TEC units of Structural Detailing II and III and so endear themselves to their employers.

Lastly, the author has met women engineers and technicians, both as colleagues and students, and looks forward to their numbers increasing in the future. He begs the forbearance of female readers for the occasional use of the male pronoun to cover both genders.

PETER H. NEWTON

PREFACE TO THE SECOND EDITION

Since the publication of the first edition there have been changes to some British Standards. While these do not affect the detailer greatly, it would be wrong to ignore them.

BS 449 is still valid at the time of going to press, but *BS 5950 The structural use of steelwork in building, Parts 1 and 2*, is intended to supersede BS 449 and both are currently in use. BS 449 has been retained for this edition of *Structural Detailing*, but extracts from BS 5950 are included in Part III for the student to make comparisons.

CP 110 has been replaced by BS 8110 and references to the former have been removed from the book. The basic design concept of CP 114 has however failed to die and a new 'code' has been published by the Institution of Structural Engineers. Presently known as *Recommendations for the permissible stress design of reinforced concrete for building structures*, appropriate extracts have been included in Part III.

CP 112 Part 2 has been replaced by BS 5268 Part 2, similarly with Part 3. As in the first edition, the author refers the reader to the widespread use of proprietary prefabricated timber roof trusses as making detailing unnecessary.

BS 4466 has been changed with the introduction of new shapes and the omission of others. Tailor-made steel fabric reinforcement to BS 4483 is now being made and supplied already bent.

The increasing use of computer-aided design in all the structural fields has been the main motive for changes in codes of practice. This poses a problem for the author, as most students will be studying the subject without reference to computers. This edition continues to emphasise the 'manual' ways of detailing of the kind that could be carried out in a small office. Students will find practice in the real world rather different.

PETER H. NEWTON

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Robert Watson & Company (Steelwork) Ltd, Filton, Bristol, for explaining current practice in the fabrication of welded portal frames, and for supplying examples.

Extracts from British Standards are reproduced by permission of the British Standards Institution, 2 Park Street, London, W1A 2BS, from whom complete copies of the standards can be obtained.

Details of the steel sections and dimensions included in part III have been taken from the *Structural Steelwork Handbook* and are reproduced in this publication by permission of the British Constructional Steelwork Association Ltd and Steel Construction Institute. Copies of this complete publication, which contains the Safe Load Tables, can be obtained from the BCSA Ltd, 35 Old Queen Street, London, SW1H 9HZ, or Steel Construction Institute, Silwood Park, Ascot, Berks., SL5 7PY (hereinafter referred to as the SCI). The copyright of these extracts belongs to the BCSA and the SCI, and they may not be re-copied in any form or stored in a retrieval system without their permission.

The Concrete Society for permission to use the material contained in *Technical Report No. 2 Standard method of*

detailing reinforced concrete, being a report of a joint committee of the Concrete Society and the Institution of Structural Engineers.

The British Cement Association for permission to base some of the detailing examples on *Designed and Detailed* by J.B. Higgins and M.R. Hollington.

Copies of both the last two publications can be obtained from the BCA, Wexham Springs, Slough SL3 6PL. The Concrete Society is at Devonshire House, 12/15 Dartmouth Street, London, SW1H 9BL.

Hunter Timber Engineering Ltd, The Legger, Bridgwater, Somerset, for supplying the example of a computer-designed roof truss.

Metal Sections Ltd, Oldbury, West Midlands, for permission to reproduce their tables of Metsec purlins.

Ward Brothers (Sherburn) Ltd, Sherburn, North Yorkshire, for permission to reproduce illustrations and tables of their Multibeam purlin and rail system.

The Institution of Structural Engineers for permission to reproduce parts of their *Recommendations for the permissible stress design of reinforced concrete building structures*.

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