Book reviews

DESIGN GUIDE FOR COMPOSITE HIGHWAY BRIDGES.

Design Guide for Composite Highway Bridges: Worked Examples

The Steel Construction Institute. The Steel Construction Institute, 2001. ISBN 1 85942 117 2 & 1 85942 118 0, 70 & 172 pp.

The publication of a single document for design of continuous bridges of steel/concrete composite construction is to be welcomed in view of the greater simplicity of a single reference document and the avoidance of repetition. The opportunity has also been taken to update and expand the reference list, including the latest design requirements for Highway and Railway bridges. Of particular value in this regard is a full list of SCI guidance notes covering the main aspects of design and specification for steel/concrete composite bridges (included within Appendix A). Additionally, the list of Highways Agency Departmental Standards and Advice Notes of relevance to composite construction has been complemented by the inclusion of appropriate Railtrack Standards and Codes of Practice.

In chapter three helpful guidance is given on the applications and relative merits of rolled sections and plate girders. Useful information is also provided for inexperienced designers on typical girder spacings and configurations for particular bridge types and for longer spans (>50 m). Attention is drawn to the separate guidance available for steel box girder composite bridges and critically to the importance of welding considerations at the design stage.

Revision of BS 5400: Part 3 to allow the coexistence of 'compact' and 'non-compact' sections within the same span, has enabled guidance that is more straightforward now that it is in a single document. Particularly useful additions to the available guidance are

- highlighting of the increased likelihood of skew bridges, the design problems that result and cross-reference to useful guidance
- acknowledgement of the requirements for integral bridge forms for enhanced durability and reference to appropriate guidance
- highlighting of the necessity to consider future maintenance at the design stage.

Beneficial additions within chapter five (Detailed design: main beams) include

- highlighting of the advantages of influence surfaces for highly skewed bridges
- the effect of moment gradients adjacent to intermediate supports
- load effects in integral bridge beams.

Designers usually design the bracing, stiffeners and splices separately, once the main longitudinal members have been sized. It is therefore more logical in the combined publication that guidance on these aspects has been provided as a separate chapter.

A useful addition is guidance on the issues involved in the selection, location and maintenance of bearings, the significance of which may not be well-understood by inexperienced designers. References for selection and design of bearings are given.

Deck slab design and shear connections are aspects which tend to be designed separately and guidance is included in a separate chapter. Additional useful information has been included on the analysis of slabs for local effects and on the design of the slab.

The flow diagrams have been modified to suit the changes to BS 5400: Part 3 and there are now 12 flow charts covering all the key aspects of design.

The combination of the two worked examples previously included in the separate documents, has permitted the production of a single guide that can be read in parallel with the design guidance. A very useful addition is the worked example for design of a slab for a single simply supported span composite bridge.

Overall this SCI guide is a compact reference document which will be of enormous benefit to inexperienced engineers and those practising engineers that require a ready reference source. It provides not only a summary of the key design requirements for steel/concrete composite bridges, but also cross-references other relevant guidance by SCI and others.

J. LANE

AN INTRODUCTION TO HIGHWAY LAW (SECOND EDITION).

M. Orlik. Shaw and Sons Limited, 2001. ISBN 0 7219 1331 8, £21.95, 250 pp.

This is an excellent book for lawyers and engineers alike to dip in and out of, in search of a quick answer. It does not claim to be a comprehensive treatise on all highways law but it certainly tackles most of the day-to-day issues likely to be encountered by professionals.

The second edition has updated both case and statute law and in particular has incorporated not only highways related legislation such as the Countryside and Rights of Way Act 2000, but also the Human Rights Act 1998 which cuts across all areas of the law.

One of the attractions of the book is its layout. It is well indexed and the chapters are clearly set out, with sub-headings indicating the contents of the following paragraph. This makes it particularly easy for the layman to use when looking for guidance before deciding whether to take further legal advice. I looked for a few particular favourites of client engineers and was not disappointed. There is, for example, an update of the law on winter maintenance and the liability of the Highway Authority for salting. This was fully discussed in the case of *Goodes vs East Sussex CC* (2000) where the law found in favour of the Council, causing many highway authorities to breathe a collective sigh of relief. Another favourite, trees in the highway, is discussed on page 101, incorporating the *Hurst vs Hampshire CC* case of 1997 which made it clear that authorities were responsible by tree roots to neighbouring properties regardless of when the trees were planted.

On traffic orders, the sub-heading 'Usefulness of traffic regulation orders' incorporates some of the common problems (and solutions) encountered when trying to regulate traffic. However, I was disappointed that there was no greater explanation of the implementation problems encountered with Special Parking Areas and the new Decriminalised Parking powers, but perhaps that is the topic of a chapter on its own in the future.

The author does try to give a clearer indication of the meaning of 'road' something legislation and the Courts have failed to do. He also refers to 'roadways in public car parks' and asserts that they may be 'roads' for the purposes of the 1984 and 1988 Acts, but not the car parking spaces. The author may care to look at the car park documentation for Central Milton Keynes where *all* of the car parks are dedicated pursuant to a Section 38 Agreement and which led to some interesting rating arguments.

The other attraction of the book is that it is not all dry law. The author has a long interest in the history of the highway and the book has many historical references such as the interesting stories of Julius Caesar and Charles I which serve as a 'grim warning' to future traffic engineers! He also incorporates one of my favourite, but still active, legal provisions, namely Section 28 of the Town Police Clauses Act 1847 which sets out many prohibitions when in the street—for example, the

provision of flower pots or heavy articles falling from an upper window still have relevance today in the age of tall buildings.

Finally he has also provided a short explanatory note on the history of the highway authority and relevant courts, all of which have changed names and responsibilities over the years. However, he makes no reference to the Local Government Act 2000 which introduced the new style of 'cabinet' government and for the first time allowed the exercise of functions to be conferred directly on a single Member.

Overall this book remains an invaluable aid to lawyers and non-lawyers alike, and should find a place in every civil engineer's library.

J. RELFE

MONITORING AND EVALUATION OF A TELEWORKING TRIAL IN HAMPSHIRE.

TRL REPORT 414. The Transport Research Laboratory. TRL Limited, 1999. ISSN 0968 4107, 101 pp.

Opinions are mixed about the potential impact of teleworking. On the one hand it is apparent that working at home and using electronic mail, internet, fax and telephone to keep in touch with the office can save precious time by avoiding the need to commute on congested roads for the journey to work, and may increase an individual's productivity. On the other hand, there is a continuing need for face-to-face meetings with colleagues, so the actual number of journeys saved in a typical week might be fewer than first imagined. Moreover, working from home means allocating space for an office, and that involves extra energy costs for heating and lighting. In addition, there is always the temptation to fit in other local car journeys during the day that would otherwise not be attempted. So the impact in fewer journeys made and energy saved is far from obvious.

This report attempts to throw light on some of these issues. It gives results from a trial which began in 1994 as part of the ENTRANCE project, involving nine cities in eight EU member states, partly financed by the European Commission's Energy Directorate. Hampshire is one of the sites, and a number of employees in four companies (the AA; BBC; Gifford & Partners, consulting engineers; and Hampshire County Council) were recruited to take part.

The main fieldwork was carried out in the spring, summer and autumn of 1996. Sample sizes were small, in that only 24 new and 19 established teleworkers were monitored in all. The study is therefore of interest in a qualitative sense, in terms of the insights gained into how people adapt, rather than a reliable quantification of the impact of teleworking if it became a much wider phenomenon.

The very detailed analysis rests on a comparison of responses gathered in the month immediately before and during a six-month period of teleworking. The study made use of self-completion questionnaires, face-to-face interviews and self-completion travel diaries. Sixteen of the teleworkers' colleagues also completed questionnaires, supplying opinions on the effect of the teleworking on team productivity and colleagues' work. Improvements in productivity claimed by the teleworkers

themselves did not appear to be at the expense of the collective productivity of the team.

The evaluation was concerned with three major topics: impacts on energy and emissions; an economic evaluation taking into account changes in time, fuel and vehicle operating costs; and a behavioural evaluation. Results support the findings from other surveys that part-time home working is set to be the main form of teleworking, with individuals typically spending one or two days per week working at home. Teleworking resulted in a substantial reduction in weekly mileage among those taking part and in the number of journeys. However, above-average commuting distances and relatively high levels of car ownership contributed to this good result.

The study concludes that teleworking will not be a stand-alone panacea for problems of energy consumption, congestion and pollution. However, it also suggests there may be considerable scope for take-up of teleworking, especially for those in senior and middle management.

For anyone contemplating repeating this kind of research there is a useful discussion of methodological issues. It is perhaps reassuring to know that studies of teleworking, carried out elsewhere, mainly in the USA, also rest on small samples—as low as 15 in one case!

J. C. MILES

UNDERSTANDING TRAFFIC SYSTEMS: DATA ANALYSIS AND PRESENTATION (SECOND EDITION).

M. A. P. Taylor, P. W. Bonsall and W. Young

The continued growth in car use around the world has placed significant pressure on urban and inter-urban road networks. In many areas, new road building is no longer a feasible option and investment to cater for and manage this growth in travel demand is focusing on increased provision of multimodal facilities and on deployment of intelligent transport systems. Travel patterns are complex and highly variable and monitoring changes brought about by new systems is a difficult task. *Understanding Transport Systems* provides a well set out, easy to read approach to the planning, design, experimentation and assessment of a wide variety of transport and environment related systems.

The book is organised in five parts, each of which can be read independently of the other sections although there is considerable forward and backward cross-referencing for the interested reader. Part A provides an introduction to the book which sets out the different levels of transport system analysis that can be considered and a generalised approach to the traffic planning and decision-making process.

Part B reviews the key elements of basic traffic theory. Unlike some older texts, the theories are very accessible to the reader and enhanced by real-world examples where appropriate, but the authors still retain all of the necessary equations and understanding and the key references for further exploration in each area. Part B concludes with a look at theories of area-wide traffic flow, origin-destination matrices and network flow

modelling. This section sets the context for the experimental design and analysis found in parts C to E.

A practical guide to the design and implementation of experiments is contained in Part C—Data Capture. This chapter reflects the considerable practical experience of the authors in the administration of complex surveys. The importance of a systematic approach to the design of experiments, including an understanding of the statistical considerations for analysis of the results is set out. The correct matching of measurement tools to tasks is a key feature of this section.

Part D presents some practical examples and methodological concerns in more detail for four main survey types: intersections, origin-destination and route choice, traffic generation and parking and safety. The authors describe the pitfalls and advantages of a variety of approaches, clearly acknowledging that the solution chosen will be a compromise of a number of factors, not least cost.

The final part of the book presents the key tools for analysing, modelling and presenting the results of surveys. This section was particularly well laid out and easy to understand with practical examples used to guide the reader through the application of statistical theory. This is a good port of call to understand the appropriate statistical tests to apply and is again supported by references to further work for more complex data set analysis.

The second edition has updated the 1996 work to reflect the new data collection and presentation tools that are available to the traffic analyst and the increased emphasis on the environmental impacts of traffic. The book is an ideal reference tool for practitioners, undergraduate and masters students alike.

G. MARSDEN

THE TECHNICAL DEVELOPMENT OF ROADS IN BRITAIN.

Graham West. Ashgate, Aldershot, 2000. ISBN 0 7546 1406 9, 161 pp.

The author takes us on a lightning journey from prehistoric trackways to present day motorways. Despite a declared intent to restrict his text to the road pavement, the author casts his net wider where necessary, for example to include some consideration of earthworks and other technical matters important to his subject. He also gives due consideration to the forces that have driven the development of road construction, such as trade and economic factors, military requirements, and social and environmental demands.

The author tells us how the Romans created a network of roads to underpin the colonisation of Britain and associated military operations. In the eighteenth century General Wade was to create a similar network of roads in Scotland for much the same purpose. In both cases the author reminds us that the methods of construction depended on the resources available, the skills of the military personnel and the availability of local materials for construction.

The growth of trade and social activity in the seventeenth century increased the latent demand for good roads. However, responsibility for their maintenance was devolved to the communities through which they passed and depended on local commitment and local skills, neither of which was necessarily present in great measure. Thence the road network would continue for some time to be used primarily by pack horses or people on foot or horseback. A critical development was the emergence of the horse drawn coach, which offered the prospect of long distance travel provided the roads existed to permit the coaches to travel reliably and at speed. Another enabling development was the creation of turnpike trusts, whereby trustees could gain an income from maintaining the roads under their stewardship to a good standard. The final piece in the jigsaw was provided by the emerging giants of road construction such as Macadam and Telford, who began to devise and disseminate a better informed and more technical approach to road construction.

The next major event was the higher speeds made possible by the coming of the motor car, which required roads capable of providing a safe and not uncomfortable journey. The author takes us quickly through the emergence of the steam roller, which allowed roads to be compacted before opening to traffic rather than by the traffic they carried, the use of bitumen and cement to bind the roadstone and create a dust free surface, and other developments in materials production and construction technology. It is at this point more than any other that the author seems unduly constrained by the limited number of pages in the book. For example, there is scant time to deal with mechanisation of the laying process, save the briefest of mentions for the ubiquitous Barber-Greene paver, or with the many items of earthmoving plant that so facilitated operations on the construction site.

Inevitably in a book restricted to 125 pages plus appendices, the scope is restricted and the topics included are generally not treated in any great depth. The book is likely to appeal most to students who wish to acquire a quick overview of the history of roads and road construction; they will be assisted by a useful bibliography identifying further, more detailed sources.

J. PORTER

HIGHWAYS.

C. A. O'Flaherty *et al.* Butterworth Heinemann, 2002. ISBN 0 7506 5090 7, £24.99, 553 pp.

This book comprises over 500 pages of up to date information on the design, construction and maintenance of highway pavements. Its value lies in the way in which it brings together material which is usually found in several publications. For example, there is sufficient geotechnical information for any road project, there is good coverage of rigid and flexible pavements, and maintenance, including surface dressing, is covered fully. A brief historical overview and an initial chapter on road location may prove less relevant than the remaining material but could be valuable for students. A chapter on road pavement materials is an excellent reference text and the soil stabilisation chapter will prove particularly relevant to UK highway engineers. Unbound materials are dealt with in greater depth than is often the case—too often, unbound materials are

given scant attention by authors who prefer to focus upon the esoteric aspects of concrete and bituminous materials. Surface drainage is dealt with in a usefully pragmatic way, introducing catchment analysis at one extreme and drainage details at the other.

Unlike many texts, this is in fact more than just another treatise on the rheological properties of bituminous materials. There is a useful chapter on current British practice on flexible and rigid pavement design. Many designers are still using the 1970 edition of Road Note 29 for pavement design (not such a bad thing) and this could be their opportunity to update themselves in a painless manner.

Of course, the details of bituminous and concrete materials are dealt with at length, but the presentation should allow even the novice reader to quickly gain an in-depth appreciation of the complexities of these materials. There is an excellent account of skid resistance in which traditional and innovative measurement systems are described.

The references at the end of each chapter constitute a valuable resource and the 12 contributing authors (12 of the 20 chapters are O'Flaherty's work so this is not just a compilation of independent papers) are all well respected in their field. The book is well laid out, well indexed and well illustrated, making it easy to use as a reference work and as an educational text.

The book will be of value to practising engineers (especially those who need a quick reference to data, testing methods, design and material properties), undergraduate and postgraduate students and those involved in highway construction and highway materials. All of the contributors (including O'Flaherty) originate from the British Isles and this influences the flavour of the book. It should become the definitive text for university courses on pavement design and should have a prolonged shelf life.

J. KNAPTON

CHARACTERIZATION OF MODIFIED ASPHALT BINDERS IN SUPERPAVE MIX DESIGN. NCHRP Report 459.

H. U. Bahia *et al.* Transportation Research Board and National Research Council. National Academy Press, 2001. ISBN 0309 06707 3, 95 pp.

The modification of asphalt binders is used to enhance the performance of asphalt surfacings but the prediction of the degree of enhancement obtained has yet to be developed. This research report records an investigation into the applicability of the standard specification for performance-graded asphalt binder currently used in the US resulting from the Strategic Highway Research Program (SHRP) 'Superpave' design method of the 1990s. This latest research was carried out because, although modified binders complying with the specification do show marked improvements in some aspects of performance, users and producers are concerned that the current methods of assessing the enhancements are not sufficiently reliable. The research was also timely because it is expected that the market for modified binders, currently about 15% of binder

production, is expected to increase in the next decade, so it is important to quantify the enhancement to ensure value for money.

Nine modified binders and 36 mixtures were selected for rheological and performance characterisation using revised procedures with the equipment developed in SHRP. The results indicated that the present specification parameters did not rank the modified binders in accordance with the performance characterisation. In order to derive binder parameters that relate more closely to the behaviour of mixtures, the concepts of non-linear viscoelasticity and energy dissipation were investigated. It was found that the damage behaviour of binders can be characterised using the test equipment associated with the current specification but with revised procedures. As a result, the investigators have proposed new test procedures and parameters for consideration in a revision of the specification.

In addition, revisions to the binder grading system have been suggested. This three-level system includes various factors: for level 1, climate is considered; for level 2, traffic conditions are added; and for level 3, climate, traffic and pavement structure are all considered. Also, a storage stability test and a particulate additive test were developed as well as advice on the conditions under which modified binders should be incorporated into asphalt mixtures.

The authors have produced a well-organised report and the detailed information will be of interest to those involved in the development of modified binders and of improved bituminous materials. However, it is noteworthy that the authors have recommended that their findings should be validated in field trials so that robust criteria can be established for inclusion in future specifications.

Therefore, this is unlikely to be the last word on this subject and those of us interested in this topic can expect many more reports like this before the contribution made by binder modifiers is quantified precisely.

D. M. COLWILL

MANAGEMENT OF HIGHWAY STRUCTURES.

Parag C. Das (ed.). London: Thomas Telford Publishing
ISBN 0 7277 2775 3.

This book is a collection of papers based on presentations made at the international symposium, *The Management of Highway Structures*, held in London in June 1998, although these have been enhanced and some additional material added. The first section of the book gives an overview of the subject and makes a clear statement of the importance of good bridge management systems and practice. The size of the problem is enormous, both considering the numbers of bridges and the economics of bridge management. The consequences of bridge failure/closure are significant and responsibilities of bridge operators great. Furthermore, bridge managers have had to cope with changing legislation, tightening purse strings, increasing traffic levels and the 'demographic' effect of ageing bridge stock resulting from the postwar upsurge in road building. Although the book focuses, understandably, on the

remit of the Highways Agency, there are papers to give an international perspective and also the local authority view. These show that the issues are truly international.

Having identified the issues, the second section outlines management methodologies that have recently been developed or are currently being developed in the UK and overseas. The UK perspective is given by a statement of the Highways Agency strategy, which describes the rationale, components and time-table for implementation of a UK bridge management system. This is balanced by a case study of the risk-based maintenance strategy that has been used on Midland Links Motorway since 1990. This section is again given an international flavour with papers describing the Danish and Finnish bridge management systems. The final paper in this section was not presented at the symposium but is a commentary that summarises the main discussions at the event. As such it is one of the more important contributions, especially as it highlights certain difficulties that still need to be overcome in implementing bridge management systems.

It is clear from the book that this field is new, is growing quickly and is taking on board new ideas at the cutting edge of computer technology and systems thinking. The later sections, given an overview of recent developments and current research, are therefore essential reading, though may date quickly. Sections 3, 4 and 5 describe the work that has been done to implement the Highways Agency's bridge management system and includes procedural guides. The final section is a brief summary of some of the current research in this area, although it is beyond the scope of this book to explore these fields in greater detail.

This book has a somewhat polemical air, championing the cause of bridge management systems in general and the Highways Agency's own system in particular. It is persuasive in establishing the need for better, more informed management of bridges. In presenting the Highways Agency's own bridge management system it is certainly informative and should be a useful primer for those responsible for implementing it. However, the counter arguments are not presented and, but for the additional paper summarising the symposium discussions, the book would have been too unbalanced. On a presentation note, the headings for sections and papers are a little inadequate, making navigation through the book a little less easy than it could have been.

J. S. OWEN

HIGHWAY WINTER MAINTENANCE: A PRACTICAL GUIDE.

ICE. Thomas Telford Ltd., London, 2000. ISBN 0 7277 2957 8,
104 pp.

The ICE Design and Practice Guide Highway Winter Maintenance is intended for use by a wide range of people including senior experienced practitioners, younger staff without previous experience and politicians wishing to broaden their knowledge.

The guide contains a comprehensive overview of current

highway winter maintenance practice throughout the United Kingdom.

The operational requirements section includes extensive information and practical advice on how to set up, operate and record the highway winter maintenance operation.

In a well run authority the majority of this information will have been incorporated in its winter maintenance plan and contract documents. Highway winter maintenance incorporates a wide diversity of activities due to the variability of the conditions to be treated. This section will be of particular use to inexperienced staff wishing to expand their understanding of the process. However, even the most experienced engineers will be able to enrich their knowledge and working practices by incorporating ideas which may have been overlooked. The recent cold spell, between Christmas 2000 and New Year 2001 brought the first major snowfall in ten years for several regions of England. For many staff involved in winter maintenance operations it would be their first experience of such conditions. In giving advice on how to respond, the guide draws on experience gained in the north of Scotland where such conditions are a regular feature.

The weather forecast is one of the most important elements in the highway winter maintenance decision-making process. The guide incorporates in depth technical details of the services available to authorities. This provides essential background information to anyone involved in the operation of winter maintenance.

The support technology, and research and development sections contain detailed practical advice on topics including thermal mapping, ice prediction and roadside weather stations. This would be particularly useful to authorities that are evaluating the benefits of implementing or expanding their system. It will increase their staff's awareness of the potential benefits of using modern technology. The appendices include further information on possible future research by the Transport Research Laboratory and a section on a prediction of future weather patterns resulting from urbanisation and global warming.

A significant proportion of Highways Agency and local authority winter maintenance has now been transferred to the private sector. Details of how this has been achieved have been included together with suggested performance indicators, which may be used to demonstrate best value.

The guide brings together a great deal of useful information, which will prove to be invaluable for use by professionals and politicians who have an interest in operation of highway winter maintenance.

I. GRIERSON

BRIDGE MANAGEMENT.

M. J. Ryall. Butterworth Heinemann, 2001. ISBN 0 7506 5077 X, £60.00, 439 pp.

The author has set out to 'write a comprehensive reference book bringing together all of the tasks required for bridge

management, a guide book that will be of use to both beginners and seasoned professionals alike'. To this end there are 12 chapters commencing with bridge management systems and running through to risk and reliability.

There is a useful chapter on load testing which is accompanied by a comprehensive table listing objectives and guidance of the different types of load test. In the concluding section it is suggested that a cost benefit analysis should be carried out before load testing as the costs may not be justified. This is an important point that is sometimes overlooked by engineers enthusiastic to do the tests. The chapter could, however, have benefited from more detailed reference to the publication *Supplementary Load Testing of Bridges* by the Institution of Civil Engineers.

The chapter on repair and strengthening is heavily laced with the new techniques involving use of epoxy resins, glass fibre reinforced plastic and carbon fibre reinforced plastic. These materials have attractive properties but it should be added that their long-term durability in the field remains to be proven.

Some of the examples are of schemes that are still at the development stage and not yet proven in the field, albeit they are clearly defined as such and should not cause any misunderstandings. It would have been beneficial to have included more examples of schemes that have been put into practice.

Despite the best efforts of the author there are inevitably errors that have escaped the checking processes. Amusingly, chapter 11 is listed as 'Stress management and monitoring'. This raises interesting possibilities but it turns out to be stress measurement! Of more importance is the apparent mismatch between values of the structural performance of carbon fibre reinforced plastic materials given in Table 7.1 and Fig. 7.8. In other places the author has been led into errors by being a little too trusting and uncritical of some of his source material.

The cover of the book features the ubiquitous Forth Railway Bridge. This is confusing as proceedings of the conferences on Bridge Management held at the University of Surrey, also edited by the author, have a similar cover and format. Although the present book has different contents, it could easily be mistaken for one of the series of conference proceedings, in fact I did so at first sight. Moreover, there are only two fleeting references to the Forth Railway Bridge in the text!

These are minor shortfalls and do not detract from the immense volume of useful material contained in the book. It is also to the author's credit that the text is so well illustrated with excellent diagrams and photographs, many showing ongoing work. There is an excellent index and a large number of references to enable readers to pursue topics in more detail.

Overall the book succeeds in meeting the author's targets and is an exceedingly useful addition to the literature on the subject. It is recommended reading.

G. P. TILLY