



Book reviews

PROCEEDINGS OF THE 3rd INTERNATIONAL MEETING ON COMPOSITE BRIDGES

Julio Martinez Calzon. A. G. Luiz Perez, 2002, ISBN 84-380-0221-8, 942 pp.

This 942-page volume gives the proceedings and discussions that took place at this conference in Madrid on 22–26 January 2001. The meeting was hosted by the Colegio de Ingerieros de Caminos, Canales Y Puertos (a Spanish Society of Civil Engineers).

There were 51 papers in total, with, nearly one half from Spain and the remainder from other European countries and North and South America. One paper discusses the CEN Eurocode for composite bridges and its relationship to the British Bridge Code and to design practice. This paper also includes brief accounts of relevant research in the UK on this topic. Another paper from France deals specifically with research programmes related to these bridge types.

There are review papers from Austria, France and Germany, and another from Germany that concentrates on the renovation or replacement of these bridge types, mainly because of increased traffic loading rather than ageing effects. A Spanish paper reviews the design of five arch bridges. Structural analysis is covered in many of the papers and there are individual papers dealing with wind problems, the use of lightweight concrete and aesthetics. Several papers concentrate on recent experience with high speed rail bridges and there are many references to use of trusses with double concrete slabs and external prestressing. Finally the Øresund bridge is described in two papers from Denmark.

The volume represents a useful review of the technology and analysis of composite bridges and both English and Spanish versions of the proceedings are available in CD format.

DAVID POWELL

MANUAL ON SCOUR AT BRIDGES AND OTHER HYDRAULIC STRUCTURES

R. W. P. May, J. C. Ackers and A. M. Kirby. CIRIA C551, 2002, ISBN 0-86017-551-0.

This manual was produced as a result of CIRIA's Research Project 661, which forms part of CIRIA's water engineering

programme. The principal objective of the project was to produce a guidance document for engineers engaged in the design, construction, operation and maintenance of structures in the water environment that may be subject to scour of erodible beds or banks. There is an impressive list of contributors and a very experienced steering group that ensured a useful document was produced.

After a useful glossary and introduction which defines scour and outlines the objectives and scope of the manual, scour processes are presented and discussed. This is followed by a chapter dealing with the several parameters that input to the design process. Methods of estimating the extent of scour are then presented with consideration of natural, contraction and local scour in turn, taking into account the several factors which influence their extent.

An overview of the assessment of the risk of scour at existing structures is presented and a number of very useful checklists guide the engineer through the possibilities. The following section deals with prevention by providing scour protection in the form of scour reduction measures, structural measures, and finally, scour reduction measures culminating in a scour protection design considerations checklist that poses an impressive list of open-ended questions which should create a mind-set that seriously challenges the design/maintenance team to check the risk of scour.

A list of all the major references is given, together with an overview of the current monitoring equipment. The manual is rounded off with 13 case studies which press home the importance of considering and designing for the effects of scour and the consequences of not or getting it wrong.

We are constantly being reminded that global warming is changing our climate, with a greater chance of cloud-bursts and flooding (aggravated by depleted flood-plains) all of which will exacerbate the effects of scour. We must be on our guard—This manual is essential reading for all civil and structural engineers. It is written in a style which is accessible to the general engineer and useful to the specialist.

CLIVE MELBOURNE

THE DESIGN OF MODERN STEEL BRIDGES

S. Chatterjee. Blackwell Science, 2nd edn, 2003, ISBN 0 632 05511 1, £69.50, 224 pp.

The Design of Modern Steel Bridges by Chatterjee is primarily aimed at readers such as final-year students studying bridges, or those qualified engineers entering into the field of designing and building steel bridges. That said, it may also be of interest to more experienced practitioners seeking both an overview of the history of bridges built in steel as the basic material and an exploration of the theoretical basis of their design.

The book starts out with a good technological history of the gradual development of different types of iron and steel bridge, drawing upon examples from across the globe, many of which are illustrated. The basic properties of steel as a building material are then described, as are the loadings that bridge structures are subjected to. Although the latter may be of only limited interest to the practitioner, other than the comparison between the requirements of different countries, it may provide a useful fairly concise summary for the novice.

An explanation of the philosophy behind the process of the structural design of bridges follows, treated in the context of limit state and statistical probability concepts. Included is detailed guidance on the design of plate and box girders (the most common form of construction presently adopted), the text undoubtedly drawing upon Chatterjee's experience as Head of Bridge Engineering at the Department of Transport, where he was responsible for all standards of design, construction and assessment of highway structures. The buckling behaviour of various components, the effects of geometrical imperfections and large deflection behaviour, and the phenomenon of post-buckling reserves are also described in great detail, with helpful design examples provided to illustrate the process.

This second edition of *The Design of Modern Steel Bridges* draws heavily on the content of the first edition, updated primarily with references to BS 5400: Part 3 2000 and relevant Euronorms, and with a new, fairly brief, chapter on cable-stayed bridges added to it.

The book offers a curious mix of generality coupled with sections, such as that on the stiffened compression flanges of box girders, that delve into fine detail. Overall it offers a reasonable overview of various issues met by those involved in the design of steel bridges, and as a result is worth looking at.

P. N. CURRAN

INTRODUCTION TO STRUCTURAL DYNAMICS AND AEROELASTICITY

D. H. Hodges and G. A. Pierce. Cambridge University Press, 2002, ISBN 0 521 80698 4, £40, 182 pp.

Y. C. Fung's *An Introduction to the Theory of Aeroelasticity* (first published by John Wiley & Sons in 1955) has served as the reviewer's prime point of reference for problems of aeroelasticity as manifested in bridges for some 40 years. This new work will not displace Fung, although it can be warmly recommended as an introduction. It is number 15 in the Cambridge Aerospace Series, and is firmly rooted as a

university textbook straddling the first degree–postgraduate threshold. It is a slim volume, 160-odd pages of text, more than half of which are devoted to basic dynamics.

The treatment of dynamics is interesting in its own right, despite the profusion of texts in this field. The authors are firmly committed to 'continuous variable' rather than 'lumped parameter' representations and solutions. Basic principles are explored through the behaviour of a stretched string (tensioned cable), giving the advantage of clarity of relationship between propagating-wave and modal solutions. The illustration of wave reflection is notable. The beam equation only appears at page 41, and although both Ritz and Galerkin approaches to approximate solution are considered at length, there is no mention of the lumped-parameter approximations familiar to civil engineers. Finite elements are restricted to one paragraph!

Before this, however, there is a very balanced and readable introduction to flutter and related aeroelastic instabilities, and on returning to aeroelasticity the development is equally clear and progressive, with 30 pages devoted to static divergence. To the civil engineer who concentrates on slender structures that are symmetric with respect to the spanwise axis, this may be a surprising length (such civil complications as lateral torsional buckling are not addressed), but this is where the additional features of the aircraft model start to dominate. Sweepback, Mach number and eccentricities between mid-chord point and both the elastic axis and the mass centroid add so much to the complexity that the civil engineer reviewer is dismayed at the recent appearance of asymmetric bridges, cable-supported on one side, or curved in plan.

The rate of progression in the text of both ideas and mathematical manipulation increases progressively through the work, and the chapter on flutter places considerable demands on the reader. Classical flutter based on presumption of a harmonic solution, taking effectively a frequency-domain representation of the aerodynamic forces, is covered in some 25 pages. A compact presentation follows of Peters' methodology (1995), which is closer to time-domain solution: this is put forward as a better tool for the study of control of flutter. Finally, the 'epilogue' is a balanced summing up, which is a worthy counterpart to the introduction. In short, an admirable text, but once beyond the basic concepts, largely directed away from civil engineers.

T. A. WYATT

BRIDGES

Martha Torres Arcila. Atrium, 2003, ISBN 84-95692-61-9, £12.94.

Bridges is an interesting A5 sized compendium of both large and small bridges from around the world. Its commentary is presented in English, French and German, with another edition available in Italian, Portuguese and Spanish.

The book presents a general view of bridges through actual examples, both realised and conceptual. It includes not only the great bridges around the world (as one might expect in a book of this nature), but also many less well-known pedestrian bridges. It therefore provides a broad spectrum of projects including not only those offering innovative construction

systems, but also those in which more traditional considerations have been carefully contemplated in order to create bridges of fine engineering and aesthetic quality.

The book arranges the projects chronologically, providing the reader with an overview of technological and aesthetic progress within the fifty-year timescale targeted. Within that time frame there are some bridges that the individual reader will undoubtedly feel should be included, and this in some way adds interest in going through the book.

Each structure is presented in a separate section, including a mix of photographs, drawings and short descriptions, intended to communicate the essential facts about each bridge as well as its most significant features, albeit briefly. Each and every structure is illustrated and presented to a very high standard, making the publication a reasonably priced quality compendium and a useful reference book for both students and practising engineers.

PETER CURRAN