

## THE HYDRAULICS OF OPEN CHANNEL FLOW: AN INTRODUCTION

By Hubert Chanson

Butterworth-Heinemann, Oxford, U.K.; 512 pages; \$90.

Since publication of the classic books by Henderson and Chow, very few books on open-channel flow have updated the subject with the appropriate depth and breadth of information needed for classroom use. The new book *The Hydraulics of Open Channel Flow: An Introduction* attempts to address this void. The author's stated audience is undergraduate students in civil, environmental, and hydraulic engineering.

The book is approximately 500 pages in length, and contains nineteen chapters grouped into four parts. The parts are Basic Principles of Open Channel Flow; Introduction to Sediment Transport in Open Channels; Hydraulic Modeling; and Design of Hydraulic Structures. The book's main text contains applications to illustrate the basic material. It also provides student exercises for each chapter, and gives revision exercises to apply comprehensive knowledge from each of the four parts. Major assignments, requiring expertise from the book's multiple parts, round out the text. Additionally, the author states that supplemental material for the text is available on the Internet (from the publisher at <http://www.bh.com/companions/0340740671/> and from the author's site at <http://www.uq.edu.au/~e2hchans/>). Unfortunately, the publisher's site primarily contains marketing information and duplication of some of the exercises already presented in the text. The author's site does contain additional resources. However, the web material is not linked directly to sections in the text.

The clearest strength of the book is its breadth of coverage. Containing a wealth of information, as well as being appropriate for an advanced undergraduate course on open-channel hydraulics, the book delivers a very good cross section of topics. Also, the number of exercises is very impressive and worth the book's cost. The historical perspectives and author's bias offered throughout the book are quite interesting and entertaining.

The overall organization of the book, however, is somewhat disappointing. The volume begins with the usual table of contents, preface, information about the author, and acknowledgments. But it then continues on to a rather lengthy glossary and list of symbols, including a collection of color plates and dimensionless numbers; it may have been more appropriate to place these latter 35 pages near the end of the text. Throughout the text, each chapter is organized by topics differentiated by section number. Within each section, numerous "Notes" are located within boxed areas. Most often while reading the text, the notes seem to disrupt the continuity of the reading. Additionally, the use of the term Applications for presenting examples is somewhat confusing as the author quite often also uses the same term for a subsection heading. Likewise, the word Discussion is used frequently both within a boxed area and as a subsection heading. Lastly, exercises given at the end of each chapter are not numbered, thereby possibly leading to confusion when assigning homework to students. These organizational matters somewhat diminish the book's overall quality.

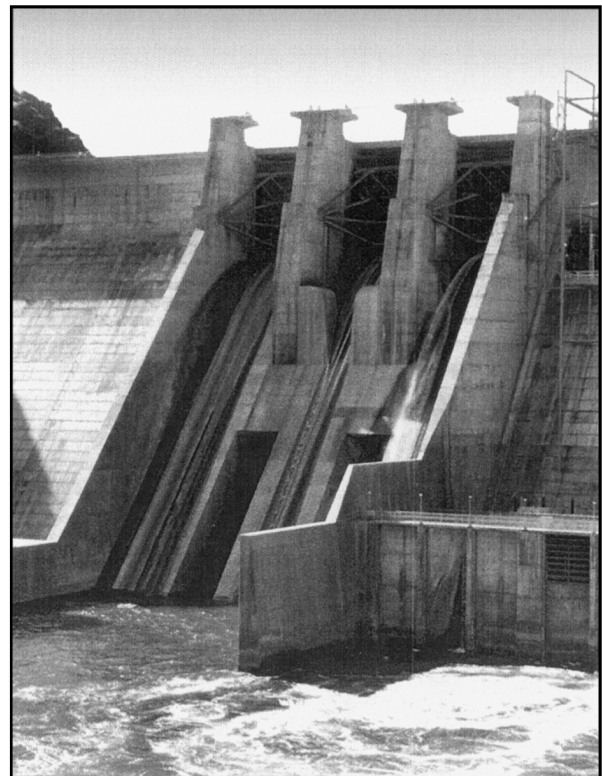
Part 1 of the book describes the Basic Principles of Open Channel Flow by introducing the fundamental equations together with the concepts of specific energy, momentum principles, flow resistance, and gradually varied flow. The development of the fundamental equations is quite simplified, being

presented at an appropriate level for undergraduate students but lacking in the rigor and depth necessary for a graduate course on the topic. The remainder of this part is presented in a reasonable manner, though the omission of a figure showing the standard profiles of gradually varied flow is a shortcoming. Additionally, the discussion relating flow controls and calculation of water-surface profiles is not entirely adequate.

Part 2 provides an introduction to Sediment Transport. It begins with a brief preamble that includes many useful examples of transport rates in major rivers. This part is reasonably well formulated. However, two very short chapters on the inception of bed-load and on suspended-load transport would have been better combined with later chapters on bed- and suspended-load transport. Additionally, this part would benefit from a stronger presentation of the merits and limitations of the various empirical formulations for sediment transport.

Part 3 presents Hydraulic Modeling. It begins with an unnecessary and short chapter restating the basic continuity, Bernoulli, and flow-resistance equations presented earlier in the book. The following two chapters discuss physical and numerical modeling. The physical modeling chapter is a concise description of modeling approaches, and is well presented. The chapter on numerical modeling is a short presentation of the one-dimensional backwater calculation. The presentation appears a bit dated, notably in its referencing of HEC 1 and 2 as well as other simplified models.

Part 4 introduces the design of hydraulic structures. Similar to earlier portions of the book, this part is not an in-depth



**FIG. 1. Unique Spillway Design of Hells Canyon Dam, Idaho, Includes Upper-Level Spillway Gates as Well as Lower-Level Sluiceways for Increased Flow Capacity (Such Designs Provide for Interesting Combinations of Open-Channel Flow)**

treatment of the topic; but it does provide valuable information related to the hydraulics of spillways, drop structures, and culverts. This part, and the book, closes by considering several broader-scale hydraulics problems similar to those faced, say, at Hells Canyon Dam (Fig. 1). In doing, the book makes a valuable contribution not found in most other books on open-channel flow.

In summary, *Hydraulics of Open Channel Flow: An Introduction* contains useful hydraulic design examples and a

wealth of exercises and problems. The book's organization, however, rather diminishes its functional use as a classroom textbook. And the book's breadth, albeit impressive, arguably detracts from its depth of topical coverage.

Larry J. Weber  
*Iowa Institute of Hydraulic Research*  
*The University of Iowa, USA*  
*E-mail: larry-weber@uiowa.edu*