

Book review

The hydraulics of open channel flow

by HUBERT CHANSON, publisher: Arnold, London, 1999, PP 495, ISBN 0 340 74067 1

This book forms an introduction to open channel hydraulics (basic principles, sediment motion, hydraulic modeling, design of hydraulic structures) and is designed for undergraduate students in Civil, Environmental and Hydraulic Engineering. It is assumed that the reader has already had an introductory course in fluid mechanics and thus, will be familiar with basic fluid mechanics (see the recently published book Fluid Mechanics by Nakayama and Boucher, Arnold).

The fluid mechanics of open channels is more complicated than that of closed conduit flow, since the location of the free surface is often unknown and boundary conditions may vary downstream. In later chapters the concepts of sediment transport and hydraulic modeling are introduced (using both physical and numerical models). Towards the end of the book the hydraulic design of structures is covered. In all sections the coverage includes rivers, canals and other waterways.

The contents are divided into four parts, as follows:

1. Basic principles of open channel flow, and their applications
2. Sediment transport in open channels and transport rate calculation
3. Physical and numerical modeling of open channel flow
4. The design of hydraulic structures in open channels (dams, weirs, spillways, drops, cascades, culverts etc.).

Besides the basic text additional material is provided which can be classified in four categories:

- (1). Applications included within the main text to illustrate the use of the basic material.
- (2). Exercises at the end of each chapter, as well as grouped "revision" exercises to demonstrate knowledge acquired over several chapters.
- (3). Major design assignments again involving a broad knowledge of the material.
- (4). Fully worked examples of selected topics are also provided. As an additional teaching resource numerical solutions, revision exercises and problems are available on the Internet.

A 19 page glossary is also included, together with 9 pages list of symbols. At the end of the book there is a 10 page list of references. The usual author and subject indexes are included. Appendices provided include tables of commonly required physical and hydraulic constants.

The author encourages the reader to make constructive criticism and suggest corrections to improve the quality of future editions. In this vein allow me to suggest the following for consideration in the next edition.

In part 1, the subchapter 1.3 *statics of fluids* is extremely short and do not cover the topic of static water pressures adequately. Further material on this topic would be appreciated.

In addition, two- and three-dimensional flow is seriously neglected. It may be mentioned here that the names of the curves described in chapter 3.2 are Braun-curve and Koch-curve after two German professors. Additional information on two- and three-dimensional flow, and some guidance on the consequences of adopting the simplified conditions proposed would be helpful.

The backwater computation, particularly for natural channels needs more emphasis. The description in 5.2.4 subchapter is too short.

In part 2, basic theories and their applications are formulated. The basic transport equations, including two- and three-dimensional transport, could be highlighted with advantage, particularly for suspended sediment and pollution in natural rivers.

In part 3, numerical modeling is restricted to two-dimensional flow, while the problems of meandering rivers are almost totally neglected (Chapter 15). However fluvial hydraulics covers natural channels as well as artificial ones so some additions here would be appropriate.

In part 4, the discharge capacity of structures is not considered for cases of submerged flow, the existing material being mainly concerned with free flow. A short section on submerged flow should be added.

Special emphasis is given to weirs and small dams, drops, cascades, and culverts. Small and medium size structures are dealt with, since large hydraulic structures, quite rightly, are outside the scope of this book.

Culverts, the most common hydraulic structures, are adequately treated. However, the design of such structures needs more attention, including at least one worked example.

While references to the work of certain authors is very comprehensive there are some notable omissions (particularly from the Russian and German literature). Aimed as this book is, at an international readership, this omission should be corrected. The author appears, however, to put special emphasis on references to the French literature.

In the four main chapters the author, quite naturally, gives particular emphasis on problems related to his own experience. This

innovative textbook contains numerous examples, including practical application, located at the end of each chapter which form an integral part of the text.

The book should serve as a valuable textbook for students of hydraulic engineering, as well as for hydrologists concerned with surface waters. In certain topics the author offers greater detail on selected problems, based on his own experiences, which makes the book a valuable resource for practicing engineers. The book also provides special "Notes", "Examples" and "Discussions", which can be valuable for practical application of the coverage.

Excellent photographs of particular structures illustrate points raised in the text. Tables and figures are used to expand the infor-

mation given on the structures. They help to explain more fully the phenomena, equations and formulae described in the text.

The author has made a great effort to help the reader to understand both the theory and its applications. The reviewer congratulates him for his original approach, which makes this book equally valuable both for students, researchers, and also practitioners in hydraulics engineering. Since it covers many world-wide problems relating to water management this book will provide useful practical help to hydraulic engineers in the developing world.

Ödön Starosolszky