The Hydraulics of Open Channel Flow: an Introduction

NEWSLETTER

No. 2, June 2001

CHANSON, H. (1999). "The Hydraulics of Open Channel Flows : An Introduction." *Butterworth-Heinemann*, London, UK, (ISBN 0 340 74067 1).

Support website :

http://www.bh.com/companions/0340740671/

Correction/addition :

http://www.uq.edu.au/~e2hchans/repritns/errata.htm

Editorial

This newsletter was prepared for the benefits of teaching staff and students using the textbook "The Hydraulics of Open Channel Flow: an Introduction". The first newsletter was published in December 2001 :

{http://www.uq.edu.au/~e2hchans/reprints/news_01.pdf}

To date, the book is used as a prescribed text in more than twenty universities worldwide, including in USA, Canada, UK, Australia. It is also used as a reference text in Asia (e.g. Japan, Thailand, Malaysia) and South-America (e.g. Argentina, Chile).

The Newsletter No. 2 discusses several issues, including recent reviews of the book, corrections and updates, and some pedagogic tips.

In the future issues of the Newsletter, the writer would welcome inputs, comments and feedback from academic colleagues and students using the textbook. It is believed that shared experience will benefits to teaching staff and students, and in turn to the professional community.

Recent reviews

+ Reviews of the book

"The Hydraulics of Open Channel Flow: an Introduction" was reviewed in several well-known journals :

Dr S.N. LANE, University of Leeds, in *Environmental Conservation*, Volume 27 2000, Issue 3, pp 314-315.

"Without a doubt, this is the best introduction to the introduction of the hydraulics of open channel flow that I have yet to read. The text deserves special credit for the explicit identification of the assumptions that exist behind relationships, something that can be (and is) easily over-looked by students whilst using other texts. As an introduction to the hydraulics of open channel flow, I would find it difficult to recommend anything that could improve upon the approach adopted. My overwhelming conclusion is that as an introduction to the hydraulics of open channel flow, it would be impossible to produce a better result. This will appear on both my undergraduate and postgraduate reading lists as the core text. It is rare for me to be so readily persuaded, and Dr Chanson deserves full credit for an outstanding teaching resource."

Professor D.A. ERVINE, University of Glasgow, in *Chemical Engineering Research and Design*, Trans IChemE, Part A, Vol 78, Number A7, Oct. 2000, pp 1055.

"Hubert Chanson's latest book is really designed for a Civil Engineering readership with its emphasis on sediment movement in rivers and also hydraulic structures for rivers and dams. All in all, a well constructed book with many helpful examples and explanations for the student."

Dr L.J. WEBER, in *Journal of Hydraulic Engineering*, ASCE, Vol. 127, No. 3, Mar. 2001, pp. 246-247.

"The 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. The number of exercises is very impressive and worth the book's cost."

These reviews add to the earlier reviews by Professors W. H. HAGER and M. JOVANOVIC (Newsletter No. 1, Dec. 2000).

Corrections and updates

A list of corrections and updates are placed on the Internet :

{http://www.uq.edu.au/~e2hchans/reprints/errata.htm}

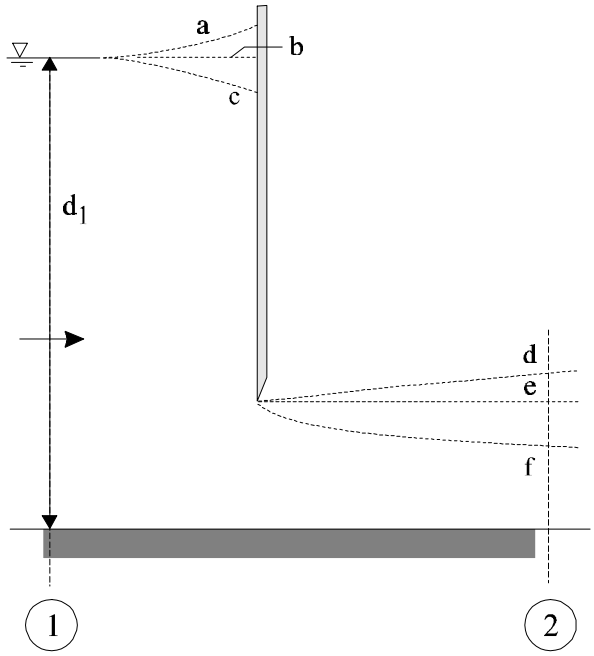
The site is updated regularly, based upon advice received from many, including from the writer's own students. Altogether 7 minor corrections and 3 updates were listed in May 2001.

Students and lecturers are welcome to send corrections to : h.chanson@mailbox.uq.edu.au. Each and every email will be answered.

Pedagogic tips

One of the greatest challenges, in teaching open channel hydraulics, is for the students to understand that the position of the free-surface (i.e. water depth) is often unknown beforehand. In contrast, pipe flow calculations are performed with known pipe diameters and hence cross-section areas. Most open channel flow calculations are not straight forward. They may require solving a cubic equation (e.g. Bernoulli equation) and perform iterations (e.g. normal flow depth).

One basic exercise is the sluice gate. Considering a sluice gate in a smooth horizontal channel, the input conditions may be the upstream depth, channel width and flow rate. Students have to calculate the downstream flow depth, the force acting onto the gate and to predict the correct free-surface profiles upstream and downstream of the gate.
Explanations are available in the text, pages 31-39 and 52-55. A more detailed problem is given in the Revision exercises, pages 116-117.

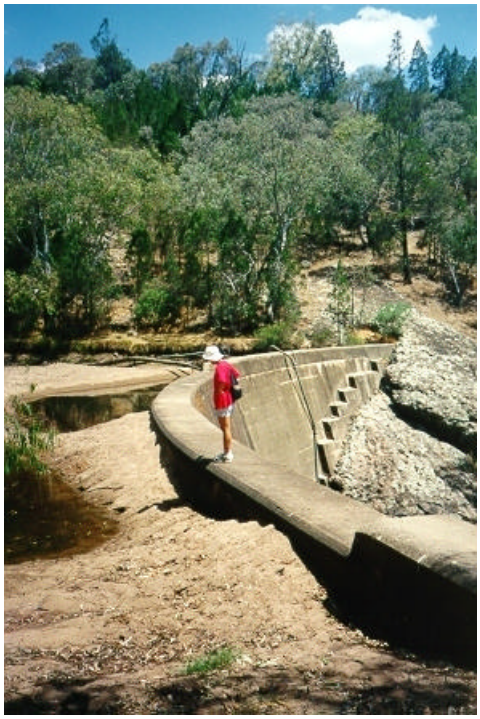


Teaching softwares

Des WILLIAMSON, from Hydrotools Software, Canada, developed two one-dimensional flow calculation softwares: HydroChan™ for backwater calculations and HydroCulv™ for standard culvert design. Both products are shareware.
{http://www.compusmart.ab.ca/dwilliam/hydtools.htm}
An important feature is the good visualisation of the results. For example, HydroCulv allows to see the free-surface profile in the barrel, compared with the normal depth and the critical depth.
At the University of Queensland, the author developed a laboratory class on culvert design which includes an audiovisual presentation, a physical model of a box culvert and numerical computations using HydroCulv. During the 3 hours class, students are first introduced to culvert design (video APELT 1994) before performing measurements in a standard box culvert model. The same flow conditions are input in HydroCulv, and comparisons between the physical model and computer program results are conducted. More details in the textbook, pages 430-434.
Notes :
1- The writer has no financial involvement with Hydrotools Software. He was involved with some validation, and he suggested changes to improve the friendliness of the softwares.
2- The program HydroCulv requires some VB support files to be placed in the same directory as the program files. Support files may be downloaded from :
{http://www.compusmart.ab.ca/dwilliam/download.htm}

Photographic snapshot

Photographs and slides are very useful tools to illustrate some lecture material : a photograph is a story. In the book, several colours photographs are presented at the beginning, between pages xxxii and xxxiii. Another source is the writer's website that includes over 150 photographs in water engineering :
{http://www.uq.edu.au/~e2hchans/photo.html}
A good example of extreme reservoir siltation, and poor understanding of sediment processes, is the Koorawatha dam. Completed in 1911, the concrete arch dam was designed to supply water to the nearby railway line. It became fully-silted in less than 25 years. The photograph shows a person standing on the dam crest, and looking at the reservoir, filled with sands and gravels.



What's new !

+ A Discussion Group ?

In the first Newsletter, the idea of a discussion group was proposed. Only two people expressed some interest. (Thank you for their response.)

At the time, it was felt that experience could be shared between academic colleagues. Basic questions included :

Q1. Would you be interested to participate to a discussion group ?

Q2. Would you be willing to provide your email address and subject website address(es) to other lecturers involved in similar subjects ?

Q3. What other benefits would you expect from the discussion group ?

The idea can still be implemented if several are interested. Email your response to :

{h.chanson@mailbox.uq.edu.au}

+ Support website

The book support website includes exercises, solutions, a culvert software. The correct Internet address is :

{http://www.bh.com/companions/0340740671/}

Two chapter samples may be downloaded from :

{www.bh.com/companions/0340740671/pdfs/chap10.pdf}

{www.bh.com/companions/0340740671/pdfs/chap14.pdf}

The material is downloadable by students and it may be distributed to them as handouts.

+ Publisher

The book was originally published by *Edward Arnold*. In June 2000, *Edward Arnold* sold the rights of all its engineering titles, including "The Hydraulics of Open Channel Flow: an Introduction", to *Butterworth-Heinemann* {http://www.bh.com}.

The publishing editor of the book has been Mrs Eliane WIGZELL {Eliane.Wigzell@repp.co.uk} since inception. She continues her solid support for the book with *Butterworth-Heinemann*.

Additional Internet resources

The writer developed several Internet resources for his students. Some may be of interest to the book readers, students, academics and professionals.

General Resources

Gallery of photographs in hydraulic engineering
{http://www.uq.edu.au/~e2hchans/photo.html}

Structurae, Intl Database and Gallery of Structures
{http://www.structurae.de/index_e.html}

Rivers Seen from Space
{http://www.athenapub.com/rivers1.htm}

Hydraulics of rubber dams
{http://www.uq.edu.au/~e2hchans/rubber.html}

History of arch dams
{http://www.uq.edu.au/~e2hchans/arch_dam.html}

The steel dams
{http://www.uq.edu.au/~e2hchans/steel_da.html}

The Formal Water Garden
{http://www.uq.edu.au/~e2hchans/wat_gard.html}

Part 1

The tidal bore of the Seine river
{http://www.uq.edu.au/~e2hchans/mascaret.html}

Engineering failures
{http://www.uq.edu.au/~e2hchans/photo.html#Failures and accidents}

Part 2

Extreme reservoir siltation
{http://www.uq.edu.au/~e2hchans/res_silt.html}

Part 4

Current expertise in stepped channel flows
{http://www.uq.edu.au/~e2hchans/dpri/topic_2.html}

Embankment overflow stepped spillways
{http://www.uq.edu.au/~e2hchans/over_st.html}

Minimum Energy Loss culverts and bridge waterways
{http://www.uq.edu.au/~e2hchans/mel_culv.html}

The Minimum Energy Loss (MEL) weir design
{http://www.uq.edu.au/~e2hchans/mel_weir.html}

Timber crib weirs
{http://www.uq.edu.au/~e2hchans/tim_weir.html}

Air entrainment on chute and stepped spillways
{http://www.uq.edu.au/~e2hchans/self_aer.html}

The full URL addresses are listed in between brackets {}.

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