

## **Energy Dissipation in Hydraulic Structures**

**Editor: Hubert Chanson**

**IAHR Monograph, CRC Press, Taylor & Francis Group, London**

**ISBN 978-1-138-02755-8**

**Price: £63.99**

Many open channel and pipe flows are highly energetic – notable examples including flood overflows down the spillways of large dams. The IAHR Monograph, *Energy Dissipation in Hydraulic Structures*, edited by Hubert Chanson, provides a contemporary account of modern developments in assessing and designing hydraulic structures aimed at lowering the energy levels of high energy free surface flows. The book considers energy dissipation by a wide range of hydraulic structures including chutes, spillways, and stilling basins. It is written by some of the leading experts in the field, and is crammed full of useful information.

*Energy Dissipation in Hydraulic Structures* is timely given the huge increase worldwide in construction of large dams that has taken place from the 1950s onwards. Energy dissipation from overspill flows is a matter of growing importance in hydraulic engineering given the cascades of dams constructed along many large rivers. The book provides a nice historical insight into the development of energy dissipating hydraulic structures from antiquity to the present day. A startling analogy is made between the power to be dissipated from the overflow of a large dam with the power production of a typical nuclear power station. For example, a single spillway discharge of 17,000 m<sup>3</sup>/s at the Paradise Dam in Australia requires energy to be dissipated at a rate of 7.5 GW (equivalent to the power produced by several nuclear power stations). The introduction links the planetary water budget to extreme rainfall and subsequent runoff and flood events. After stating the rationale for dams and reservoirs, the introduction then considers the necessity for energy dissipaters on, and downstream of, dam spillways, before briefly discussing various

operational issues (including cavitation, sedimentation, and air entrainment). Care is taken to outline practical ways of analysing the scouring effect of spillway flows over erodible beds. The main bulk of the book is taken up with chapters on energy dissipation at block ramps, stepped spillways, cascades, stilling basins, ski jumps, jets, and plunge pools. The penultimate chapter discusses impact dissipaters. The book closes with a succinct reminder of its context, followed by forward looks into current trends in the modelling of hydraulic energy dissipaters, and future developments that are likely to occur in research and training. In the reviewer's opinion, the book is a very useful adjunct to existing open channel flow textbooks (such as e.g. Chow V.T. 1985, *Open Channel Hydraulics*, McGraw-Hill, and Henderson F.M., 1966, *Open Channel Flow*, MacMillan) and hydraulic structure guidance documents. In time, *Energy Dissipation in Hydraulic Structures* could become the reference book of choice for all engineers charged with the design of energy-dissipating hydraulic structures.

The book is sensibly structured, concise, reasonably consistent (noting the number of contributors) and quite readable. The photographs are pertinent, and often very interesting; however, it is a pity that the publisher decided not to print the photographs as plates, instead adopting a no doubt cheaper but less sharp format. It would have been wonderful to have seen the colour originals. The text flows very well in various chapters (e.g. 1, 3, 4), but becomes disjointed in others (e.g. 2). There are rather a lot of small grammatical and stylistic errors in English that litter certain chapters, and serve to distract the reader from the message being conveyed in this otherwise excellent book. It is to be hoped that these errors can be eradicated in the next edition. The book could also benefit from lists of notation and abbreviations. Certain symbols are used twice, with different meanings. Others are not defined near where they are introduced. And a few are not defined at all; in particular, various non-dimensional numbers such as  $Re$ . The word 'some' is overused. Although many

of the equations are empirical, there are equations presented that should have been derived from first principles. Labelling of the diagrams is on the small side, and often located within the plot area rather than below or to the left of the axes (the more usual convention). Even so, these points should not detract from the overall usefulness of this book.

In the reviewer's opinion, *Energy Dissipation in Hydraulic Structures*, edited by Hubert Chanson, is recommended reading for practicing hydraulic engineers engaged in the design and maintenance of energy dissipation devices. With some further polishing, this book could become the gold standard in the subject. This reviewer is left viewing hydraulic structures in a new, more awe-inspired light.

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Edinburgh, August 2016