



## Book reviews

### **HYDRAULIC GATES AND VALVES IN FREE SURFACE FLOW AND SUBMERGED OUTLETS, 2nd edn**

Jack Lewin, Thomas Telford Ltd, 2001; ISBN 0 7277 2990 X, £75, 314 pp.

This revised treatise reviews the options available to engineers and designers, together with the main advantages, disadvantages and potential problems associated with each type of gate and valve. Previous sections on trunnions of radial gates, seals, ice formation, gate operation and structural design have been extended. Also, the chapter on the types of gates has been expanded to include new types of water-operated hydraulic gates, rolling weir gates, fuse gates and barrier gates, and their details. Radial, vertical-lift, rolling, barrage, flap, mitre, drum, sector, bear-trap, intake and submerged outlet gates are described. Sluice, butterfly, hollow-cone, hollow-jet, needle, pressure-reducing, and sphere valves are reviewed and discussed.

There are new sections on hazards and reliability, earthquake effects, and environmental impact. Spillway gates are known to have had failures of controls, hoists, structure, leaking seals, and to have caused dams to fail when spillway gates have failed to open. Power supplies, limit switches and ice may also cause failures. The risks of these failures are assessed through probabilistic risk analysis and failure mode effect and criticality analysis. Examples are given of dams damaged by earthquakes. Analyses for seismic damage to gates, control buildings and machinery are discussed. Environmental impacts include avoidance of piers in navigation channels, the lower prominence of bottom hinged gates, and the risk of damage by debris.

Detailed design includes details of many types of seals, avoidance of friction, bearing pressures, limit switches, and design criteria for trashback and debris screens. Practical advice includes the use of mild steel to minimise deflections, and stainless steel for embedded parts that may be in contact with water. Structural considerations include analysis of stresses on plates subject to hydraulic pressure, and also the need to be aware of debris traps and loads from ice.

Hydraulic considerations include stage-discharge characteristics for various gates, hydraulic downpull on vertical lift gates, instability in a watercourse caused by the operation of a gate with limited ponded up water, vorticity at intakes, losses at gate slots, and cavitation and erosion at high flow velocities. Gates

may vibrate from extraneous effects, unstable flow, such as vortex shedding from the lip of a gate or leakage at a sill, or movement of a vibrating structure. Analyses of potential vibration are described, together with the use of spoilers and changes to gate seals to avoid vibration.

Operating machines are described with system diagrams for hydraulics and reasons for the use of squirrel cage induction motors on electromechanical plant. Control systems, including mechanical, electromechanical and water level instruments, are discussed, together with the need for back-up electrical or mechanical power supply.

This reviewer is not an expert in hydraulic gates and valves, but found a wealth of clear guidance and details for the practising engineer. The 300 pages include 205 illustrations, 37 equations, 10 tables and 278 supporting references. Clearly, the author is an expert in hydraulic gates and valves.

PETER BLAIR-FISH

### **GUIDELINES FOR THE ASSESSMENT AND PLANNING OF ESTUARINE BARRAGES.**

N. Burt and A. Rees. Thomas Telford, 2001. ISBN 0 7277 2863 6, £75, 468 pp.

These guidelines present the results of research carried out by HR Wallingford and largely funded by the Department of the Environment and the Environment Agency. The results are presented in twelve chapters and eight appendices, plus a long preface which forms an overall summary. The first chapter is an introduction, with each succeeding chapter covering a specific issue. There is excellent guidance on the wide range of statutory authorities likely to be involved in any proposal to build a barrage in the UK.

Significantly, after dealing with overall planning aspects in Chapter 2, Chapter 3 covers fisheries and conservation. One message that comes across strongly is that migratory fish are of great importance and the measures that have been included to allow fish to migrate past a barrage have generally not been successful. The following 'environmental' chapters (Chapters 4–10) cover, respectively, water quality, hydrodynamics, morphology, flood defence, groundwater, navigation and waves. The last two chapters (Chapters 11 and 12) cover structural design and operational aspects, and research needs. Chapter 11 is a useful checklist of the wide-ranging aspects that have to be

taken into account, including relevant design codes and standards. The research needs identified include: the valuation of urban regeneration associated with a barrage, migratory fish, sedimentology and computer modelling.

The book aims to cover all types of barrage, from tide-protection barriers such as the Thames barrier, to tidal power barrages. However, the emphasis is on tide-excluding and partial 'amenity' barrages, with only brief mentions of the other types.

The Environment Agency's terms of reference included 'to review available experience on the design, operation and environmental impact of estuarine barrages.' Only two completed barrages, those on the Tyne and Tees, are referred to in any detail, while the Cardiff Bay barrage was under construction at the time the research was carried out. A fourth barrage, proposed on the Usk, is included as an example of one that did not proceed. Each of these is discussed under case studies in appropriate chapters and also in an appendix. It would have been helpful if more details of experience on completed projects had been included, particularly with regard to design and environmental impacts. For tidal power barrages, only the Rance barrage is discussed, briefly, and this highlights the adverse effects during construction without mentioning that the estuary was effectively closed off until the barrage was commissioned—an approach which could not now be adopted as the effects on the estuarine environment are too severe.

The book is well-written but would have benefited from closer editing to reduce the amount of repetition—for example, the list of recreation activities that may be available in the basin behind a barrage (sailing, birdwatching, etc.) appears three times. However, this detracts only slightly from what is a useful reference work for local authorities and other promoting organisations that may be contemplating an estuarine barrage, and their consultants.

A. C. J. BAKER

### **HANDBOOK OF WATER AND WASTEWATER TREATMENT TECHNOLOGIES**

Nicholas P Cheremisinoff, Butterworth–Heinemann, Woburn, MA, 2002, ISBN: 0-7506-7498-9

This handbook is a comprehensive and useful review of modern water treatment technologies. Interesting features include an extensive glossary which is a reference in itself and a 'Questions for thinking and discussing' section at the end of

most chapters. There are inset notes in the form of highlighted boxes which would appeal to the speed reader and those who need a quick reference. The 'Questions for thinking and discussing' would particularly appeal to students of water technology at degree level. The term 'handbook' refers to the reference style rather than its size, which is more akin to the dimensions of a textbook.

Basic fundamentals of water processes are described in some detail and this includes both the mechanical processes such as sedimentation, which is covered in some detail, and chemical processes such as sterilisation. There is substantial coverage of filtration and some of the water processes referred to apply to industry and medicine rather than the water industry alone.

There are twelve chapters of text, tables and diagrams, starting with a general introduction that includes the reasons why water treatment practices are needed. However, the content is based on American practice and some of the terminology may not be fully understood in other countries.

There is a good section on membrane technology and the final chapter describes the processes of sludge treatment and disposal but not to the extent this difficult topic needs. However, there is surprisingly little content on activated sludge processes for municipal wastewater treatment and the engineer may find this coverage too fundamental.

The civil engineer needing to understand water and wastewater treatment processes would find the book interesting but of limited practical use for design, although this is acknowledged by the author. Also the water and wastewater processes are intermixed under the chosen chapter subjects and understanding the application of some processes is sometimes difficult. While the basic understanding of a significant range of fundamental processes is well covered, their actual application and impact on society is not as well addressed.

The author expresses personal opinions in places which are somewhat out of place.

The publication has some appealing modern features, which enhance its value as a general reference, but the main readership will be from academia. However, practising civil engineers in the water industry would classify the content as useful background reading rather than a specific reference book.

A. R. EADON