Book review

ICOLD Bulletin 144: Cost Savings in Dams

ICOLD, Paris, France, 2011, €48.00.

This bulletin is divided into two parts. The first part covers the identification and mitigation of existing factors that are detrimental to cost savings, such as procedures, set ideas and so on. The second part identifies the opportunities for innovation and cost saving in the design of both high and low dams.

Chapter 1 provides a general introduction to the subject. The authors refer to a previous International Commission on Large Dams (ICOLD) analysis that has forecast that the annual worldwide investment on dams could reach up to US\$500 billion within the next 20 years. Potential cost savings of up to 20% of this figure have been estimated (ICOLD Bulletin 73). The subject is viewed from the perspective of existing dams, those under construction and future dams.

Chapter 2 advocates the search for cost savings from the earliest stage of a new scheme and in particular the application of value engineering techniques to conceptual design and options development. The team developing the concept and options should include specialists in environment, sociology and legal requirements. Efforts should be made to secure local confidence as early as possible and understand the approvals and permitting route and the likely constraints. A helpful section on the need to challenge design standards, past designs and correcting misconceptions (e.g. Embankment dams are always the cheapest option) is included. A design record is recommended to record decisions and prevent scope creep, and care should be taken not to rely solely on existing specifications, as there is a tendency to over-specify. The chapter concludes with the tendering and construction stages, the potential benefits for incentivised contracts and the observation that there is likely to be a cost penalty for an unsafe site.

Chapter 3 refers to the significant costs and safety risks associated with controlling river flows during construction. The authors observe that most future high (more than 50 m) dams will be built in Asia and Latin America

and that savings could be found in more efficient permanent/temporary works design through the combined efforts of the consultant and the contractor.

The importance of the general layout of the dam structures is discussed. Construction time and consequent finance costs are affected by the arrangement of the components (e.g. spillway, diversion conduits, generator house etc.). These should be optimised with consideration to optimal excavation and placement rates.

Dam foundations are discussed with the authors' warning that cost savings should only be considered if accompanied by good investigations. Savings opportunities related to the dam shape, flood event provision and materials are also discussed in detail and there is mention made of a new technique of using slightly expansive concrete in arch dams to eliminate the need for construction joint formation. An extensive discussion takes place looking at the interaction of whole-life safety, storage capacity and cost, with the authors proposing how the optimum balance is to be achieved. The importance of achieving meaningful improvements in safety by the relatively cheap applications of good weather forecasting, flood warnings, emergency planning and sound gate operation is stressed.

The costs of providing additional capacity to allow for future sedimentation are discussed, with the figure put as high as 20% for newly built dams. Initial and whole-life costs can be reduced by consideration of siting, sluicing layout and so on. The authors advocate the benefits of physical modelling. Consideration should be given in the design as to how the dam operator can manage seasonal flows and storage to minimise the sediments retained within the reservoir.

The appendices include two innovations in spillway designs that could offer efficiencies, namely piano key weirs and concrete fuse plugs.

This document is a valuable source of guidance for those engineers who commission, design, build and operate new large dams and need to establish the best overall value from invested funds.

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