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Hydrometry — Methods for assessment of reservoir sedimentation

This British Standard is the UK implementation of ISO 6421:2012.

The UK participation in its preparation was entrusted to Technical Committee CPI/113, Hydrometry.

A list of organizations represented on this committee can be obtained on request to its secretary.

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6421 was prepared by Technical Committee ISO/TC 113, *Hydrometry*, Subcommittee SC 6, *Sediment transport*.

Introduction

Most natural river reaches are approximately balanced with respect to sediment inflow and outflow. Dam construction dramatically alters this balance, creating a reservoir which often results in substantially reduced velocities and relatively efficient sediment trapping. The reservoir accumulates sediment and loses storage capacity until a balance is again achieved; this normally occurs after the reservoir fills with sediment. The rate and extent of sediment deposition depends on factors which influence sediment yield and sediment transport, as well as the reservoir's trapping efficiency.

The distribution of sediment deposition in different reservoir regions is equally important. Depending upon the shape of the reservoir, mode of reservoir operation, sediment-inflow rates and grain-size distributions, the incoming sediment may settle in different areas of the reservoir. Declining storage reduces and eventually eliminates the capacity for flow regulation and concomitant benefits such as water supply, flood control, hydropower, navigation, recreation, and environmental aspects that depend on releases from storage. Water resource professionals are concerned with the prediction of sediment deposition rates and the probable time when the reservoir would be affected in serving its intended functions.

The estimation of sediment deposition is also important in the design and planning of storage reservoirs. However, it is difficult to estimate the volume and rate of sediment deposition accurately from the known criteria and available sediment transport equations. Reservoir capacity surveys indicate patterns and rates of sedimentation, which help in improving estimation of capacity-loss rates.

This International Standard describes the following reservoir-sedimentation assessment methods:

- conventional topographic surveys (Clause 6)
  - contour method (Clause 7)
  - cross-sectional (range line) method (Clause 8)
  - sub-bottom measurements (Clause 9)
- remote-sensing techniques (Clause 10)
  - light detection and ranging (Clause 11)
    - aerial applications
    - ground-based applications
  - aerial imagery (Clause 12)
    - photogrammetry methods
    - satellite imagery methods

Hydrometry — Methods for assessment of reservoir sedimentation

1 Scope

This International Standard describes methods for the measurement of temporal and spatial changes in reservoir capacities due to sediment deposition.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any revisions) applies.

ISO 772, *Hydrometry — Vocabulary and symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 772 apply.

4 General

4.1 Origin of the sediment deposited in the reservoir

Reservoirs are subjected to several types of sedimentation as a function of the geomorphology (geology, slope, topography and land use, drainage density, climate, etc.) of the watershed and the biological cycles in the reservoir or the drainage basin, in the following order of importance.

a) **Erosion** of the drainage basin produces dissolved substances and mineral particles with an assortment of sizes, shapes and types that are related to the rock type and slope of the drainage basin. In addition, landslides produce debris flows. Sediment is delivered to the reservoir both as suspended sediment load and as bed load.

b) **Sedimentation** occurs due to plant debris from the drainage basin and from vascular plants and phytoplankton in the reservoir. The debris decomposes very slowly and often forms alternating layers with mineral deposits. The mud resulting from this type of sedimentation is very fine and extremely fluid, often with a gelatinous texture. Accumulation of mud at a rate of several centimetres per year often causes problems when a reservoir is drawn down or drained. It has a very high organic content resulting in heavy consumption of dissolved oxygen.

The proportion of sedimentation caused by each type may be assessed by on-site visual observations and by analyses of the sediment deposit.

4.2 Overview of reservoir-sedimentation assessment methods

Two basic methods for assessment of reservoir sedimentation are described.

1) Sediment transport balance: