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Measurement of liquid flow in open channels by weirs and flumes — Streamlined triangular profile weirs

*Mesure de débit des liquides dans les canaux découverts au moyen de
déversoirs et de canaux jaugeurs — Déversoirs carénés à seuil à profil
triangulaire*



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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.

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.

International Standard ISO 9827 was prepared by Technical Committee ISO/TC 113, *Hydrometric determinations*, Subcommittee SC 2, *Notches, weirs and flumes*.

Measurement of liquid flow in open channels by weirs and flumes — Streamlined triangular profile weirs

1 Scope

This International Standard specifies methods for the measurement of the flow of water in open channels under steady flow conditions using streamlined triangular profile weirs. The flow conditions considered are free flow, which is dependent on the upstream head only, and drowned flow, which depends on both upstream and downstream water levels.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 748:—¹⁾, *Measurement of liquid flow in open channels — Velocity-area methods*.

ISO 772:—²⁾, *Measurement of liquid flow in open channels — Vocabulary and symbols*.

ISO 5168:—³⁾, *Measurement of fluid flow — Evaluation of uncertainties*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 772 apply.

4 Units of measurement

The units of measurement used in this International Standard are SI units.

5 General requirements

Conditions regarding preliminary survey, selection of site, installation, approach channel, maintenance, measurement of head and wells which are generally necessary for flow measurement are given in 5.1 and 5.2. The particular requirements for streamlined triangular profile weirs are given separately in clause 8.

5.1 Site selection

A preliminary survey shall be made of the physical and hydraulic features of the proposed site, to check that it conforms (or can be made to conform) to the requirements necessary for measurement by a weir.

Particular attention shall be paid to the following features:

- a) existence of an adequate length of channel of regular cross-section;
- b) flow velocity distribution;
- c) absence of a steep channel, if possible;

1) To be published. (Revision of ISO 748:1979)

2) To be published. (Revision of ISO 772:1988)

3) To be published. (Revision of ISO 5168:1978)

- d) effects of any increase in upstream water level due to the measuring structure;
- e) sediment content of the stream and possibility of heavy deposition just upstream of the weir, affecting its performance;
- f) permeability of the ground on which the structure is to be founded and the need for piling, grouting or other sealing-in river installations;
- g) necessity for flood banks to confine the maximum discharge to the channel;
- h) stability of the banks and the necessity for trimming and/or revetment of natural channels;
- i) removal of rocks or boulders from the bed of the approach channel;
- j) effects of wind, which can have a considerable effect on the flow in a river or over a weir, especially when these are wide and the head is small and when the prevailing wind is in a transverse direction.

If the site does not possess the characteristics necessary for satisfactory measurement, the site shall be rejected unless suitable improvements are practicable.

If an inspection of the stream shows that the existing velocity distribution is regular, then it may be assumed that the velocity distribution will remain satisfactory after the construction of the weir.

If the existing velocity distribution is irregular and no other site for a gauge is feasible, the distribution shall be checked after the installation of the weir and improved if necessary.

Several methods are available for obtaining a more precise indication of irregular velocity distribution. Velocity rods, floats or concentrations of dye can be used in small channels, the latter being useful in checking conditions at the bottom of the channel. A complete and quantitative assessment of velocity distribution may be made using a current meter. Further information on the use of current meters is given in ISO 748.

5.2 Installation conditions

5.2.1 General

The complete measuring installation consists of an approach channel, a measuring structure and a

downstream channel. The condition of each of these components affects the overall accuracy of the measurements.

Installation parameters include such features as weir finish, cross-sectional shape of channel, channel roughness, influence of control section or devices upstream or downstream of the gauging structure.

The distribution and direction of velocity have an important influence on the performance of a weir, which is determined by the features mentioned above.

Once an installation has been designed and constructed, the user shall avoid any change which could affect the discharge characteristics.

5.2.2 Approach channel

On all installations the flow in the approach channel shall be smooth, free from disturbance and shall have a velocity distribution as normal as possible over the cross-sectional area. These criteria can usually be verified by inspection or measurement. In the case of natural streams or rivers, they can only be met by a long straight approach channel free from projections either at the side or on the bottom. Unless otherwise specified in the appropriate clauses, the following general requirements shall be complied with.

The change in flow conditions due to construction of the weir may cause buildup of shoals of debris upstream of the structure, which in time might affect the flow conditions.

In an artificial channel the cross-section shall be uniform and the channel shall be straight for a length equal to at least 5 times its width measured from the upstream toe of the weir.

If the entry of the approach channel is through a bend or if the flow is discharged into the channel through a conduit of smaller cross-section, or at an angle, then a greater length of straight approach channel will be required to achieve a regular velocity distribution. Baffles in the approach channel shall not be closer to the point of measurement than a distance of 10 times the maximum head to be measured.

Under certain conditions, a standing wave may occur upstream of the gauging device, for example if the approach channel is steep. Provided this wave is at a distance of not less than 30 times the maximum head upstream, flow measurement will be feasible, subject to confirmation that a regular velocity distribution exists at the approach to the weir. If a standing wave occurs within this distance the approach conditions and/or gauging device shall be modified.