# Comparison of current Australian Standard with updated ISO standard

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| Current Australian Standard | AS 3778.2.5 (2001) | {Measurement of water flow in open channels - General - Guidelines for the selection of flow gauging structures} |
| Updated ISO Standard | ISO 8368 (Third edition 2019-11) | {Hydrometric determination – Flow measurements in open channels using structures – Guidelines for selection of structure} |

There is a 20-year gap between the old AS (which was based on ISO 8368:1999), and the new ISO 8368. In that long period of time language changed and included applications and some limitations in international standards, further limitations of the flow measurement structures (more details) and range of flow to be measured. Starting with the use of the word "Hydrometry determinations" in the title, and included more details discussion in Operation, maintenance and repair. More details information about passage of fish in the new ISO. A complete set of International standards on structures list included in the Table 4 in the new ISO. The new ISO standard also includes more explanatory diagrams and symbols. These diagrams appear next to the text which refers to them, rather than appearing at the end of the standard, such as in the old AS (e.g., Table 1, applications some limitations of structures in international standards)

In the new ISO, there are also links given to each Table and figure. In summary the new ISO is a timely improvement, and a necessary update for the hydrometric industry.

## Reviewer recommendation

I recommend that the technical committee accept the updated ISO in full to replace the current AS, as well as giving some consideration to the broader issues raised above.

| *options* |
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| • *accept the updated ISO in full to replace current AS (simplest option!)* |
| • *reject the updated ISO and withdraw the current AS (in cases where the update is not appropriate for Australian practice)* |
| • *reject the updated ISO and re-confirm the current AS without change (an alternative option in cases where the update is not appropriate for Australian practice)* |
| • *further work required to adapt the ISO for an updated AS (non-preferred option, exceptional cases only)* |

## Detailed summary of differences

The table below outlines in more detail a summary of the differences between the current Australian Standard under review and the relevant updated ISO standard and includes reviewer comment where relevant.

*Column 1: Identifies the number and name of the section in the current Australian Standard*

*Column 2: Classification of the change for that section. Classified as either:*

- ***No change** (green shading) – The updated ISO is the same as the current Australian Standard.*
- ***Minor change** (blue shading) – Changes that have minimal impact on the outcome, including*
  - *minor format, style or heading changes*
  - *minor additions, removals or changes to a few words or clauses*
  - *addition or exclusion of more detailed explanation*
  - *very minor changes to steps or processes.*
- ***Significant change** (orange shading) – Changes that have a moderate to major impact on the outcome, such as*
  - *Changes to requirements*
  - *Significant changes to calculations, steps or processes.*

*Column 3: More detail to describe the change, and comment from the reviewer (enough detail for the consideration of AHA and WaMSTeC members in their review).*

*Text colour is used in this column as follows:*

- *Black text – More detailed explanation of the changes and reviewer comment. Specific reviewer comment on the changes highlighted in yellow.*
- *Blue text – reference to information included in the updated ISO that is not in the current Australian Standard*
- *Red text – reference to information included in the current Australian Standard that is not in the updated ISO.*

- ***No change (green shading)***

| Section (AS section number) | Classification of change<br>AS to ISO | More detail and comment on changes in the updated ISO |
|---|---|---|
| Title | • ***Minor change (blue shading)*** | Format and language change- detail title, and uses the new term hydrometry determinations. |
| 1. Scope | • ***Minor change (blue shading)*** | In the new ISO they clearly explained the scope. This document gives guidelines for selecting particular types of flow gauge structure for measuring liquid flow in an open channel. It describes how the individual structures function in simple non-technical terms, and sets out the factors and parameters to take into account in order to make an informed decision on which type of structure to use. This document will indicating values of the relevant parameters and also describing the limitations and uncertainty involved in the use of these structures. In the ISO standard, Table-1 providing details of a particular type of structure in the individual standards. I would strongly recommending to add Table -1 in this section as it has clearly explained structure type, sketch of structure, ISO standard, approach channel length, uncertainty and uses. |
| 2. Normative references | • ***Minor change (blue shading)*** | In the AU standard, 15 normative documents included. The normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. In the ISO, the Table-1 (discussed before) included these 15 normative references except ISO 772, Hydrometer – Vocabulary and symbols.<br>ISO included one normative reference (ISO 772, Hydrometer – Vocabulary and symbols). |

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|---|---|---|
| 3. Terms, definitions and symbols | • ***Minor change (blue shading*** | In the ISO additional information included. ISO and IEC maintain terminological databases for use in standardization at the following address:<br>- ISO Online browsing platform: available at https://www.iso.org/obp<br>- IEC Electropedia: available at http://www.electroperia.org/ |
| No Symbols considered | • ***Minor change (blue shading*** | Symbols (not in Australian Standard). A detail information included in the ISO based in a tabular format. In the table, number of Symbols and respective unit and description are included. I am recommending for considering necessary symbols detail in the Australian standard. |
| 4. Types of structure | • ***Minor change (blue shading)*** | Australian standard only provided structural description. ISO included details information for each structure (Sub section 5 in the ISO).<br>I picked up one structure to draw attention:<br>a) thin-plate weirs:<br>1) rectangular;<br>2) V-notch.<br><br>Thin-Plats weirs<br>Two types of thin-plat weir are in use. These are rectangular thin-plat weirs and V-notch thin-plate weirs. For the same cross-section shape, thin plate weirs are the more sensitive because of streamline curvature over the crest.<br>These weirs are relatively inexpensive and easy to manufacture and install, and can be relatively small in size. They are the most accurate form of weir, particularly the V- |

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| | | notch weir, which is installed to measure low flows on small water courses and artificial channels. Problems with this form of weir come from the accumulation of depth of debris behind the structure which reduces the h/P ratio, and floating debris that can block the discharge point.<br>Recommending to review and to add detail information against each structure. |
| 5. Factors affecting choice<br>5.1 General | • ***Minor change (blue shading)*** | In the sub-section General, Australian standard are same as ISO standard except one (sub section 6 in the ISO). Key works were applied in the Australian standards from ISO description. In the ISO the additional one is " - accuracy of which the flow is to be measured".<br>I recommended to add detail information in the Australian standard for each structure. |
| 5.2 Purpose | • ***Minor change (blue shading*** | Sub-title changed in ISO (In the ISO "Intended purpose of the structure" and sub section number is **6.2**). Australian Standard included all key points from ISO. In ISO the Table 1 is more informative than Table 1 in Australian standard. Additional table in the ISO is Table 2 that covered further limitations of the flow measurement structures. ISO also included reference to identify sources of uncertainty (ISO/IEC Guide 98-3 and ISO/TS 25377). I recommended to add updated version Table 1 and Table 2 from ISO. I further recommended to consider the reference (from ISO) that identify sources of uncertainty. |
| 5.3 Range of flow | • ***Minor change (blue shading)*** | In the Australian standard referred Table 2 and ISO referred Table 3 but both are similar table. In the ISO more types of weir and flume added in the Table 3 (e.g. Streamlined triangular – pro-file weirs and Parshall flume and others, In the ISO it is sub-section **6.3 and title "Range of flow to be** |

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| | | **measured**"). Recommending to update Table 2 in the Australian standard based on additional information from ISO Table 3. |
| | • ***Minor change (blue shading*** | **New sub-title in the ISO under 6.4 sub-section. Title heading is " Accuracy to which the flow is to be measured"**<br>This sub-section not included in Australian Standard. In this sub-section, briefly explained structures name those are suitable for wide range of small and larger discharges. It is general information and not critical to include in the Australian Standard. |
| 5.4 Afflux | • ***Minor change (blue shading*** | Sub-title heading more elaborately written in the ISO. Due to hydraulic structures in the water way, upstream water level rise immediately. ISO included meaning of Afflux and also explained clearly. Recommended to update the Australian Standard based on ISO information. It is sub-section 6.5 in the ISO. |
| 5.5 Size and Nature of channel | • ***Minor change (blue shading)*** | 1st paragraph for Australian Standard and ISO standard same. Additional paragraph in the OSO Standard that included "Most if not all structures operate better if the upstream approach channel is straight for up to 10 channel widths. This ensures that the approach flow to the structure is uniform, tranquil and aligned correctly". Recommending to consider 2nd paragraph from ISO into Australian Standard. It is sub-section 6.6 in the ISO. |
| 5.6 Channel slope and sediment load | • ***No change (green shading)*** | Australian Standard and ISO same. |

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| 5.7 Operation and maintenance | • ***Minor change (blue shading*** | In the ISO heading is "Operation, maintenance and repair" but in the Australian Standard heading is " Operation and maintenance". Sub section in the ISO is 6.8.<br>Australian standard and ISO are very similar except additional paragraph in the ISO. Last paragraph highlighted about maintenance that included the accretion of large scale debris also affects the calibration of a structure. Recommending to add the 4th paragraph from ISO to Australian Standard. |
| 5.8 Passage of fish | • ***Minor change (blue shading)*** | The migration of fish upstream for spawning can be restricted if a structure does not have proper provision and it is not permitted under environmental legislation in many countries. The factors that affect fish migration beyond a flow measuring structure should be taken into account. Both standards cover the same subsection topics. Last two paragraphs in the ISO has explained limitation of larinier fish passages.<br>Extensive development of fish passes has been undertaken since 2000 to devise acceptable fish passes on many styles of weir. The results of this work should be taken into account when a weir is being designed, or when the retro-fitting of a fish pass is required.<br>Recommending for considering last two paragraphs from ISO. |
| 5.9 Cost | • ***Minor change (blue shading*** | Sub-title heading updated in ISO (**sub-section 6.10 and heading" Whole life cost"**). Both standards covered main key points. In the ISO considered an example, where a licensed abstraction is being managed, there is a legislative driver to remain compliant with the terms of the abstraction license. Otherwise, a financial penalty may be imposed on the license.<br>Recommend updating sub-heading in the AS and to include |

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| | | few key information in the ISO (e.g. add example from ISO to AS) |
| 6 Recommendations<br>6.1 Thin-plate weirs<br>6.1.1 General | • ***Minor change (blue shading*** | Both standards covered same information. But in the ISO recommendation included for the site where temporary weir is not ideal. Please add this recommendation in AS. |
| 6.1.2 Rectangular weirs | • ***No change (green shading)*** | No change |
| 6.1.3 V-notch weirs | • ***No change (green shading)*** | Very similar. Keep Australian Standard as it is. |
| 6.2 Broad-crested weirs<br>6.2.1 General | • ***No change (green shading)*** | No change |
| 6.2.2 Round-nose weirs | • ***No change (green shading)*** | No change |
| 6.2.3 Rectangular horizontal weirs | • ***No change (green shading)*** | No change |
| 6.2.4 V-shaped weirs | • ***No change (green shading)*** | No change |
| 6.3 Triangular-profile weirs | • ***Minor change (blue shading*** | New ISO Included a description of the detailed steps but very similar. Both standards covered similar information. Keep Australian Standard as it is. |
| 6.4 Streamlined triangular - profile weirs | • ***No change (green shading)*** | No change (In ISO sub-section 7.3.2) |

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| 6.5 Flat-V weirs | • ***No change (green shading)*** | No change (In ISO sub-section 7.3.3) |
| 6.6 Compound gauging structure | • ***No change (green shading)*** | No change (In ISO sub-section 7.5) |
| 6.7 Trapezoidal-profile weirs | • ***No change (green shading)*** | **7.3 Trapezoidal-profile weirs**<br>Australian Standard and ISO very similar.<br>It is simple geometry and may be used in a both modular and drowned-flow range. Despite the simplicity of the geometry, care is needed during construction to ensure that the finished structure accurately reflects the desired design.<br>Recommending to keep the Australian standard as it is. |
| 6.8 Vertical underflow gates and radial gates | • ***No change (green shading)*** | No change (In ISO sub-section 7.6) |
| 6.9 End-depth method | • ***No change (green shading)*** | No change (In ISO sub-section 7.4.6) |
| 6.10 Flumes<br>6.10.1 General | • ***Minor change (blue shading*** | Both standards covered main key points and similar. Additional information in ISO related to accuracy between weirs and flumes (In ISO sub-section 7.4.1). In general flumes are calibrated theoretically or on site by current meter gauge. Therefore, the accuracy of measurement of these structures is less than that for weirs. |
| 6.10.2 Rectangular flumes | • ***No change (green shading)*** | No change (In ISO sub-section 7.4.2) |
| 6.10.3 Trapezoidal flumes | • ***No change (green shading)*** | No change (In ISO sub-section 7.4.3) |

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| 6.10.4 U-throated flumes | • ***Minor change (blue shading*** | **Both standards covered main key points and similar (In ISO sub-section 7.4.4).** Additional information in ISO related to cost comparison between U-throated flumes and rectangular flumes. U-throated flumes flume is expensive. **Not very important and recommend keeping Australian Standard as it is.** |
| 6.10.5 Parshall and SANIIRI flumes | • ***Minor change (blue shading)*** | **Both standards covered main key points and similar (In ISO sub-section 7.4.5).** Additional information in ISO is not very important and recommend keeping Australian Standard as it is. |
| 7 Parameters governing choice of structures | • ***Minor change (blue shading*** | **Both standards covered main key points (In ISO section 8)** but figure 1 (Flow chart for the selection of structures) in the ISO has been updated from Table 4 (Table 4 in the ISO has been updated). Please update AS (Table 3 and figure 1 based on information from ISO section 8). |
| Larinier fish passage (not considered in AS) | • ***Minor change (blue shading)*** | **One new structure is included in the ISO (ISO Sub-section 7.7)**. Please add this additional structure from ISO to AS under the **Recommendations section**. New structure is Larinier fish passes. |