

Comparison of current Australian Standard with updated ISO standard

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| Current Australian Standard | AS 3778.4.10 (1991) | {Measurement using flow gauging structures – End – depth method for estimation of flow in rectangular channels with a free overfall} |
| Updated ISO Standard | ISO 18481 (First edition 2017-12) | {Hydrometry – Liquid flow measurement using end depth method in channels with a free overfall} |

There is a 28-year gap between the old AS (which was based on ISO 18481:1991), and the new ISO 18481 (First edition 2017-12). Starting with the use of the word “Hydrometry determinations” in the title, and included more details discussion in Operation, maintenance and repair. In that long period of time language changed and added more structures with details information (e.g. **Triangular channels drop structure, Trapezoidal channels drop structure, circular channels drop structure and Parabolic channels drop structure**). 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.

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| <i>options</i> |
| <ul style="list-style-type: none"> • <i>accept the updated ISO in full to replace current AS (simplest option!)</i> |
| <ul style="list-style-type: none"> • <i>reject the updated ISO and withdraw the current AS (in cases where the update is not appropriate for Australian practice)</i> |
| <ul style="list-style-type: none"> • <i>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)</i> |
| <ul style="list-style-type: none"> • <i>further work required to adapt the ISO for an updated AS (non-preferred option, exceptional cases only)</i> |

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

| Section (AS section number) | Classification of change AS to ISO | More detail and comment on changes in the updated ISO |
|-----------------------------|--|--|
| Title | <ul style="list-style-type: none"> • Minor change (blue shading) | Format and language change- detail title, and uses the new term hydrometry determinations. |
| 1. Scope | <ul style="list-style-type: none"> • Minor change (blue shading) | In the new ISO they clearly explained the scope. A wide variety of channel cross sections with overflow have been studied, but only those which have received general acceptance after adequate research and testing are considered. This document covers 5 types of channel cross sections. Reviewer comment: The ISO change is recommended as it provides additional detail. |
| 2. Normative references | <ul style="list-style-type: none"> • No change (green shading) | In the current ISO and AU standard has one normative document (ISO 772, Hydrometer – Vocabulary and symbols). |
| 3. Terms, definitions | <ul style="list-style-type: none"> • Minor change (blue shading) | Definitions given in ISO 772. ISO and IEC maintain terminological databases for use in standardization at the following address: <ul style="list-style-type: none"> - ISO Online browsing platform: available at https://www.iso.org/obp - IEC Electropedia: available at http://www.electroperia.org/ |
| 4. Units of Measurement | <ul style="list-style-type: none"> • Minor change (blue shading) | Symbols and abbreviated terms are not in current 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. Reviewer comment: The ISO change is recommended as it provides additional detail (symbols and abbreviated terms and principle). |

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|---|--|--|
| 5. Selection of Site | <ul style="list-style-type: none"> • Minor change (blue shading) | <p>ISO clearly described site selection and elaborately explained to ensure particular attention for selecting site for few features (items a to h, e.g. In case of unconfined nappe, the side walls shall end at the drop and nappe should be completely free at the sides to permit unrestricted spreading).</p> <p>Reviewer comment: The ISO change is recommended as it provides detail.</p> |
| 6. Measurement of depth | <ul style="list-style-type: none"> • Minor change (blue shading) | <p>In the ISO explained elaborately. ISO considered three sub-section and those are General, head measuring devices and gauge datum. In the ISO, included additional section for maintenance, types of structures (Rectangular channels are further classified into two types: confined nappe and unconfined nappe), specifications for the drop structure and specifications for installation.</p> <p>Reviewer comment: The ISO change is recommended as it provides detail.</p> |
| 7. General equation for sub-critical flow | <ul style="list-style-type: none"> • No change (green shading) | <p>In the Australian Standard name of the sub-section is " General equation for sub-critical flow" and in the ISO sub-section name is "Discharge relationship". Both are based on same equation.</p> |
| New section in the ISO | <ul style="list-style-type: none"> • Significant change (orange shading) | <p>9. Triangular channels drop structure (New addition to ISO)</p> <p>ISO added new structure in the report. That is "Triangular channel drop structure".</p> <p>ISO included few sub-sections and clearly explained step by step. Sub-sections are:</p> <ul style="list-style-type: none"> 9.1 Specifications for drop structure 9.2 Specifications for installation 9.3 specifications for head measurement 9.4 discharge formula – unconfined |

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| | | <p>9.5 uncertainty of measurement.</p> <p>Reviewer comment: The ISO change is recommended as it provides additional detail.</p> |
| New section in the ISO | <ul style="list-style-type: none"> • <i>Significant change (orange shading)</i> | <p><u>10. Trapezoidal channels drop structure (New addition to ISO)</u></p> <p>Sub sections are:</p> <p><u>10.1 Specification for the drop structure</u></p> <p><u>10.2 specifications for head measurement</u></p> <p><u>10.3 Discharge formula – unconfined</u></p> <p><u>10.4 Practical limitations</u></p> <p><u>10.5 Uncertainty of measurement</u></p> <p>Reviewer comment: The ISO change is recommended as it provides additional detail.</p> |
| New section in the ISO | <ul style="list-style-type: none"> • <i>Significant change (orange shading)</i> | <p><u>11. Circular channels drop structure (New addition to ISO)</u></p> <p>Sub sections are:</p> <p><u>11.1 Specification for the drop structure</u></p> <p><u>11.2 specifications for head measurement</u></p> <p><u>11.3 Discharge formula – unconfined</u></p> <p><u>11.4 Practical limitations</u></p> <p><u>11.5 Uncertainty of measurement</u></p> <p>Reviewer comment: The ISO change is recommended as it provides additional detail. In the ISO, added Table 1 that clearly showing discharge for circular channel.</p> |

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| New section in the ISO | <ul style="list-style-type: none"> • <i>Significant change (orange shading)</i> | <p><u>12. Parabolic channels drop structure (New addition to ISO)</u></p> <p><u>Sub sections are:</u></p> <p><u>12.1 Specification for the drop structure</u></p> <p><u>12.2 specifications for head measurement</u></p> <p><u>12.3 Discharge formula – unconfined</u></p> <p><u>12.4 Practical limitations</u></p> <p><u>12.5 Uncertainty of measurement</u></p> <p>Reviewer comment: The ISO change is recommended as it provides additional detail.</p> |
| 8. Uncertainties in Flow Measurement | <ul style="list-style-type: none"> • <i>Minor change (blue shading)</i> | <p>In the ISO, more clearly explained and add few new sub sections. Sub sections are:</p> <p>8.1 General - more clearly explained in the ISO. ISO add sub sections to explained elaborately (e.g. sources of error and Kinds of error)</p> <p>8.4 Uncertainties in coefficient values – same text in Australian Standard and ISO. In the ISO added maximum systematic uncertainty in the discharge coefficient C.</p> <p>8.5 Uncertainties in measurements made by the user - same text in Australian Standard and ISO.</p> <p>8.6 Combination of uncertainties to give total uncertainty on discharge – In the Australian standard, included an equation to calculate the uncertainty on the rate of flow.</p> |

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| | | <p>In the ISO random uncertainty in Q can be calculated through formula added in the example. In the example, included formula to calculate the random uncertainty and systematic uncertainty.</p> <p>Reviewer comment: The ISO change is recommended as it provides additional detail. In the ISO, more clearly explained and add few new sub sections (above sub sections 8.1, 8.2, 8.3, 8.4, 8.5 and 8.6).</p> |