Uisce Éireann

Standard Title

***(Note:** Guidance and requirements on creating a Standard are outlined on page 3-5 of this template).*

Revision history: (2nd page)

"This section should contain the date that the Standard was first approved and issued. It should include the dates of each subsequent review and modification and a description of the change. If necessary, a schedule of amendment dates and the amendments made should be added as a table as illustrated below".

Revision Number	Description of Change	Author(s)	Approved By	Date of Approval

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1 INTRODUCTION

Flow measurement shall be provided to enable reporting under the Urban Wastewater Treatment Directive transposed into Irish Law as the Urban Wastewater Treatment Regulations, facilitate Uisce Éireann's operation, optimisation, reporting and monitoring requirements and to comply with the requirements of the EPA Wastewater Discharge Authorisation (WWDA). Wastewater treatment requirements with regards to regulatory flow measurement, are site specific, risk based and dependent on a number of factors. Flow measurement may also be used to support the operation and control of the Wastewater Treatment Plant (WWTP) process as well as for recording and reporting purposes.

2 PURPOSE

This Standard will guide the designer and / or contractor in establishing engineered solutions that deliver robust, reliable and repeatable performance that meets Uisce Éireann's objectives for Wastewater Treatment Works, while also forming part of a series of standard specifications for use as 'building blocks' when compiling project designs. It should also be noted that the application of this, and every other specification within the 'building block' structure, must also give consideration to health & safety, operability, environmental impact, CAPEX, OPEX and TOTEX.

The standard is provided to convey Uisce Éireann's specific baseline requirements with regard to key wastewater influent and effluent flow measurement. The appointed designer or contractor will retain the role of detailed system designer and each design will be carried out on a site specific basis, accounting for all constraints and restrictions therein.

This Standard must be followed for all new, upgrade, expansion, refurbishment and replacement works, across all Uisce Éireann plant classes. If situations arise where compliance with this Standard or other related document is not possible and an alternative solution is proposed, then the designer / contractor shall require prior written approval from Asset Strategy (Wastewater Team) before proceeding with detailed design, construction and installation.

3 SCOPE

3.1 Standard Scope (inclusions/exclusions)

The scope of this standard relates to the provision of flow measurement for the main relevant wastewater flows on wastewater treatment plant sites, defined in section 4. The following is **out of scope** for this standard:

- Network pumping station flow measurement
- Gas flow measurement
- Air flow measurement.
- Chemical dose flow measurement
- All other WwTP interstage flow measurements provided for operational monitoring and control
  Storm and emergency overflow flow measurement (including even detection and duration monitoring).

Where guidance is required on flow monitoring for any of the above installations, please consult the relevant wastewater treatment or wastewater networks technical standards or specifications.

3.2 DEROGATIONS FROM THE SPECIFICATION/STANDARD

Whilst the minimum requirements of this specification / Standard shall be met (where applicable) this document is not intended to stifle innovation by the Contractor, or delay progress. Should the Contractor wish to apply for a derogation from any aspect of the document, they shall submit a derogation application to the Employer's Representative in accordance with AD-EDS-SOP-005, in advance of any proposed departure from the requirements of the Standard (the required form for the derogation application will be provided to the Contractor by the Employer's Representative). Submission of the derogation application does not confer permission to proceed, and the application should be submitted allowing sufficient time for the Employer and the Employer's Representative to evaluate. Works can only proceed on the basis of the derogation, after the Contractor has received written confirmation from the Employer's Representative. The written confirmation of the derogation shall be treated as a change order/variation under the contract and its consequences shall be decided pursuant to the change/order variation mechanism of the contract.

The submission of a derogation application shall not impact on the programme of works for the specified project and shall be made at the risk and expense of the Contractor. Uisce Éireann or the Employer's Representative shall retain the right to reject the derogation application in favour of compliance with this document.

For the avoidance of doubt, the derogation, where approved, shall only pertain to the specific circumstance for which the derogation is approved. An approved derogation shall not carry any precedent to another project/contract and shall not be used or applied on other similar projects/contracts or circumstances thereafter. The subject of a derogation can only be applied on another contract/project if it has been directly incorporated into the standards/Standards for the relevant contract/project

4 DEFINITIONS

TBD

5 ROLES AND RESPONSIBILITIES

The responsibility for ensuring compliance with the Uisce Éireann Standards and Specifications shall lie with Designers and Contractors. Uisce Éireann reserve the right to inspect all assets at any time to ensure compliance with the Standards and Specifications is being achieved.

6 STANDARD

6.1 General Requirements

Flow measurement devices shall be sized such that they can measure the entire range of flows reasonably expected at the designated measuring point. The following measuring points are deemed the key flow measurement monitoring locations, as they are/can be subject to regulatory flow reporting.

- Flow to plant (FTP)
- Flow to full treatment (FFT)
- Outflow (OF)

The exact range of flows any given flow monitor is required to measure is subject to individual site requirements. For guidance on how to estimate the maximum flow at these given locations, refer to Appendix A of IW-TEC-700-99-02 for formula A calculations, and consult the produced WAC document regarding future design horizon FFT flow permitting requirements. As guidance, an additional 10% allowance should be made on top of the estimated maximum flow for any designated flow monitoring point, and final figures should be agreed with the UÉ project manager. All flow meters should be capable of detecting no flow events (i.e. reading 0l/s). The minimum flow at which accurate calibration of the provided monitoring system should be expected shall be confirmed on a project by project/site specific basis. As a general guidance, for high level design it can be assumed that this is value is 50% of the measured dry weather flow (DWF), but this must be confirmed with the UÉ project manager and technical team.

All internally contained site return flows (e.g. sludge holding tank decant liquor returns) shall be discharged at locations that avoid re-measurement/double counting of flows. Again this will be dependant on site specific set ups in terms of the location of the FFT and FTP. Further guidance on this is provided in the example PFD included in section 6.5.5.

All flow monitoring shall be demonstrated to have an uncertainty better than ±8% and a confidence level of 95% on a weighted average of total daily flow. Transmission and collection errors shall be incorporated into the calculation of overall uncertainty.

On WWTP sites where regulatory reporting of flows is not required, flow measurement on flow to full treatment (FFT) and internal site returns is not required unless an exceptional need is identified and approved by UE.

Commented [JB1]: Not sure why RAS is mentioned here at all? Also would suggest this 1,000 PE figure slightly contradicts some of the other standard numbers (closer to 500hd?). Review and come back to this, seems unneccesariyl specific, monitoring only required where there is a permit need, or a very large site?

Commented [JB2R1]: SME agreed to change wording and include reference to permitting requirements rather than PE figure

Flow measurement equipment shall include the following common ancillaries as required: -

- all necessary pipework, penstocks, valves and flow control equipment for the effective operation and control of the flow measurement equipment;
- all necessary electrical controls, instruments, telemetry, etc. (at sites with a power supply) for the effective operation control and monitoring of the plant;
- isolation valves, penstocks, hand-stops or stop-logs shall be provided for routine maintenance and calibration; and
- by-pass arrangements.

6.2 Identification of Needs

Wherever there is a regulatory requirement to report flow measurements at any of the locations on a given site specified in section 6.1, provision for flow monitoring and reporting in line with the content within this standard shall be provided. Even where there is no regulatory requirement to report flow measurement data, provision for flow monitoring and reporting in line with the content within this standard shall still be provided where the following criteria is met. Where FTP and FFT are the same (i.e. for treat all flow works) the FTP condition shall apply:

- FTP – Any WwTP with Population Equivalent of 2,000hd or greater
- FFT – Any WwTP with Population Equivalent of 1,000hd or greater

The Designer / Contractor shall be responsible for assessing whether additional flow monitoring is required due to site/catchment specific circumstance. Any additional flow monitoring requirements, not required for regulatory purposes, or due as a result of direction from other standards/specifications, is subject to approval by UÉ.

6.3 Equipment/Device Selection

Selection of the required flow measurement equipment is to be based on the maximum expected at the specified flow monitoring location. Maximum flow definition for design

purposes will vary from site to site but with regards to flow measurement at the inlet works (Flow to Plant and FFT) this shall typically be Formula A unless otherwise specified (refer to Appendix D of the Inlet Works and Stormwater Treatment Standard (Ref. IW-TEC-700-99-02) for Formula A calculation). There are some instances, where the inlet works maximum flow may be lower than Formula A, e.g. in cases where separate storm screening is provided. Maximum flows for flow measurement and monitoring design must always be confirmed with the UÉ project manager.

It is the designer/contractor's responsibility to ensure that all data regarding the above factors and how they may influence the flow measurement equipment design at a specific works is collected in advance of IDD workshop 1 & 2. This is so any additional allowance for flow measurement equipment design based on site specific circumstances can be consider in full at these workshops.

Site specific data shall be used where available. Where this is not feasible then estimations should be undertaken. Estimations shall be based on experience and lessons learned from comparable Uisce Éireann sites and shall be submitted by the Designer / Contractor to Uisce Éireann for approval.

Other factors to consider when selecting flow measurement equipment include, but is not necessarily limited to:-

- If influent is pumped or gravity fed;
- Imported sewage or sludge;
- Varying loads;
- Future growth;
- Trade discharge;
- Hydraulic head;
- Site size limitations;
- Health and safety considerations;
- Meteorological Conditions;
- Level of rag contents;

Commented [JB3]: This is a bit vague, maybe be more specific about how and why these would affect the selection?

Commented [JB4R3]: SME suggested leave as is, put something in that this data needs collecting/understood in advance of IDD workshop 1 & 2. SME to talk internally to see if any additional detail needs putting in here

6.4 Application of the Specification

The Designer / Contractor shall demonstrate that the plant and equipment provided satisfies the following requirements:-

- Low whole life cost (WLC);
- Low energy usage;
- High reliability;
- Robustness and operational flexibility;
- Low maintenance and low frequency of operator’s visits;
- Meets Health & Safety Requirements (e.g. minimise operator handling); and

- Good operability and maintenance (e.g. accessibility, ease of process control).

The design process parameters given in the following sections are minimum requirements based on current good practice. A detailed process design shall be undertaken for each proposed works to suit the site specific flow and loading characteristics and Uisce Éireann operational requirements.

The layout of any plant and ancillary equipment shall take into account health & safety requirements, along with maintenance requirements.

The Contractor / Designer shall in the first instance ensure that flow measurement equipment can be maintained online without interruption to the process. Where this is unavoidable the Contractor / Designer shall provide the facility to take equipment out of service for maintenance and cleaning. During such planned maintenance, the required final effluent discharge standard must continue to be met. The Contractor / Designer will be required to demonstrate how he has provided for this situation (this may include provision within the WWDA licence or certificate for a temporary relaxation, where this has been agreed with the EPA).

Commented [JB5]: Think there needs to be a distinction here between regulatory reporting requirements and not. Taking WAS flowmeter out of service would be fine, but sustained interruption to FFT recording presumably not. Think this should be clarified here

Commented [JB6R5]: SME agreed to review list of proposed monitoring points where can be taken out of service for maintenance

Spares shall be provided under the Contract; unless Strategic Spares are already held by Uisce Éireann, or there is an agreed Uisce Éireann framework for repair and maintenance of the equipment. The framework for repair and maintenance must provide an acceptable Operational Service response times to repair / replace equipment to avoid any environmental pollution incidence. Uisce Éireann shall agree all standby & spares provision with the designer / contractor to ensure licence compliance and best WLC asset provision.

Where Supervising Control and Data Acquisition (SCADA) and telemetry systems are provided, the control, monitoring and recording of flow measurement equipment and associated signals shall be fully integrated with the SCADA and telemetry system whether or not the control is provided by a proprietary control panel or a centralised Programmable Logic Controller (PLC).

Where there is any perceived conflict in requirements clarity shall be sought through agreement with IW Asset Management. Waiver / change request arrangements shall be sought through agreement with IW Asset Management.

Commented [JB7]: This still the relevant team to contact?

Commented [JB8R7]: SME suggested leave this as is

6.5 FLOW MEASUREMENT DEVICES

6.5.1 General Requirements

This Section shall be read in conjunction with the latest issue of Water Industry Mechanical

and Electrical Specifications (WIMES) for the plant specified, including the Uisce Éireann amendments and generic data sheets. Electrical installation shall be in accordance with WIMES 300 series, and associated Uisce Éireann amendments.

The following methods of flow measurement are preferred. However, if the designer/contractor can demonstrate alternative approaches that are still in compliance with the requirements in this standard, other approaches will be deemed acceptable without the need to follow the derogation process outlined in section 3.2:

- FTP (pumped) – electromagnetic
- FTP (gravity) – Flume or partial flow electromagnetic
- FFT (pumped) – electromagnetic
- FFT (gravity) – Flume or partial flow electromagnetic
- OF – V Notch Weir/flume

Unless authorised through an approved derogation, following the process laid out in section 3.2, the following shall apply to all flow measurement devices and installations:

- Where instantaneous flow monitoring is required, daily maximum, minimum and average flows (midnight to midnight), expressed as m^3/ day shall be logged for a minimum of 5 years (this may be done via telemetry system).
- All installations shall be in compliance with the relevant sections of the latest MCERT guidance
- Only instrumentation that appears on the latest MCERT approved list shall be accepted for use
- Calibration of all monitoring equipment shall be carried out in line with original manufacturer's requirements, or at least once annually (whichever time interval is shorter)
- All regular maintenance and calibration shall be achievable without requiring access below coping levels.
- Minimum clearance shall be provided such that parts can be removed in a safe & reliable way, without interference to operation.
- All flanges shall be PN16.
- Design life shall be based on availability 24 hours per day, 365 days per year.
- A design life of 20 years for all non-wearing / non-consumable components shall be achieved.
- There shall be a level hard-standing adjacent to the flow measurement facility for access.
- For sites without power supply, a solar/wind powered / battery powered logger shall be provided with an intermittent transfer of flow data to the data logger.
- Flow measurements recorded for regulatory purposes may be used to control other process elements. Any provided installation shall facilitate this by providing signals from the flowmeter transmitter to telemetry and SCADA where installed.

Commented [JB9]: So few points think these could be incorporated in the indiivudal sections

Commented [JB10R9]: SME agreed to remove or move to another section. Review how maintenance is covered in other standards in more depth?

Commented [JB11]: This seems so limited? Remove section and put elsewhere

Commented [JB12R11]: SME agreed to remove or move to another section. Review how maintenance is covered in other standards in more depth?

- Any installation shall allow for the collection and recording of signals (instantaneous and total flow). Flow measurement shall report to telemetry and SCADA where installed.

6.5.2 FLUMES

In addition to the general requirements listed in section 6.5.1, the following requirements related specifically to the installation of assets to provide flume type measurement shall be adhered to.

- All flumes shall be designed to minimum self-cleansing velocity and prevent build-up of rags, debris, grit, etc. from the incoming flow
- Where a standing wave flume is provided, it shall be designed and constructed in accordance with the requirements of the latest version of BS ISO 4359.
- The flume and associated channels shall be designed to operate over the full range of flows without being drowned.
- Where a final effluent flume is used for flow measurement and there is no requirement for a permanent autosampler, there shall be a step drop in level after the flume which does not impinge on its operation but can be used to obtain representative final effluent samples.
- Standing Wave flumes shall be preceded by an area of laminar flow for the installation of an ultrasonic level detector with data logger.

Commented [JB13]: Still relevant?

6.5.3 V NOTCH WEIRS

In addition to the general requirements listed in section 6.5.1, the following requirements related specifically to the installation of assets to provide flume type measurement shall be adhered to.

- Where a V-notch weir is provided, it shall be designed and constructed in accordance with the requirements of BS 3680 Part 4I:-1986. This type of measuring device shall only be used to monitor final effluent.
- The plate with a V-notch weir shall be mounted within a flow measuring chamber, which shall include the ability to obtain representative sample and have a removable light weight cover enabling visual inspection without requiring removal of the cover (e.g. open-grid deck).
- There shall be a facility to clean and remove any settled matter that may accumulate upstream of the plate.
- Sumps upstream of thin-plate weirs shall have a manual drain and wash-down facility for removal of accumulated settled solids. The drain shall not discharge downstream of the weir.
- V-notch weirs shall be preceded by an area of laminar flow for the installation of an ultrasonic level detector with data logger.

6.5.4 ELECTROMAGNETIC METERS

In addition to the general requirements listed in section 6.5.1, the following requirements related specifically to the installation of assets to provide flume type measurement shall be

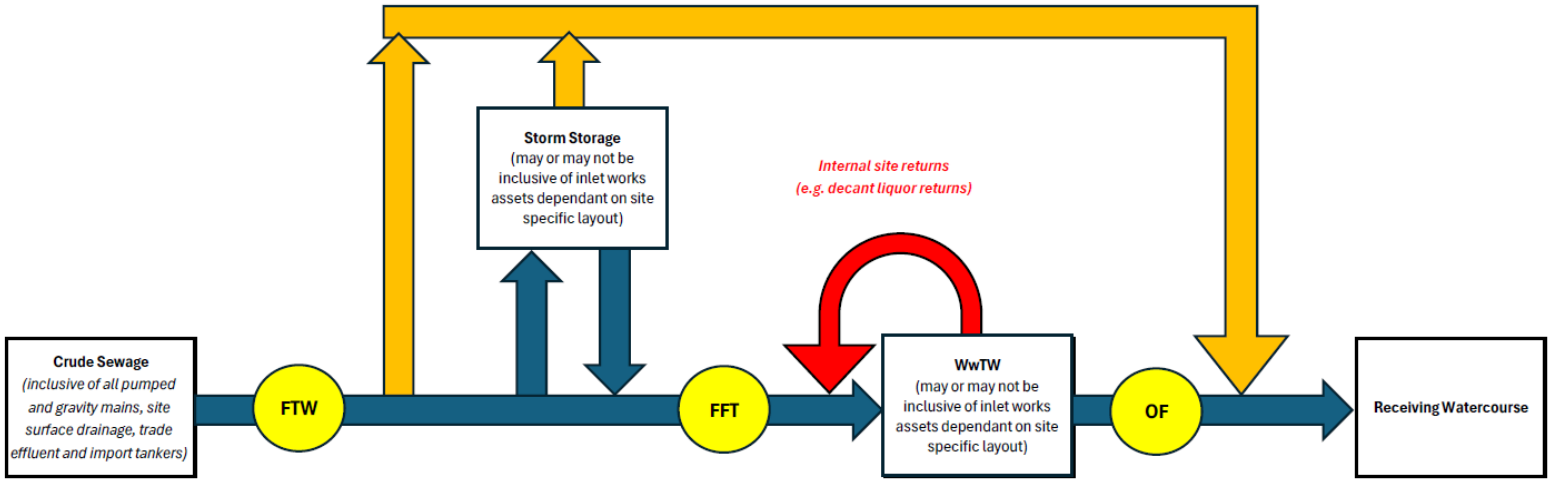
adhered to.

- Where an electromagnetic flowmeter is provided, it shall comply with the requirements of BS EN ISO 6817:-1997 and BS 7405:1991 and be appropriately sized and positioned in accordance with the manufacturer's recommendations to achieve the specified accuracy. The flowmeter shall operate under all flow conditions.
- In the case of an electromagnetic flowmeter, it is recommended to maintain minimum straight lengths distances of x10D upstream and x5D downstream of the meter, or in line with the flowmeter manufacturer requirements, which ever is the greater (where D is the pipe diameter).
- provided for flushing closed pipes routinely and prior to calibration. Accuracy shall be minimum 1% of the flow rate.
- Closed-pipe monitoring of pipelines that are not always fully immersed may utilise a Partial Flow electromagnetic flow measurement device on pipe sizes 150 mm and above. The filling height at average flow rate shall be minimum 30% and above 60% at maximum flow rate.
- Where a V-notch weir is provided, it shall be designed and constructed in accordance with the requirements

Commented [JB14]: Would change this so it reads either this or manufacturers guidance, whatever is the more stringent

Commented [JB15R14]: SME agreed to add this statement in

6.5.5 Location of Required Flow Monitoring



It should be noted that the identified flow monitoring locations are shown to provide context in relation to the flow streams and potential WwTP assets. In reality, there could be multiple individual flow monitoring locations that are required to capture the full flows required.

7 REPORTING (if required)

Refer to requirements set out in section 6.5.1

8 REFERENCED DOCUMENTS

Uisce Éireann documents

- IW-TEC-700-99-02 Inlet works and storm water management V1.0
- IW-TEC-700-99-06 Import Facilities V1.0
- IW-TEC-700-99-08 Sampling at WWTPs V1.0

External documents

- BS ISO 4359:2013 - Flow measurement structures - Rectangular, trapezoidal and U-shaped flumes.
- BS EN ISO 6817:1997 - Measurement of conductive liquid flow in closed conduits. Method using electromagnetic flowmeters.
- BS 7405:1991 - Selection and application of flowmeters for the measurement of fluid flow in closed conduits.
- BS 3680-4I:1986, ISO 8333-1985 - Methods of measurement of liquid flow in open channels. Weirs and flumes. V-shaped broad crested weirs.
- MCERTS - Performance Standards for Flowmeters V2.4 (2013) for both open channel and closed pipe devices.
- Relevant Water Industry Mechanical and Electrical Specifications (WIMES) including the Uisce Éireann amendments and generic data sheets.

Document Name	*Document Number*	*Location*

9 GENERATED DOCUMENTS

None created

Document Name	*Document Number*	*Location*