Uisce Éireann

Inlet Works and Stormwater Treatment (Wastewater)

RECORD OF CHANGES AND AMENDMENTS

Amendment Number	Amendment Date	Author	Initials	Brief Summary of Change	Document Version Number
1	01/08/2015	Wastewater & Sludge Strategy	DW & KC	Draft for Review	0.1
2	01/09/2015	Wastewater & Sludge Strategy	DW & KC	Comments incorporated	0.2
3	01/11/2015	Wastewater & Sludge Strategy	DW & KC	Comments incorporated	0.3
4	08/03/2015	Wastewater & Sludge Strategy	DW & KC	Revision following sub-WTEF workshop	0.4
5	04/07/2016	Wastewater & Sludge Strategy	DW & KC	Post WTEF approval incorporating agreed changes	1.0
6	12/04/2024	Wastewater & Sludge Strategy	PK & KC	Changes detailed in Annex A	1.1

FOREWORD

GENERAL PURPOSE

The Uisce Éireann Standards and Specifications suite of documents describes the minimum standards to be achieved by those engaged in the Design, Construction and Installation of Uisce Éireann assets.

GENERAL SCOPE

The Uisce Éireann Standards and Specifications shall apply to all new assets and to all existing assets undergoing refurbishment, replacement or expansion.

RESPONSIBILITY

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.

REFERENCES

The Uisce Éireann Standards and Specifications may make reference to external documentation (e.g. National Standards Authority of Ireland (NSAI) Standards, British Standards (BS), etc.) which are deemed to form part of the Standards & Specifications. It shall be the responsibility of the Designers and Contractors to obtain copies of all referenced external documentation where this is necessary to ensure compliance with the Standards and Specifications. The most recent version of all external documentation is to be used.

IMPLEMENTATION OF CHANGE

Uisce Éireann reserves the right to implement change at any time. Such changes may be required through a change in external Legislation, internal Policy or Strategic Direction. Any changes to standards are through the relevant Uisce Éireann change process.

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1. PURPOSE

Under the current Wastewater Discharge (Authorisation) Regulations 2007, Uisce Éireann has the responsibility to provide the required level of wastewater treatment prior to discharge to the environment. The Regulations, through a local site Wastewater Discharge Authorisation (WWDA) Licence (>500 PE) or Certificate (≤500 PE), prescribe the quality standards to be applied, the relevant supervision required and the enforcement procedures in relation to the discharge, including sampling frequency requirements, sampling parameters and compliance sampling points.

Wastewater treatment requirements are site specific, risk based and dependent on a number of factors, including influent quality and discharge consent requirements. The inlet works stage is key to a robust and reliable Wastewater Treatment Works (WWTP) as it provides protection to the following treatment stages from rags, grit, debris, etc.

This Specification 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 Specification describes a suite of requirements for wastewater inlet works installations and comprises of Uisce Éireann's policies towards process, control and automation techniques, as well as equipment specifications. While the Specification is provided to convey Uisce Éireann's specific baseline requirements with regard to wastewater inlet works, 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.

Where appropriate, this Specification will make reference to the relevant Water Industry Mechanical and Electrical Specifications (WIMES) which have been adopted by Uisce Éireann in a bid to ensure a baseline quality standard of system design and installation across all categories of wastewater treatment work. For this Specification, the user should make reference to the WIMES documents and associated Uisce Éireann amendments (see Reference section).

The aforementioned WIMES documents shall form the basis of equipment selection, installation and testing for all inlet works installations and, in tandem with this document, should be used as a reference point by the designer / contractor to ensure compliance with Uisce Éireann requirements. Where additional information is required, the designer may also refer to the following Uisce Éireann documents:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

This Specification 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 Specification, WIMES, or other documents 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.

2. SCOPE

The scope of this standard relates to the design and installation of inlet works and storm water treatment on Uisce Éireann wastewater treatment plant sites. The inlet works comprises coarse, fine screening, screenings handling, grit removal and grit handling, fats, oil, and grease (FOG) removal and handling, inflow balancing and odour control. Storm water treatment comprises screening, storm water holding tank, storm water return management and storm water reed beds.

The following is **out of scope** for this standard:

- Flow measurement at the inlet works
- Wastewater Import handling facilities
- Control of return liquors
- Storm water storage in the network

The Uisce Éireann Standards and Specifications shall apply to all new assets and to all existing assets undergoing refurbishment, replacement or expansion.

3. REFERENCES

Uisce Éireann documents

- TEC-700-99-01 Flow Measurement (Wastewater) V1.0
- TEC-700-99-03 Washwater Standard V1.0
- TEC-700-99-06 Import Facilities V1.0
- TEC-700-99-08 Sampling at WWTPs V1.0

External documents

- BS 5493 "Code of practice for protective coating of iron and steel structures against corrosion."
- BS EN ISO 12944 "Paints and varnishes. Corrosion protection of steel structures by protective paint systems."
- BS EN ISO 14713 "Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures."
- BS 7079 Part A1 "Specification for the preparation of steel substrate before application of paints and related products."
- BS EN ISO 1461 "Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods."

- BS EN 22063 "Metallic and other inorganic coatings. Thermal spraying. Zinc, aluminium and their alloys."
- BS 4772 "Specification for ductile iron pipes and fittings."
- BS 3170 "Specification for flexible couplings for power transmission."
- BS 4504 "Circular flange for pipes valves and fittings (PN designated)."
- BS 4662 "Boxes for flush mounting of electrical accessories. Requirements, test methods and dimensions."
- BS 4999 "General requirements for rotating electrical machines."
- EN ISO 3651-2 "Determination of resistance to intergranular corrosion of stainless steels."
- ISO 9223, "Corrosion of metals and alloys - Classification of corrosivity of atmospheres."
- ISO 9224, "Corrosion of metals and alloys - Guiding values for the corrosivity categories of atmospheres."
- WIMES 2.02 Grit Removal and Treatment Equipment
- WIMES 2.03 Packaged Inlet Works for Wastewater Treatment
- WIMES Series 300 Electrical (3.01 to 3.12 inclusive)
- WIMES 4.01 Paints & Polymeric Coatings for Corrosion Protection
- WIMES 5.02 Coarse Screens for Sewage Treatment
- WIMES 5.03 Fine Screens for Sewage Treatment
- WIMES 5.04 Overflow Screens for Sewerage Systems and Sewage Treatment Works
- WIMES 6.03 Screenings Handling Equipment
- WIMES 8.03 Mechanical Installations
- WIMES 8.05 Odour Control Equipment

4. GENERAL

Inlet works processes (providing preliminary treatment) will include a combination of the following:-

- Coarse Screening;
- Fine Screening;
- Screenings Handling;
- Grit Removal;
- Fats, Oil and Grease (FOG) Removal;
- Storm Water Treatment;
- Inlet Flow Balancing;
- Package Inlet Works; and
- Inlet Works Odour Control Requirements.

All treatment stages shall be sized to accommodate Formula A flow as defined in Appendix A. Screens sizing shall account for an additional peaking factor as per Appendix B. Note – the peaking factor applies only to the screenings loading, it is not applicable to the screen flowrate.

On WWTP sites where the population served is less than 500 PE, septic tanks are the Uisce Éireann default option for primary settlement and thus preliminary treatment is not required. For WWTP serving populations less than 500 PE that do not utilise septic tanks for primary settlement, preliminary treatment shall be provided.

Preliminary treatment shall include the following common ancillaries:-

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

4.1. IDENTIFICATION OF PRELIMINARY TREATMENT NEEDS

The minimum requirements for preliminary treatment on Uisce Éireann WWTPs are detailed in Table 4.1, Table 4.2 and Table 4.3. The Designer / Contractor shall be responsible for assessing the catchment and WWTP needs on a site specific basis and supplementing the minimum requirements where needed to provide a suitable and robust form of preliminary treatment. The preliminary treatment process shall be capable of meeting the site discharge license / certificate and also protecting the downstream processes.

Grit removal shall always be downstream of the initial screening stage. On a site which has coarse and fine screens, the grit removal stage may be down stream of the coarse screens but upstream of the fine screens i.e. in between the two screenings stages.

If installed, any FOG removal assets shall be downstream of all screening and grit removal assets.

For larger sites (>25,000 PE) hydraulic modelling should be considered for inlet works installations as it can deliver a more compact, cost-efficient solution.

Consider in the following tables means that the designer shall consider and justify to Uisce Éireann the technical and operational benefits of the options under consideration. Options proposed by the designer must demonstrate whole life cost benefits over the option marked as required, but the will not require the submission of a derogation to be taken forward as the preferred solution.

Derogations against the information provided in Table 4.1,Table 4.2 and Table 4.3 will only be required if a certain type of asset is specified as being required.

Table 4.1: Required Inlet Works Stages Selection Chart

Required Inlet Works Stages								
Works Size (PE – Population Equivalent)		Typical Flow Range (l/s)	Coarse Screening [2]	Fine Screening	Grit Removal [3]	FOG Removal[5]	Package Inlet Works	Odour Control
0-500	Septic Tank(s)[4]	0-10	-	-	-	-	-	Consider
	Other Processes	0-10	-	Required	-	-	Option [1]	Consider
501-1,500		5-20	-	Required	-	-	Option [1]	Consider
1,501-2,500		10-30	-	Required	Required	Consider	Option [1]	Consider
2,501-5,000		20-75	-	Required	Required	Consider	Option [1]	Consider
5,001-10,000		50-150	-	Required	Required	Consider	Option [1]	Consider
10,001-25,000		90-300	Consider	Required	Required	Consider	Option [1]	Consider
25,001+		200+	Consider	Required	Required	Consider	-	Consider

[1] To be provided in lieu of individual components.
[2] Coarse screens are not required if >75% of the peak flow to the works is pumped.
[3] Stone trap to be provided upstream of screening where grit removal not installed. Grit removal and treatment required if primary treatment is not available, or downstream process is a membrane bioreactor, activated sludge process, or sequencing batch reactor.
[4] Septic tanks shall be installed as the preliminary treatment option on plants with less than 500 PE as the Uisce Éireann default option with some exceptions (e.g. site space restrictions, downstream process requirements, etc.).
[5] See Section 7 for consideration on provision of FOG removal

In addition to the requirements in the table above:

- For installations on WwTPs up to 25,000 hd Population Equivalent, coarse and fine screening provision may be provided in a combined screening installation
- For installation on WwTPs on sites in excess of 25,000hd Population Equivalent, coarse and fine screening provision shall be provided by separate installations (where coarse screening is deemed a requirement)
- Screenings handling units (e.g. compactors and wash compactors) will be required for installations on WwTPs over 2,500hd Population Equivalent
- Provision of standby screens handling units is required on installations provideding fine screening provision on WwTPs over 25,000hd Population Equivlaent
- Manual Bypass Screens (19mm) shall be required on any coarse or fine screening installations on WwTPs over 2,500hd or if there is a permit requirement to provide this.

Table 4.3: Required Grit Treatment Selection Chart

Grit Treatment								
Works Size (PE – Population Equivalent)		Grit Removal[2] [3]					Grit Classifier	
		Vortex Type	Cross Flow Tank Type	Aerated Grit Chambers	Standby Unit	Bypass Channel	Duty Unit(s)	Standby Unit
0-500	Septic Tank(s)[1]	-	-	-	-	-	-	-
	Other Processes	-	-	-	-	-	-	-
501-1,500		-	-	-	-	-	-	-
1,501-2,500		Consider	-	Option (in place of vortex type)	-	Required (if grit removal provided)	Required (if grit removal provided)	-
2,501-5,000		Required	-	Option (in place of vortex type)	-	Required	Required	-
5,001-10,000		Required	-	Option (in place of vortex type)	-	Required	Required	-
10,001-25,000		Required	Option (in place of vortex type)	Option (in place of vortex type)	-	Required	Required	-
25,001+		-	Required	Consider	Consider	Required	Required	-

[1] Septic tanks shall be installed as the preliminary treatment option on plants with less than 500 PE as the Uisce Éireann default option with some exceptions (e.g. site space restrictions, downstream process requirements, etc.)
[2] Stone trap to be provided upstream of screening where grit removal not installed.
[3] Constant velocity grit channels permitted only where agreed with Uisce Éireann.

4.1.1. PRELIMINARY TREATMENT CAPACITY & LOADING

Selection of the required preliminary treatment equipment is to be based on the maximum flow received at the WWTP. The definition of the maximum flow to be designed to will vary from site to site but regards to the inlet works sizing unless otherwise specified this shall assumed to be Formula A (refer to document TEC-800-03 for guidance on Formula A calculations). On occasion, WwTP design may only require inlet works design to be sized for Flow to Full Treatment (FFT). This will most likely be the case where there is separate screening provided on flows to on-site storm tanks. If it can be shown to provided a whole life cost effective solution, the designer may propose separate inlet screen installations for the FFT flow streams and the storm tank flows.

Other factors to consider when selecting preliminary treatment equipment include:-

- If the crude sewerage network feeding the WwTP is a combined or separate system;
- Salinity of influent sewage;
- If influent is pumped or gravity fed;
- Septicity;
- Imported sewage or sludge;
- Varying loads;
- Unique characteristics of wastewater due to location;
- Future growth;
- Trade discharge;
- Hydraulic head;
- Site size limitations;
- Aesthetics;
- Availability of washwater;
- Access / lifting considerations;
- Health and safety considerations;
- Meteorological Conditions;
- Level of rag contents; and
- Vulnerable process equipment downstream.

Site specific data shall be used where available. If site specific data is unavailable, the preference will be for site investigation / monitoring / sampling to be carried out to obtain site specific data. Where this is not feasible then estimations can 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.

Alongside the above, reference to the following suite of documents should be made:-

- *TEC-800-03 (Storm Water Overflows)*

4.2. APPLICATION OF THE SPECIFICATION

The Designer / Contractor shall demonstrate that the plant 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);
- Good operability and maintenance (e.g. accessibility, ease of process control); and
- Low environmental impact (e.g. odour, vehicular movements).

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 final effluent quality requirement outlined in the WWDA.

The design and layout of all plant and ancillary equipment shall take into account health & safety requirements, along with maintenance requirements. For example: working platforms should be designed so they do not to contain any unprotected edges or require personnel to overreach any fall protection to access any equipment or instrumentation. The use of fixed ladders should be avoided as a means of accessing raised inlet works or equipment at height, stairs or steps shall be provided. All open channels e.g. inlet flume, storm water overflows, etc. shall be protected and should not present any trip hazards. Considerations shall be given to all screening equipment and how this equipment will be serviced during breakdowns i.e. avoiding or limiting the need to remove/unblocking units by hand thus reducing the risk of entanglement, needle stick injury etc. All overflow screens should be designed to reduce manual handing and/or biological risk associated with their cleaning. Consideration should be given to the location of pipework and equipment so they do not present any bump or trip hazards to personnel working in or around the inlet works. Sufficient connections and tap points should also be provided for washing equipment in order to avoid manual handling and trip hazards associated with the use of long hoses on stairs and walkways etc. Sufficient space should be provided on all working platforms to allow for the safe removal of all equipment. Working close to or under overhead cables shall be avoided. Sufficient emergency stops shall be provided at convenient and visible locations. Consideration shall be given to how full wheelie bins & wheelie skips will be moved or presented for collection by waste removal service in order to minimise/avoid any manual handling risk associated with this activity. The above is a non-exhaustive list of examples that should be considered when designing inlet works. Other health and safety considerations may also be noted throughout this specification.

The overall design and layout of a WWTP shall minimise adverse environmental impacts. Such measures may include utilising technologies that decrease the potable water demand and energy

consumption, covering structures where necessary, minimising odour release and noise, sympathetic colour schemes, boundary fencing and planting schemes, as required by all planning, regulatory and environmental requirements.

As part of the design process, the manning strategy needs to be taken into account, such that accurate whole life cost decisions can be made.

The Designer / Contractor shall give special consideration to facilities which receive mostly (>50%) pumped flows and provide primary treatment within the range 0 - 5000 PE due to pump stop / start flow delivery and diurnal flow impact.

Where more than one process unit is utilised, the ability to take one unit out of service for maintenance and cleaning shall be provided. All process units, vessels and tanks should include the provision to allow for their emptying; this facility can utilise hired plant to enable drain down if this offers the best WLC arrangement. 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.

Minimum requirements are detailed in this Specification; however, decisions on whether or not standby plant is required shall be determined by the criticality of that specific process unit with regard to the impact on the licence condition or the importance to the functional output. Where proprietary plant is provided, the manufacturer shall identify the critical items of plant that may induce failure of their process unit and shall supply stand-by equipment as part of the plant design. 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.

In arriving at decisions on standby provision, the treatment process must be considered as a system and standby shall be provided at the point in the system that provides the lowest whole life cost.

Where Supervising Control and Data Acquisition (SCADA) systems are provided, the control and monitoring of each process shall be fully integrated with the SCADA system whether or not the control is provided by a proprietary control panel or a centralised Programmable Logic Controller (PLC). The Remote Asset Management (RAM) policy for inlet works shall be complied with to ensure all equipment and sensor signals are available for SCADA and telemetry.

In inlet works installations in which final effluent (FE) is of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, the use of FE washwater should be preferred and must follow the requirements of TEC-700-99-03. The requirement for a potable water backup to

the FE system shall be determined as part of the HAZOP process and / or under written instruction from UE Asset Planning (Wastewater).

In cases where the above sustainable measure is unfeasible, clean (potable) water should be utilised for washwater. The use of clean (potable) water as the primary method of Washwater for intel screens must be approved by a derogation and will only be approved if it can be demonstrated as a lower whole life cost option than re-use of final effluent. All connections to potable systems must comply with "Guidance on the use of I.S. EN 1717 in the Uisce Éireann Supply System" to ensure that the water supply system is adequately protected from backflow. All wastewater sites are deemed a Fluid Category 5 risk. Generally protection will be achieved utilising barrier pipework and break tank with an AA or AB type air gap. The AA and AB air gaps shall be as per I.S. EN 13076:2003 and I.S. EN 13077:2008 respectively

This engineering specification is part of a suite of specifications that includes higher level general requirements, including requirements for compliance with the ATEX Directive 1999/92/EC as incorporated into Part 8 of the 2007 Safety Health and Welfare at Work (General Application) Regulations and Safety and Welfare at Work (Confined Spaces) Regulations 2001 (S.I. No. 218 of 2001). Uisce Éireann is currently developing an ATEX zoning designation policy and risk assessment tool, which is in draft form at present. All new and refurbished inlet works shall be assessed in accordance with this draft policy and using the risk assessment tool until this is replaced with the final version of both at which time the approved policy and risk assessment tool shall be used. The risk assessment tool evaluates catchment risk in determining the zoning requirements at the inlet works.

Where there is any perceived conflict in requirements, clarity should be sought through agreement with Uisce Éireann Asset Management. Waiver / change request arrangements should be sought through agreement with Uisce Éireann Asset Management.

The following standards shall be read in conjunction with this Specification where appropriate:-

- ISO 9223, "Corrosion of metals and alloys - Classification of corrosivity of atmospheres."
- ISO 9224, "Corrosion of metals and alloys - Guiding values for the corrosivity categories of atmospheres."
- EN ISO 3651-2 "Determination of resistance to intergranular corrosion of stainless steels."
- BS 5493 "Code of practice for protective coating of iron and steel structures against corrosion."
- BS EN ISO 12944 "Paints and varnishes. Corrosion protection of steel structures by protective paint systems."
- BS EN ISO 14713 "Zinc coatings. Guidelines and recommendations for the protection against corrosion of iron and steel in structures."
- BS 7079 Part A1 "Specification for the preparation of steel substrate before application of paints and related products."
- BS EN ISO 1461 "Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods."

- BS EN 22063 "Metallic and other inorganic coatings. Thermal spraying. Zinc, aluminium and their alloys."
- BS 4772 "Specification for ductile iron pipes and fittings."
- BS 3170 "Specification for flexible couplings for power transmission."
- BS 4504 "Circular flange for pipes valves and fittings (PN designated)."
- BS 4662 "Boxes for flush mounting of electrical accessories. Requirements, test methods and dimensions."
- BS 4999 "General requirements for rotating electrical machines."

4.2.1. ASSOCIATED EQUIPMENT

References to associated Uisce Éireann equipment specifications will be added to this section as and when they become available.

4.2.1.1. WASHWATER PUMPING STATIONS

Washwater will be provided to equipment requiring washwater as stated by the supplier. Washwater will be provided to the standards (e.g. pressure, flow, etc.) outlined by the supplier. Washwater usage shall be minimised by good control and on small WWTP (<1500 PE) the impact of washwater flows shall be taken into account on downstream hydraulics.

Where applicable, refer to the following suite of documents with regards to wash water pumping stations:-

- *TEC-700-99-03 Washwater Standard V1.0*

4.2.2. MAINTENANCE OF ASSETS

All assets shall, at minimum, meet the following maintenance requirements:-

- All regular maintenance should be achievable without requiring access below coping.
- No elements that require greasing shall be below the water line.
- Minimum clearance should be provided such that parts can be removed in a safe & reliable way, without interference to operation.
- Wearable brushes (where used) should be replaceable by a single operator.
- All flanges shall be PN16.

Refer to individual sections for more specific requirements.

5. BASE SCREENING REQUIREMENTS

Where appropriate, this Section shall be read in conjunction with the latest issue of WIMES for the plant specified, including the Uisce Éireann amendments and generic data sheets.

The following WIMES documents apply to Screening: -

- WIMES 5.02 Coarse (1D) Screens for Sewage Treatment;
- WIMES 5.03 Screens for Sewage Treatment;
- WIMES 6.03 Screenings Handling Equipment.

Electrical installation shall be in accordance with WIMES 300 series, and associated Uisce Éireann amendments

Where spray nozzles are used in either final effluent or potable water wash systems they shall be fully enclosed to contain any aerosol. All washwater shall be returned to the treatment flow.

Where the manufacturer's design incorporates screened water as a screenings cleaning medium, this shall not be used within the screening's washing process.

Where mechanical screens are used, these shall be provided with an automatic screenings removal system, incorporating a conveyor / launder channel appropriate to the screen type. Failure of this shall not inhibit screen operation.

All fixings shall be manufactured from stainless steel[1] with appropriate isolation kits where necessary to prevent galvanic corrosion.

Where appropriate, screens and screenings handling units shall be supplied with stainless steel or GRP covers. Hinged or removable sections shall be incorporated in the cover to allow easy access for maintenance but not compromise operator safety. Where necessary, grease lines shall be extended so that lubrication can be carried out with the covers in place. Automatic grease dispensers shall be fitted.

Where equipment cannot be accessed from floor level, an access platform and walkway shall be supplied and designed in accordance with the requirements of this Specification.

Screens will generally be as per Table 5.1 below. Information regarding screen type selection for storm water overflows is now available in TEC-800-03.

[1] The selection of steel grade shall be made on the basis the degree of corrosion resistance required. This shall be a function of the aggressiveness of the environment, particularly with respect to the presence of chlorides, and the frequency and duration of immersion.

Table 5.1: Types of Screen to be Used by Application

Description	
Coarse	**Raw Sewage**
Raked Bar Screens	Preferred
Rotating Bar Interceptors (RBIs)	By Exception
Slot Screens	By Exception
Step Screens	By Exception
Disc Screens	By Exception
Fine	**Raw Sewage**
Escalator Screen (Fine)	Preferred
Band Screen	Preferred
Combined (Inclined Auger) Screen	Preferred
Step Screen	By Exception
Cup / Drum Screen	By Exception

"By Exception" – these screen types may be used where a whole life cost assessment demonstrates that utilisation of this screen type will deliver savings over the preferred screen type and their use is agreed with the Uisce Éireann project team through an accepted derogation. Potential scenarios where this may be the case include re-using existing civil structures that suit a particular screen arrangement, unique influent qualities / content or site hydraulic restrictions.

The above applications are given for guidance and are not exclusive. Refer to Table 4.2: Required Coarse and Fine Screening Selection Chart for further guidance on screen types.

5.1. PEAKING FACTOR

The Peaking Factor Assessment Protocol (P-FAP) developed by Thompson RPM, located in Appendix A, will be used to determine the peaking factor (PF). For further details refer to technical note TRPM-TN004 *Sewage and Catchment Characterisation* (a copy of this document is available as part of the Uisce Éireann document suite).

For Uisce Éireann assets the peaking factor shall be a minimum of 50 in all cases (covering fine and coarse screens).

Note – the peaking factor relates only to the screenings loading volume / rate, it is not applicable to the flow to the screen.

5.2. SCREEN MAINTENANCE

All screens / screening handling systems shall, at minimum, meet the following maintenance requirements:-

- Isolation of screens / screen channel to be permanent.
- Routine service to be possible without removing screen from the raw sewage channel. Any disassembly or re-assembly must not require any special tools.
- Combined screen units should be accessible (by pivot or other means).

Refer to Section 4.3.2 for general requirements.

5.3. DESIGN LIFE

Design life shall be based on the following criteria:

- Design life based on 2000 hours / year screen / handling unit running time.
- 20 years for all non-wearing / non-consumable components.
- 3 years for non-metallic wearing components (i.e. brushes, seals, strips, etc.).
- 5 years for metallic wearing components (i.e. chains, rollers, guides, etc.).

6. SCREENS

Where appropriate, 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.

All screens shall provide a barrier for the removal and disposal of non-faecal solids (e.g. rags, plastic, etc.) of a minimum determinant size from the incoming flow.

The capacity of all standby screens shall be the same capacity as the individual duty screen(s).

6.1. COARSE SCREENS

Coarse screens shall be provided where there is an excessive presence of debris; in the form of plastic wrapping, rags, general floating debris and / or rock, stones and any other items that would have a detrimental effect on the downstream plant / process. Coarse screening provision will be provided where on a site specific basis there is agreement with the Uisce Éireann project team that this will provide a whole life cost benefit.

Coarse screens shall screen in 1 dimension (1D). The definition of a 1D screen is one which incorporates screen curtain apertures with the same size in only 1 dimension; e.g. a 6 mm wide slot, 10 mm bar spacing, 19mm wide bar spacing, etc. Coarse screen bars shall be trapezoidal.

Screens defined as 1D screens should comply with WIMES 5.02 'Coarse (1D) Screens for Sewage Treatment' together with Uisce Éireann Amendments and generic data sheets.

The function of this type of screen is either to protect the downstream processes such as the WWTP inlet fine screens from mechanical damage or to relieve process plant such as grit removal plant from excess ragging.

This Specification therefore applies to the following types of screens:-

- Raked bar screens (e.g. continuous chain raked screens, straight bar screens, curved bar screens, etc.).
- Rotating bar interceptors (RBIs).
- Slot screens.
- Step screens.
- Disc screens.

For Uisce Éireann's preferred type of coarse screen refer to Table 5.1: Types of Screen to be Used by Application.

For coarse screens to be used for the bypass of fine screens refer to Section 6.2 Fine Screens.

6.1.1. PERFORMANCE REQUIREMENTS

Coarse screens shall be provided to achieve the following:-

- debris of size in any one dimension greater than the clear interval between bars shall be separated from the wastewater flow;
- the retained screenings shall be effectively transferred for further treatment and disposal;
- no solids accumulation or deposition in the approach channel shall be observed; and
- the installed equipment will be readily accessible for maintenance purposes.

Screens shall be designed to cope with a minimum of 110% of design capacity – the required design capacity shall be agreed with Uisce Éireann. The approach velocity should be in the order of 0.4 - 0.9 m/s (min - max respectively) depending on the type / design of the screen. The actual capacity and optimum design conditions shall be confirmed with the manufacturer.

6.1.2. DESIGN BASIS

The following approach should be used in the design of coarse screens:-

- Design flow shall be the maximum design flow to the works. An unscreened bypass of the coarse screen shall be provided.
- Minimum design flow in the approach channel shall be greater than 0.4 m/s to prevent grit settlement. Where the designer can provide an alternative approach that prevents channel grit settlement without achieving this minimum velocity, this should be submitted via the derogation process, demonstrating the whole life cost benefits.
- Peaking factor and screenings loading to be based on peaking factor assessment protocol and loading assessment contained in Appendix B and Appendix C respectively.
- Coarse screens shall have a clear spacing between bars not less than 25 mm unless otherwise agreed with Uisce Éireann and confirmed by the manufacturer of downstream fine screens or other equipment can handle larger debris without impacting on their performance guarantees.

When sizing coarse screens the following steps shall be taken:-

- Determine design parameters (e.g. consented Formula A flow or equivalent, average flow, minimum & maximum flows, etc.);
- Assess catchment area, including an allowance for future growth;
- Account for a blinding factor of 50%;
- Assess solids loading;
- Complete a hydraulics assessment, and review site layout;

- Determine screen requirements (e.g. number of screens, duty and standby arrangements, and sizing), and locate placement options for new screen(s);
- Contact suppliers, and revise options towards one option; and
- Complete ancillary documentation for selected option.

The Designer / Contractor shall determine the screenings quantity and loading rates and select the screens and screenings handling plant accordingly. If an accurate average screenings loading value is not available for a given site, a typical figure of 0.045 m^3/ 1000 PE/day shall be specified. This average load should be multiplied by a peaking factor to give a maximum load (refer to Appendix C). Screens selection is to be confirmed as suitable for each site by the Designer / Contractor. Screens should not be selected on flow rate or PE alone, the Designer and Supplier need to optimise screenings capture efficiency by management of surface area of the screen presented at variations in flow rate. Screen selection shall give a greater weighting to their relative performance and robustness over capital cost to minimise WLC.

6.1.3. SPECIFIC REQUIREMENTS

The screen shall be constructed at a minimum entirely of a combination of grade 304 and 304L stainless steel to ensure corrosion resistance; the contractor shall review the local site conditions (location, nature of wastewater etc.) with reference to relevant standards to determine the appropriate grade of stainless steel for construction of screen. Aluminium shall not be used in the fabrication of screens or screen assemblies.

At small sites where flow data may be limited or unavailable, 1DWF at 0.6 m/s is to be used for the purposes of sizing.

Provision shall be made to independently isolate each screen for maintenance and repair. Routine maintenance and repair of wearable parts and bearings shall be easily achieved with the screen in-situ. Routine servicing shall be possible without removing the screen from the raw sewage channel. Any disassembly or reassembly must not require any special tools.

Mechanical coarse screens shall be provided with the manufacturer's proprietary cleaning system. This shall include a mechanical device for the removal of screenings from the screen and depositing the screenings to a screenings handling system, as a minimum requirement.

Lubrication intervals shall be a minimum of 12 months.

Final effluent (FE) of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, should be utilized rather than potable water for screen washwater and launder transfer water. The FE must follow the requirements of TEC-700-99-03, and covers shall be provided to contain the aerosol effect. Any deviation from using final effluent for wastewater must be supported with a WLC assessment. Washwater pipework will be insulated and trace heated as per WIMES requirements.

Benching shall be incorporated in channels to ensure a velocity greater than 0.4 m/s to ensure no deposition of grit and / or organic material. If deposition is unavoidable, manual removal via appropriate equipment (i.e. suction tanker), shall be facilitated by the design. The frequency of removal will be no greater than once per operator site visit, and shall be outlined in the maintenance regime. Estimates of raked bar screen design life shall incorporate an allowance for the loss of the thickness of the bars due to corrosion.

6.1.4. PROCESS CONTROL AND OPERATING REGIME

The cleaning cycle shall be automated to ensure efficient screening removal, to minimise wash water usage and to prevent continuous operation of the screen.

The frequency and duration of this cycle shall initially be set to manufacturers parameters during commissioning, however, provision shall be made within the control system for operator intervention to adjust the time clock settings and / or manually initiate a cleaning cycle in addition to level control operational of the screen.

To protect the screens from damage during cold weather, they will start when the air temperature falls below +1°C and shall operate within an intermittent cycle in accordance with manufacturer's recommendations and to suit local climatic conditions i.e. inland sites, elevation, etc. The screen will continue on an intermittent cycle until the temperature rises above +2°C. It will then revert to operation on demand. The idle duration settings will be determined in order to prevent the formation of ice on the plant and equipment.

The screens will continue to operate in the event of screenings handling plant failure / being unavailable.

A separate local operation station shall be provided. The control system capable of automatic and manual control and the local panel shall include hand / off / automatic and forward / off / reverse (where applicable) and an emergency stop push button. Alarms for tripping of the screens and high level shall be included.

6.2. FINE SCREENS

Fine screens are defined as a screen with a screening aperture between 3 to 6 mm, in 2 directions (2D). Fine screens shall be capable of removing screenings with dimensions greater than 6 mm in any two dimensions. Some downstream processes may require finer screening, up to 3 mm. Unless otherwise stated the term 'Fine Screen' shall imply a 6 mm 2D screen within this Specification.

Sewage screens defined as 2D screens should comply with WIMES 5.03 'Screens for Sewage Treatment' together with Uisce Éireann Amendments and generic data sheets.

This Specification applies to the following types of screens:-

- Fine screens;
- Band screens;
- Drum screens;
- Step screens; and
- Combined screen/screenings treatment equipment.

This section also covers the 19 mm default bar spacing (permissible variance between 17 mm – 24 mm, to allow for manufacturers standard designs) bypass screen that is required as part of the fine screenings stage.

6.2.1. PERFORMANCE REQUIREMENTS

Fine screens shall be provided to achieve the following:-

- Debris of size in any two dimensions greater the screen penetrations shall be separated from the wastewater flow;
- Wash cycles designed to minimise energy consumption and wash water usage;
- Meet the required site discharge license / certificate;
- The retained screenings shall be effectively transferred for further treatment and disposal;
- No solids accumulation or deposition in the approach channel shall be observed; and
- The installed equipment will be readily accessible for maintenance purposes.

Screens shall be shown to comply with the manufacturers provided performance guarantees or in line with the following minimum screenings capture ratios (SCR). This shall be demonstrated by on site testing through pre and post screen sampling over the course of a consecutive 28 day period. :-

- Brush Screens – 64% for 2D 6mm, 86% for 2D 3 mm, 94% for 2D 1 mm.
- Combined Screens – 52% for 2D 6 mm, 73% for 2D 3 mm, 94% for 2D 1mm.
- Escalator Screens – 70% for 2D 6 mm.
- Band Screens – 78% for 2D 6 mm.

The function of this type of screen is predominantly for screening flow to full treatment (FFT) / Formula 'A', but may be used to screen increased flows where the storm overflow weir is downstream of the fine screens or other site requirements dictate.

Screens shall be designed to cope with a minimum of 110% of design capacity for works of sizes greater than 2,500 PE, on sites smaller than this a minimum of 150% of design capacity shall be used – the required design capacity should be agreed with Uisce Éireann. The approach velocity should be in the order of 0.4 - 0.9 m/s (min-max respectively) depending on the type / design of the screen. The actual capacity and optimum design conditions shall be confirmed with the manufacturer.

6.2.1.1. BRUSH SCREEN

The screen shall be of the Combined Brush Screens and Disintegration Screenings Handling equipment as defined by WIMES 5.03 clause 6.7.2 incorporating a brush screen mechanism and disintegration screenings handling.

- Screening shall consist of a curved screenings curtain inclined to the incoming flow incorporating:
  - Perforated Plate screenings mesh.
- Removal of the screenings, from the screenings shall be by a reciprocating brush mechanism, with brushing action with brushes fitted to the front of the spiral by adjustable clamps.
- Screening shall be deposited into sump for transport and simultaneous disintegration by a single dual purpose unit with single motor to a screening condition unit. Screenings transport and disintegration by means of separate macerator & pumps is not allowed.
- Headloss through the screen shall be 100mm or less at design flow.
- All brushes & pins shall be ceramic type and require no lubrication.

6.2.1.2. COMBINED SCREENS

The screen shall be of the spiral sieve type with integral screening conditioning and shall incorporate within its design the following features as standard:

- Semi-circular screenings basket inclined to the incoming flow.
- Perforated Plate screenings mesh.
- Removal of the screenings, from the screenings basket, by means of a shafted helical screw, with brushing action with brushes fitted to the front of the spiral by adjustable clamps.
- The unit shall be able to be mounted at any angle between 35^0 and 48^0, to allow for variable site conditions and restraints.
- The auger brush shall be crimped every 10 mm to ensure localised damage to brush is not propagated during operation.
- The spiral sieve unit is to be supplied with a single motor and gearbox for the removal and compaction and dewatering of screenings. The single speed motor/gearbox drive system for the unit is to be mounted at the head of the unit driving the main shafted screw shaft. The gearbox used is to be of oil filled direct drive type.
- The unit is to be supplied with an intermediate auger bearing located immediately after the perforated basket section.
- The screen auger shall be a hollow shaft fitted with a thermostat controlled heating element designed to provide heating to the screening compaction zone. Electrical connection to the heating element shall be via slip rings adjacent to the geared motor.
- The bearing design shall limit the possibility of the shaft making contact with the basket when the brush has worn is minimal and shall be configured to become wearing part in place of the auger and basket should the brush not be changed as and when necessary.
- Bearings located within the sewage flow or fitted to the bottom of the channel are not

acceptable except by agreement with Uisce Éireann

- The integral screw conveyor shall be completely sealed.
- The integral screw conveyor shall be constructed of stainless steel with a shaftless screw element within the basket area of sufficient length to allow for rigidity of the unit in this area. The design of the unit shall incorporate a shafted element contained within an enclosed screen conveyor.
- The sizing of the screw conveyor shall provide appropriate screw diameters for the sites screenings handling requirements.
- A concentric flanged easily detachable and replaceable dewatering chamber will surround the completely enclosed compaction area, located at the top of the spiral sieve unit. Washings from the screenings in this area will be deposited within the dewatering chamber and returned to the main flow downstream of the screen basket via a PVC drainage tube. This area is to be automatically cleaned and washed on a regular basis for a set period after a set period of operation of the screen to allow for free drainage of the removed washings.
- For channel mounted units, remote spray bar systems for cleaning of the screenings in the basket area is not acceptable due to potential aerosol generation.
- Then unit is to include for the provision of a minimum of 3 nozzles located within the screens conveyor tube which shall be fed by a pulsed washwater solenoid valve to ensure intensive washing of screenings occur within the enclosed screw conveyor section. The nozzles shall be angled to create a vortex flow to break up faecal matter.

6.2.2. DESIGN BASIS

The fine screens should be designed on the following criteria:-

- The maximum required design flow;
- 6mm in 2D unless otherwise stated.
- Complete with bypass arrangement to prevent inlet works or other upstream structure overtopping, sized for 150% of the maximum design flow.
- Complete with 19mm default spacing (varying between 17mm – 24mm) manually raked, bypass bar screen. Sized for 150% of maximum design flow when clean.
- The fine screen approach channels shall be designed to prevent the accumulation of grit and debris so that, at a minimum flow, a velocity of 0.4 m/s is maintained;
- The hydraulic design of the inlet works shall be based on the fine screen(s) being blinded by a factor of 50%.
- All fine screens shall operate continuously at low flow (1DWF) and consideration given to channel design to maintain minimum velocity.
- Peaking factor and screenings loading to be based on peaking factor assessment protocol and loading assessment contained in Appendix B and Appendix C respectively.

When sizing fine screens the following steps shall be taken:-

- Determine design parameters (e.g. consented Formula A flow or equivalent, average flow, minimum & maximum flows, peaking factor, etc.);
- Assess catchment area, including an allowance for future growth;
- Account for a blinding factor of 50%;
- Assess solids loading;
- Complete a hydraulics assessment, and review site layout;
- Determine screen requirements (e.g. number of screens, duty and standby arrangements, and sizing), and locate placement options for new screen(s) with reference to Table 4.2: Required Coarse and Fine Screening Selection Chart;
- Contact framework suppliers, and revise options towards one option; and
- Complete ancillary documentation for selected option.

The Designer / Contractor shall determine the screenings quantity and loading rates and select the screens and screenings handling plant accordingly. If an accurate average screenings loading value is not available for a given site, a typical figure of 0.045 m^3/ 1000 PE/day shall be specified. This average load should be multiplied by a peaking factor to give a maximum load (refer to Appendix C). Screens required to be confirmed as suitable for each site by the Designer. Screens should not be selected on flow rate or PE alone, the Designer and Supplier need to optimise screenings capture efficiency by management of surface area of the screen presented at variations in flow rate. Screen selection shall give a greater weighting to their relative performance and robustness over capital cost to minimise WLC.

Sack screens shall not be used.

For standby requirements refer to Table 4.2: Required Coarse and Fine Screening Selection Chart.

Where duty / standby are required and (only) two units are provided, each shall be capable of handling the maximum flow. Both shall be available continuously.

6.2.2.1. BYPASS SCREEN REQUIREMENTS

The design of the fine screen by-pass arrangement, shall allow the specified flows to by-pass the screen arrangement if they become fully occluded, without overtopping the inlet works.

Bypass needs to be designed to allow flow forward at all times when blinded and shall have a screenings removal trough.

Bypass shall have local hose down point for washing of screens and surrounding area.

The bypass bar screen shall have easy access for removal of any exceptionally large detritus conveyed via the sewer. The screen design / installation shall provide a suitable and safe means for the operator

to rake the screen, remove the screenings and transport them to a suitable disposal / storage location. The preferred arrangement is for the operator to be able to directly rake the screenings to a channel / tray, which allows the removed screenings to be deposited upstream of the mechanical screens.

Table 6.1: Manually Raked Bypass Bar Screen Requirements

Manually Raked Bypass Bar Screen Requirements	
Spacing	19mm default spacing (permissible variance between 17mm – 24mm)
Type	Raked Bar Screen (preferred)
Design Blinding Factor	50% (minimum)
Bypass	Unscreened (150% hydraulic capacity)
Maximum Width	3.5m
Design velocity through blinded screen	1.2m/s
Material	Grade 304 SS minimum (higher grades shall be selected where required by environmental conditions)

6.2.3. SPECIFIC REQUIREMENTS

Fine screens will be installed such that all screens will receive the flow to the works. Provision shall be made to independently isolate each screen for maintenance and repair. Routine maintenance and repair of wearable parts and bearings shall be easily achieved on site.

Screenings handling may be an integral to the screen, incorporating washing and compaction, refer to Section 7 for details of screenings handling requirements.

The screen shall be constructed at a minimum, entirely of a combination of grade 304 and 304L stainless steel to ensure corrosion resistance; the contractor shall review the local site conditions (location, nature of wastewater, etc.) with reference to relevant standards to determine the appropriate grade of stainless steel for construction of screen. Aluminium shall not be used in the fabrication of screens or screen assemblies.

The brush will be of high quality polypropylene and will be complete with fully adjustable mounting brackets to allow for ease of replacement and adjustment to enable the maximum life of the brush to be achieved.

The brushing mechanism shall be provided with a run reverse cycle to reduce hair pinning.

The unit is also to be supplied with bottom sealing plates to ensure that no screenings bypass the unit at its base and the bottom of the sieve basket is sealed to prevent bypassing.

Inlet screen enclosures shall be included to provide suitable cover around screen. The enclosure shall completely cover all elements of the screen but shall be easily removed for normal operation and maintenance. Viewing ports should be provided for moving parts.

The number of screens required shall be determined on a whole life cost basis, taking account of operational issues (e.g. frequency of cleaning required on manual screen, access to the site and likely breakdown frequency, spares requirements and anticipated repair times).

Where only one screen is provided a full set of critical and long delivery spares shall be provided (taking account of any spares held as operational spares for other sites).

The wash water pipework feeding the screen and any launder channels, etc., must be adequately insulated and trace heated. Multiple injection points for washwater shall be provided to prevent a single point of failure on washing system.

Where associated proprietary plant is provided, the manufacturer shall identify the critical items of plant that may induce failure and provide stand-by plant as part of the system design. Where any downstream process requires screening to meet plant and equipment performance guarantees (e.g. activated sludge plant diffusers) a standby fine screen shall be provided.

Lubrication intervals shall be a minimum of 12 months.

Bearing wear sensors shall also be provided. This sensor is to be of an electrical design to highlight brush and make telemetry signals available for inclusion in Site SCADA system and GSM alarm protocol system. It shall be of a proximity switch design and located within the body of the intermediate bearing itself. This will not inhibit the screen's operation. The lamp and fault signal shall be reset via the reset pushbutton when the bearing and sensor have been replaced.

Hand stocks shall be provided such that flows can be diverted to the bypass to facilitate maintenance.

Table 6.2: Fine Screen Requirements

Fine Screen Requirements	
Spacing	6 mm 2D
Type	Perforated Plate
Design Blinding Factor	50%
Design Blinding Factor (no coarse screens)	70%
Bypass	19 mm default bar spacing (permissible variance between 17 mm – 24 mm) screened to take 150% of flow
Max width of screen	2.5 m
Design velocity through blinded screen	1.2 m/s

6.2.4. PROCESS CONTROL AND OPERATING REGIME

The cleaning cycle shall be automated to ensure efficient screening removal, to minimise wash water usage and to prevent continuous operation of the screen.

Each individual screen shall be complete with local emergency stop and reset buttons. The e-stops shall be hardwires to the motor starters and be suitably IP rated for the installation environment (IP65 minimum).

The screens will be termed duty, assist and / or standby, and this will refer to the automatic washing cycle of the screens. The washing cycle will be initiated by head loss measured either by differential across the screenings units or by reference to an upstream high trigger point. Once the cycle has been triggered, the duty screen will wash; if, after washing, the head loss remains, the assist screen will wash. This will continue until all assist screens have been washed. The duty / assist allocation will be subject to a rotation so that all installed screens will have a duty allocation during a specified period. This period will be from the manufacturer or by consultation with Uisce Éireann.

The screen washing operation levels shall be set such that flooding of the head of the works and / or the upstream network does not occur and / or that premature operation of the screen bypass does not occur.

The frequency and duration of the screening cycle shall be set to the manufacturers parameters during commissioning, however, provision shall be made within the control system for operator intervention. To protect the screen from damage during cold weather, screens will start when the air temperature falls below +1°C and shall continue within an intermittent cycle in accordance with manufacturer's recommendations and to suit local climatic conditions (e.g. inland sites, elevation, etc.). The screen will continue on an intermittent cycle until the temperature rises above +2°C.

It will then revert to operation on demand. The idle duration settings will be determined in order to prevent the formation of ice on the plant and equipment. In addition, the following controls shall be included:-

- Notwithstanding upstream head, screens should operate in auto every hour for a fixed adjustable cycle.
- Screens should include adjustable overload protection.
- Cut in / cut out levels should be designed to ensure flooding at the head of the works and / or in the upstream network does not occur.
- Cut in / cut out levels should ensure that premature operation of the screen bypass does not occur resulting in screenings passing through treatment plant.
- A separate local operation station shall be provided. The control system capable of automatic and manual control and the local panel shall include hand / off / automatic and forward / off / reverse (where applicable) and an emergency stop mushroom pushbutton.

7. SCREENINGS HANDLING

Section 7 will be read in conjunction with Section 5.

Where appropriate, this Section shall be read in conjunction with the latest issue of WIMES for the plant specified, including the Uisce Éireann amendments and generic data sheets.

The following WIMES documents apply to Screenings Handling Equipment: -

- WIMES 6.03 – Screenings Handling Equipment.

7.1. PERFORMANCE REQUIREMENTS

Screenings handling units shall be provided to achieve the following:-

- To clean, compact and store removed screenings to an adequate degree that they can be stored on site without creating a nuisance such as odour or scattering over the site due to wind, etc.;
- Shall deliver washed screenings that have an organic matter content acceptable for off-site land disposal as non-biologically active waste; and
- To minimise the water / moisture content of screenings.

In-line disintegration or maceration with the return of screenings to the flow shall not be permitted.

7.2. DESIGN BASIS

The following approach should be used in the design of screenings handling units:-

- A single (common) screenings handling unit will be satisfactory for sites with 1 No. or 2 No. fine screens. If a site contains more screens, additional screening handling units may be required. Multiple screening handling units will be able to run concurrently, unless a combined screening and handling unit is proposed.
- Capacity of screenings handling equipment shall be sufficient to allow all installed screens to be operated simultaneously;
- Equipment used to transport screenings from the screens to the screenings handling units can be common to multiple screens.
- Screenings shall be automatically transferred to skips or bagging units for disposal.
- Screenings handling units must be the washer compactor type, simple compactors will not be permitted on sites greater than 1,500hd PE. For smaller sites, single compactor solutions will be considered without the need for derogation.
- Where only one screenings wash system is provided a by-pass and temporary arrangement will be provided to retain the screenings during maintenance or breakdown of the screenings wash system.

- Skips / wheelie bins will be sized to accommodate sufficient screenings to allow for, at most, one change over per week.

Washed and dewatered screenings shall comply with the following:-

- Minimum 30% average dry solids content;
- No visible faecal matter;
- No odour nuisance;
- A reduction of screenings volume by 50%;
- No free draining water; and
- Screenings will meet requirements outlined in the Irish Waste Management Regulations for disposal in landfills.

Launder channels shall not be used for coarse screen applications.

7.3. SPECIFIC REQUIREMENTS

Provision shall be made for easy and safe access for manual cleaning of the screenings transfer system.

If a singular screening handling unit is in use, critical spares, long lead time items and specialist tools shall be provided.

Hoppers for collecting captured screenings shall be of adequate size to cope with peak loads and shaped to avoid blockages.

Skips used to hold screenings prior to removal from site shall be covered to keep the contents dry and to help control odour. Consideration should also be given to the effects of prevailing winds and measures taken where required to prevent screenings being blown out of the skip.

The screenings handling system shall be either an integral part of the screen as per Table 4.1: Required Inlet Works Stages Selection Chart, incorporating washing and compaction, or a stand-alone unit. The screenings handling system shall be capable of segregating large stones and other large debris to protect the washing and compaction unit from damage. In either case, effluent from the washing cycle shall not contain screenings and shall be returned to the main flow upstream of the screens for further treatment.

An appropriately designed skip will be the preferred Uisce Éireann option. Proprietary bagging unit are to be avoided as they create on-going operational costs and a reliance on the supplier.

Final effluent (FE) of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, should be utilized rather than potable water for screen wash water and launder transfer water. The FE must follow the requirements of TEC-700-99-03. Moreover, dedicated final effluent launder pumps and then a potable washwater system will be used in that order of preference. If effluent launder pumps are chosen, a standby pump will be mandatory.

Design of screenings handling systems, bagging units and disposal facilities including bins and skips shall be capable of working with standard bins, skips, etc., which shall be provided by others under an Uisce Éireann services contract. A suitable system to prevent rainwater ingress and odour nuisance shall be provided.

Where "wheelie bins" are agreed with Uisce Éireann as appropriate, due recognition shall be made of manual handling to minimise risk of operator injury and fully account for collection and disposal arrangements without the need for manual transfer of the bin's contents.

Where skips require to be positioned in a building, there shall be a suitable skip positioning system provided and protection measures to prevent damage to the building fabric and screening handling equipment during skip movements / collections. Drainage of the skip loading area shall be connected to the foul drainage system.

Provision shall be made for easy and safe access for manual cleaning of the screenings transfer system.

Instrumentation to detect blockages within the screenings conveyor will be incorporated, typically this will be level sensors on launder channels / belt systems and torque switches on screw conveyors.

Manually emptied stone traps will be accepted if recommended by the supplier, unless a grit trap is installed upstream. The stone traps will require emptying no more than once per operator site visit. Removal and disposal of the stones shall be facilitated in to the site design.

7.3.1. CONVEYORS AND ESCALATORS

To be sized for the total screening volume plus maximum screen wash water volumes.

7.3.1.1. GENERAL

The Designer / Contractor shall ensure that the design and manufacture meets the requirements of current safety legislation including BS 5667-1 Specification for Continuous Mechanical Handling Equipment Safety Requirements, and BS EN 618+A1 Continuous Handling Equipment and Systems – Safety and EMC Requirements.

Conveyor drives shall be continuously rated and shall withstand the working conditions arising from the siting and use of the conveyor.

Conveyors for use in hazardous areas shall be fitted with belting complying I.S. EN ISO 22721:2007.

7.3.1.2. TROUGHED BELT CONVEYORS

Fixed troughed belt conveyors shall be designed and constructed in accordance with BS 8438+A1.

Where mobile or portable troughed belt conveyors are required these shall be designed and constructed in accordance with BS 4531.

The conveyor shall incorporate a troughed belt having a width and running speed sufficient to remove the maximum amount of materials to be deposited on to the conveyor.

Where inclined conveyors are required the angle of inclination shall not exceed 30˚ to the horizontal. Conveyors shall be reversible for maintenance purposes (reverse 'inching' function).

Belt materials and fixings shall comply with I.S. EN ISO 14890:2013 Conveyor and Elevator Belting.

The belt drive shall consist of an electric motor, transmission and drive pulley. The transmission shall incorporate a reduction gearbox, direct coupled to the motor and with a chain and sprocket drive to the drive pulley.

The drive pulley shall be crowned, and shall comply with the dimensions specified in the appropriate Irish Standard / British Standard. A snub pulley shall be provided to ensure adequate belt wrap on the drive pulley. The belt shall be supported by three roll idlers at centre spacing to ensure that belt sag does not exceed 2% of belt span. A take-up device shall be incorporated at the non-drive end to adjust belt tension. The pitch spacing of the idlers at the loading point shall be reduced to half the normal pitch. Return idlers shall be spaced at intervals not exceeding 2.0 m.

Where necessary conveyors shall be fitted with side plates to ensure the materials deposited are retained on the belt. A drip tray shall be fitted below the belt to collect and return liquors to the sewage flow or site drainage system.

A counter balanced scraper shall be provided at the discharge end having a renewable rubber blade arranged to remove all materials adhering to the belt face.

The whole conveyor system shall be mounted on a steel support frame. Metal surfaces shall be galvanised after fabrication, or painted in accordance with WIMES 4.01.

7.3.1.3. SCREW CONVEYORS

7.3.1.3.1. GENERAL

Screw conveyors shall be designed for horizontal or inclined application as required.

Fixed screw conveyors shall be designed and constructed in accordance with BS 4409 Part 1.

A single screw will not be longer than 25 m, and the conveyor shall not exceed 45˚ to the horizontal.

The conveyor shall incorporate an emergency discharge route, to ensure screenings can still be safely removed manually in the event of mechanical breakdown.

The selection of screw conveyor diameter shall be provided by the contractor prior to installation for approval by Uisce Éireann with supporting calculations and selection criteria.

Where mobile or portable screw conveyors are required these shall be designed and constructed in accordance with BS 4409 Part 2.

The conveyor shall comprise a screw running in a totally enclosed steel fabricated `U' section trough. Dimensions of screw and trough shall comply with the appropriate Irish Standard / British Standard. The top of the trough shall be provided with a weatherproof top cover which shall be of the quick release / removable type.

The drive unit shall preferably be by geared motor via a chain and sprocket arrangement enclosed in a safety guard and with the drive motor top mounted.

An inlet hopper shall be provided at the feed end, and a discharge chute equal to the full trough width shall be provided at the point of discharge.

The screw, trough and covers shall be manufactured from stainless steel complying with I.S. EN 10095:1999.

7.3.1.3.2. SCREW CONSTRUCTION – POWDER OR GRANULAR MATERIALS

For screw conveyors conveying the following materials the screw(s) shall comprise a continuous flight welded to a tubular centre shaft:-

- Dry powders;
- Granular materials including wastewater grit;
- Dewatered sludge cake discharged from filter presses; and
- Wastewater screenings for compaction.

Each shaft shall be supported on end bearings of the sealed for life ball or roller type with secondary dust seals. Where required centre bearings shall be fitted, together with suitable access through the trough to allow replacement.

7.3.1.3.3. SCREW CONSTRUCTION – DAMP OR FIBROUS MATERIAL

For screw conveyors conveying fibrous or damp and viscous materials which can be adhesive, the screw shall consist of a shaftless screw rotating in a U-formed trough lined with replaceable liners. Replaceable liners shall be manufactured from high wear resistant polyurethane or similar material.

The drive unit for shaftless conveyors shall be located at the feed end.

Axial support bearings shall be provided at the non-drive end. The drive end bearing shall be of the combined radial and thrust type and sealed to prevent ingress of grit. The drive end bearing shall be arranged for grease lubrication.

7.3.2. LAUNDER SYSTEMS

A fall less than 1° shall not be used in launder channels. Long radius / swept fittings (bends, t-pieces, etc.) shall be utilised.

Level monitoring shall be provided to detect chokes / blockages in the launder system. The launder shall incorporate an emergency discharge route.

Launder systems shall be complete with stone traps.

Flushing water jet points need to be adjustable to ensure continuous flushing and prevent build-up.

Launders are to be covered with view ports included where possible.

7.4. PROCESS CONTROL AND OPERATING REGIME

Screening handling systems shall be installed as all duty or assist units (i.e. all capable of operating simultaneously, no "standby" units). Where multiple units are installed the inlets shall be complete with actuated valves to allow automatic rotation of the units in operation.

Screenings transport systems shall operate when the screens are in operation and be complete with an operator adjustable run on timer.

To protect the handling units and transport systems (excluding launder channels) from damage during cold weather, they will start when the air temperature falls below +1^{o}C and shall continue within an intermittent cycle in accordance with manufacturer's recommendations and to suit local climatic conditions (e.g. inland sites, elevation, etc.). The units will continue on an intermittent cycle until the temperature rises above +2^{o}C.

In addition, the following controls shall be included:

- Overload protection.
- Run / reverse operation.

8. GRIT REMOVAL

Where appropriate, this Section shall be read in conjunction with the latest issue of WIMES for the plant specified, including the Uisce Éireann amendments and generic data sheets.

The following WIMES documents apply to Grit Treatment Equipment: -

- WIMES 2.02 – Grit Removal and Treatment Equipment;

WIMES 2.02 does not specifically include grit traps or constant velocity channels nor does it include for positive displacement type grit pumps, which are also options that may be considered. Some elements of the Specification however may be applicable, e.g. air lift systems, bridges, etc.

Grit removal shall be provided to prevent accumulation of grit within inlet channels, etc., and protect downstream processes and mechanical plant from abrasion and potential blockages.

Removal includes separation of grit from the wastewater, collection, washing to separate out organic particles, dewatering and handling for disposal.

Grit removal shall be provided at all works treating over 2,500 PE and on smaller works where specific circumstances require grit removal to protect the downstream processes (i.e. smaller sites with no primary treatment) as per Table 4.3: Required Grit Treatment Selection Chart. Works that are likely to require this facility include those:-

- Where high grit concentration has been identified as a particular problem and/or where the size of the grit is in excess of 12 mm;
- Where grit separation is required prior to a package plant; and
- Where grit can cause excessive abrasion to downstream plant.

The method of grit removal is subject to the size of works and whether or not power is available as per Table 4.3: Required Grit Treatment Selection Chart. Grit removal is not necessary for works with septic tanks. The following types of grit separator may be used, subject to specific site requirements:-

- Vortex flow separators;
- Detritors;
- Aerated grit chambers; and
- Constant velocity grit channels (by exception only).

Combined grit removal / screening units will be considered but the unit must meet the performance criteria of the individual sections.

8.1. PERFORMANCE REQUIREMENTS

The following shall be achieved:-

- Grit removal equipment shall comprise one or more fully integrated units designed to remove 95% of grit particles of diameter 0.2 mm and above and with a specific gravity equal to or greater than 2.65, at a settling velocity of 0.3 m/s.
- The grit handling plant shall be designed to produce a product, which is acceptable for local off-site land disposal having no more than 10% organic matter and free of all visible faecal matter. In addition, the product shall have no less than 50% dry solids.
- Free draining water shall be removed as much as feasible.
- Capable of removing peak grit loads, arriving at works following a significant rainfall event.
- Grit separation to be designed for a minimum hydraulic retention time of three minutes.

8.2. DESIGN BASIS

The basis for design should be as follows:-

- The Designer / Contractor shall determine the grit quantity and loading rates to design the grit collector and grit handling plant accordingly. A grit volume of 0.008m3/1000m3 for sites up to 10,000 PE and 0.005 m^3/1000 m^3 for sites greater than 10,000 PE of incoming flow with a peak multiplier of not less than 10 shall be used as a minimum where no specific data is available. Therefore the minimum capacity shall be 0.08m3 (up to 10,000 PE) or 0.05m3 (over 10,000 PE) per 1000 m^3 of incoming flow. Refer to Appendix D for further details on the grit volume calculation;
- The grit separator(s) shall be sized to operate over the full range of flows;
- Constant velocity channels shall be designed so that a horizontal flow velocity between 0.25 to 0.35 m/s is maintained under all flow conditions;
- Grit removal efficiency shall be maintained under all flow conditions to the maximum design flow specified.
- Grit removal equipment shall be selected as per outlined in section 4.1, to suit the size of works and conditions.

All grit removal facilities shall be provided with a manual by-pass arrangement capable of handling 100% of the maximum design flow.

8.3. DESIGN LIFE

Design life shall be based on the following criteria:-

- Design life based on 2000 hours / year grit plant running time.
- 20 years for all non-wearing / non-consumable components.
- 3 years for non-metallic wearing components (i.e. brushes, seals, strips, etc.).
- 5 years for metallic wearing components (i.e. chains, rollers, guides, etc.).

8.4. SPECIFIC REQUIREMENTS

8.4.1. GRIT REMOVAL EQUIPMENT

All equipment shall be of weatherproof construction and suitable for continuous operation in an external location. Hand railing shall be provided around tanks and along the sides of bridges.

For hand railing requirements refer to the following specifications:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

8.4.1.1. GRIT TRAPS

Grit traps shall be provided with an automatic system to wash the grit by agitation with air and an air lift pump to transfer the grit to a vortex separator at high level. Air for each function shall be supplied by a single fixed speed blower and shall be piped to the base of the grit trap by separate headers sized for each duty. Air shall be directed to each header in turn by a three way actuated ball valve. A control system shall be provided to start and run the blower for adjustable time intervals and to sequentially wash and lift the grit.

Air lifts for moving bridges shall incorporate a fixed speed, bridge mounted blower and air pipework to the inlet of the air lift pump. The blower shall run continuously while the bridge is in operation.

8.4.1.2. VORTEX GRIT SEPARATOR

Vortex Grit Separator Systems shall be designed to manufacturer's recommended range of operational level and throughput.

Vortex Grit Separators shall consist of a grit removal chamber with the inlet and outlet separated by not less than 270º of the chamber periphery. The upper part of the chamber shall have a diameter larger than the lower chamber. The chamber walls at the transition section shall slope to allow grit to settle to the base of the lower chamber.

A grit removal device consisting of a vertical rotating hollow tube and demountable impeller shall be fitted centrally in the chamber. The impeller shall be fitted with blades which shall create an upward flow in the central zone of the upper chamber, whilst leaving the outer annulus of the upper chamber quiescent to allow grit settlement.

The gearhead shall comprise a heavy-duty cast iron base housing the bearing and drive assemblies. The base shall support the slewing ring and the driven gear shall be bolted to the rotating section of

the slewing ring. The cover of the gearhead shall support the geared motor and shall have a bolted flanged connection for the airlift pipe.

The grit removal device, gearhead, motor and blower unit shall be supported from a fixed bridge.

If a blower is chosen to be the means of creating the vortex, refer to the following specifications:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

Vortex type separators may be of fabricated steel or concrete construction and shall be of proprietary design and manufacture, complete with mechanically aided grit separation and collection.

8.4.1.3. CONSTANT VELOCITY CHANNELS

Constant velocity channels shall be of parabolic section and shall be sized for the full range of design flows. Channel length shall be twice the design length based on a particle diameter of 0.2mm.

Channel level shall be controlled by a standing wave flume.

Grit settling out on the channel floor shall generally be removed by a travelling suction dredger equipped with airlift or suction lift pumps or other proprietary equipment.

The grit shall be separated and transferred to a grit classifier or conveyor for disposal.

Where manually cleaned constant velocity channels are used a minimum of two channels shall be provided. Manual cleaning will be carried out with appropriate equipment (i.e. suction tanker). Manual isolation shall be provided which may include penstock or single man lift stop-logs.

8.4.1.4. CROSSFLOW DETRITUS TANKS

Cross flow detritus tanks shall comprise an approach channel, circular detention tank with inlet deflector plates to ensure an even flow distribution across the tank, and a rotating collector mechanism which transfers the grit from the tank floor to a collection hopper at the base of a classifier.

Inlet deflectors shall comprise an adjustable pre-cast concrete aerofoil section pivoting on a spindle retained in bearing housings cast into the concrete structure. A facility shall be provided to lock the aerofoil sections in place after the correct orientation has been achieved to prevent flow pressure causing inadvertent movement.

As part of the design process, provision shall be made for ongoing site access to the deflector baffles for re-adjustment of the orientation and removal of any accumulated deposits.

A system based on a bottom bearing within the tank will not be acceptable.

The scraper drive mechanism shall incorporate a mechanical overload safety coupling or other similar device to disconnect the drive. A shear pin device will not be acceptable. The overload coupling shall be fitted with a limit switch to stop the drive and initiate an alarm.

8.4.1.5. AERATED GRIT CHAMBERS

Aerated grit chambers shall be provided with a means of isolation and drain down.

8.4.1.6. BRIDGES FOR GRIT REMOVAL PLANT

8.4.1.6.1. FIXED BRIDGES

Fixed bridges shall generally be provided for detritus tanks, vortex separators and grit traps.

8.4.1.6.2. TRAVELLING BRIDGES

Travelling bridges shall generally be provided for constant velocity grit channels however alternative designs for grit removal arrangements may be considered.

Where bridges are used they can span one or more grit channels to suit the site layout.

The design of travelling bridges shall take into consideration the weight of additional equipment (e.g. grit pumps that may be mounted on the bridge structure). The design shall be able to withstand the operating conditions and forces exerted on the bridge structure due to any such additional equipment, and any other external forces.

8.4.2. GRIT TREATMENT

Design of grit disposal facilities, including bins (for small works only) and skips, shall be capable of working with standard bins, skips, etc., which shall be provided by others under an Uisce Éireann services contract. A suitable system to prevent rainwater ingress and odour nuisance shall be provided.

Drainage of the skip loading area shall be connected to the foul drainage system.

For larger works where two or more grit separators are provided, a common grit classifier and dewatering system may be used to serve a maximum of two grit separators.

All grit treatment systems shall allow for free draining.

8.4.2.1. TRANSFER AND CLASSIFICATION

Transfer mechanisms shall be designed to remove grit from the tank floor or hopper. The grit shall be classified by separating out organic material and sewage. Transfer and classification may be combined using a reciprocating rake classifier or screw classifier.

Grit classifiers shall be of proprietary design. The unit shall facilitate removal of organic matter from the removed grit. All extraneous solids and water shall be returned to the wastewater flow for treatment.

8.4.2.2. AIRLIFT / AIRWASH ASSEMBLIES

Where an airlift / air wash assembly is required to facilitate grit removal, transfer or washing, it shall consist of an airlift and discharge pipe delivering to the grit classifier and shall be complete with separate air wash and airlift headers and actuated 3-way ball valve. The air wash header shall discharge an adequate quantity of air to effect transfer and washing of the collected grit. The airlift shall operate on an operator adjustable time clock control.

The air lift shall be designed for static heads in the range of 3.5 to 5.0 m. The air supply shall be piped to the point of entry to the uptake pipe. The rate of air flow shall be determined to provide a flow of water into the uptake pipe sufficient to suspend the grit and transport it to a high level classifier.

Air lift pumps are to be rotary lobe type.

Aerated grit chambers shall be provided with a means of isolation and drain down.

8.4.2.3. GRIT PUMPS

Where transfer by airlift alone is not possible (e.g. due to static head requirements) grit pumps shall generally be used for the transfer of grit from the collection sump/hopper to the classifier. Where necessary, carrier water shall be provided to re-suspend the grit and facilitate grit removal, with the return liquor discharge back to treatment. The grit pumps shall operate in conjunction with the classifier unit (where appropriate) on an operator adjustable time clock control.

Centrifugal Grit pumps should comply with WIMES 2.02 'Grit Removal and Treatment Equipment' together with Uisce Éireann Amendments and generic data sheets. Suction and discharge isolation valves and a discharge non-return valve shall be provided.

Positive displacement ram type grit pumps shall be specifically designed for pumping grit. All surfaces coming into contact with grit shall be manufactured from hard wearing materials to give the pumps the lowest whole life cost of operation. Typically rams shall be manufactured from tungsten carbide coated stainless steel. All internal passageways shall be smooth and designed to prevent the accumulation of grit. Where ragging may be an issue, double valve chambers shall be provided.

Where grit pumps are provided these shall be proprietary items specifically designed for the duty and form part of the grit removal assembly.

8.4.2.4. RECIPROCATING RAKE CLASSIFIER

Rake classifiers shall comprise a reciprocating rake mechanism installed in an inclined concrete channel.

The lower end of the concrete channel shall be connected to the peripheral discharge port which collects grit from the grit scraper. The rake paddles shall contact the deposited grit on the upward stroke of the rake motion.

An open impeller pump shall wash organic material from the grit particles in the lower part of the channel allowing sufficient time for water to drain off prior to discharge to a skip. The pump shall comprise a suction strainer, an impeller operating in an inlet pipe, motor baseplate and drive unit.

The reciprocating rake shall comprise a fabricated rake assembly, electrically driven via a speed reduction gearbox and bell crank mechanism complete with balance weights.

8.4.2.5. SCREW CLASSIFIER

The classifier shall comprise a solid shaft helical screw design, rotating in a fabricated stainless steel trough. The trough shall be inclined to enable the grit to be lifted and discharged into a skip. The screw shall be supported in upper and lower bearings as appropriate.

The lower bearing shall be of the self-aligning type, sealed to prevent the ingress of grit and shall be grease lubricated by an electrically driven variable output automatic lubricator. The upper bearing shall be mounted above the classifier. A deflector plate shall be fitted over the bearing to prevent the grit being discharged on to the bearing. The upper bearing shall be a grease lubricated sealed bearing of the combined thrust and radial type.

The water and organic material shall be returned to the main flow via a flanged pipe. The dewatered grit shall be discharged at high level from a chute into a skip or other suitable receptacle below.

The screw classifier shall be driven by a direct coupled shaft mounted geared motor. The screw shall be guarded by stainless steel covers securely fixed to the top of the trough. The complete classifier unit shall be self-supporting and suitable for bolting to prepared foundations.

8.5. PROCESS CONTROL AND OPERATING REGIME

The grit removal and classification system shall be under automatic control.

The frequency and duration of the cycle shall initially be set to the manufacturer's parameters during commissioning, however, provision shall be made within the control system for operator intervention to adjust the time clock settings and / or manually initiate a grit removal cycle.

Temperature control, as per manufacturer's requirements, shall be included.

9. FAT, OIL AND GREASE (FOG) REMOVAL

Fat oil and grease (FOG) removal shall be provided as instructed by Uisce Éireann or where the Designer has deduced that it is a requirement to protect process plant or guarantee the stability of treatment process.

FOG removal may either be a separate system or combined with the grit and screenings removal system. It shall protect downstream equipment and reduce operational attendance on a best WLC basis.

Viable methods of FOG removal at wastewater treatment sites, include (in order of preference):

- Physical Removal
  - Natural Floatation
  - Aided Flotation
  - Induced Flotation
- Biological Removal
- Chemical Removal

The preferred method is natural floatation is a skimming tank, aided by diffused air where necessary to achieve the required level of FOG removal / reduction.

Biological and chemical removal methods are to be used to alleviate build-up at historical / specific trouble spots, and used as a large source removal method if physical removal methods are not viable.

FOG removal will only be considered if the treatment process could be negatively influenced by the ingress of FOGs or the expected FOG loading will be in excess of 50 mg/l, and FOG cannot be removed / controlled at the source.

9.1. PERFORMANCE REQUIREMENTS

The following shall be achieved:-

- Removal / reduction in the influent FOG content to a level that does not impact on downstream plant, equipment and processes.
- The water content of the removed FOG is minimised as far as is practicable.

For standby requirements refer to Section 4.1.

Where a single FOG separation unit is used, a by-pass facility shall be provided complete with isolation penstocks or valves for maintenance purposes.

9.2. DESIGN BASIS

The basis for design should be as follows:-

- The system shall be designed to accommodate 110% of the maximum flow.
- The FOG removal process shall achieve a maximum allowable outlet concentration of 50mg/l. Specific downstream processes may require more onerous figures (e.g. MBR). This is to be confirmed on project by project basis with the UE project team.
- Separated FOG shall be stored in a dedicated tank / well. FOG shall not be discharged to sludge holding tanks.

9.3. SPECIFIC REQUIREMENTS

FOG separation by natural floatation and floatation with diffused air are the preferred solutions but other methods will be considered if appropriate process guarantees can be obtained and the method is agreed with Uisce Éireann.

If chemical removal methods are selected, safety equipment shall be utilised (e.g. safety showers, and eyewash stations). Refer to the following suite of specifications:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

Tanks shall be provided with a means of isolation (penstocks, stop-logs or valves) and drain-down facilities for maintenance purposes.

FOG shall be transferred from the separation tank to a dedicated storage tank for appropriate further treatment and / or disposal. Discharge to sludge holding tanks is not acceptable. Where treatment works also include scum removal on primary and secondary treatment, all FOG and scum removed shall be transferred to a common separate holding tank and not mixed with un-thickened sludge; FOG volumes should be minimised as far as practicable.

Where there is anaerobic digestion on site, FOG can be fed to the digestion process as a separate stream in agreement with Uisce Éireann Asset Strategy.

9.4. PROCESS CONTROL AND OPERATING REGIME

Automated systems may operate as a batch or continuous process incorporating all associated plant and controls designed specifically for the works.

Where a batch process is employed, a minimum of two streams shall be provided and shall be fully automated. Provision shall be made within the control system for operator adjustable variable settings (e.g. time clock control, etc.) to enable the control sequence to be optimised and / or varied according to prevailing conditions. Selection should be on the basis of lowest WLC.

10.

10. INLET FLOW BALANCING

Balancing of flows shall be provided as required on a site specific basis.

Flow balancing should be considered in the following situations:-

- At works with less than 100 PE that have strict final effluent requirements;
- Where most of the influent is directly pumped to the works and where no flow balancing measures have been (or could feasibly be) implemented in the sewerage system or pumping station(s) within the catchment;
- Where a wide diurnal variation in load or flow places undue strain upon a treatment plant;
- Where there is a known strong wastewater stream (e.g. trade discharges) (consultation will be made by Uisce Éireann to determine the opportunity for modification of trade effluent agreements or flow management within a single trader's premises);
- Where there is a requirement for sludge liquor return, septic tank and / or leachate imports to the works;
- Where treatment process contains rotating biological contractors (RBCs) and submerged aerated filter (SAF) units downstream;
- Where seasonal variations in population occur; and
- Where the works receives pumped flow from a number of terminal pumping stations whose combined flows will exceed the FFT of the treatment process.

10.1. PERFORMANCE REQUIREMENTS

The following are the main performance requirements for the balancing tanks:-

- Forward flow from the balancing tank shall not cause the maximum design flow to the treatment works to be exceeded and the flow to downstream processes shall be substantially constant; and
- Where the balancing tank incorporates a storm overflow, there shall be sufficient storage volume to prevent premature operation of the storm overflow; i.e. only flows over the instantaneous FFT flow rate shall be permitted to overspill.

10.2. DESIGN BASIS

The following approach shall be adopted in the design:-

- WWTP receiving a pumped flow, the balancing tank shall be sized to even out the flow in the intervals between each pumping cycle;
- The balancing tank shall be provided with a manual valve bypass arrangement, for use in need of grit removal and cleaning of the tank;

- The balancing tank shall, as a minimum, have a capacity the greater of 0.1 m^3/PE, 1 hour retention at dry weather flow, or equal capacity as the operational working volumes of all terminal pumping stations feeding the plant; and
- A high level overflow that deposits downstream shall be incorporated into the balancing tank.

Pumps with bleed back arrangements shall not be used.

Flow balancing can be carried out using modified septic tanks

10.3. SPECIFIC REQUIREMENTS

The floor slope of the tank shall be a minimum of 1 in 10. Alternatively on larger tanks mixers shall be provided.

10.4. PROCESS CONTROL AND OPERATING REGIME

Balancing tanks, unless provided at small works with no power, shall be provided with a high level overflow detector as a minimum requirement with output to the telemetry system to detect failure of the flow control device.

11. INLET WORKS ODOUR CONTROL REQUIREMENTS

Wastewater treatment plants are perceived by the public to be a source of odours. However odours are not considered to be a health risk but are considered to be a nuisance (unless caused by a toxic source i.e. H_2S).

The following section is for odour control requirements solely applicable to the inlet works. Reference to the following suite of documents should be made:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

As a malodourous environment can be created in a multitude of ways, consideration towards odour should be carried throughout the design process. An effective design can reduce the economic repercussions that odours can cause.

All preliminary treatment equipment shall be supplied with odour control if they will be contained in a building that is to be accessed by site operators.

Odour control equipment will be included if the site has historical odour concerns.

To confidently capture all odour issues, an odour risk assessment shall be produced in conjunction with any construction method statement.

Due to the nature and combination of processes and activities likely to be employed at the wastewater treatment plant is important not to treat preliminary treatment odour control and ventilation in isolation.

11.1. PERFORMANCE REQUIREMENTS

To ensure that unpleasant odours can be controlled in the most efficient and cost effective manner the design and layout of the WWTP should take account of all opportunities to minimise the problem at an early stage of the design. The methodology which should be adopted when designing the wastewater treatment plant is to:-

- Consider systems which minimise the production of unpleasant odours;
- Restrict the release of unpleasant odours to the atmosphere by containment and treatment; and
- Maximise the distance between the vented source of the unpleasant odour and the site boundary.

All odour measurements shall be made by using dynamic olfactometry.

Where deemed necessary by Uisce Éireann the efficiency of the odour control system will be determined by continuous readings of hydrogen sulphide concentrations at the inlet and outlet of the system.

The factors which are required to be determined when designing an odour control system will include:-

- The Odour Threshold (dilutions) at the inlet;
- The flow rate;
- The total mass of the contaminants; and
- The Odour Threshold (dilutions) at the outlet.

It should be noted that several factors which can have an effect on odour production include: -

- Nature of sewage;
- Increased retention time of the sewage;
- Increased saline content;
- Increased septicity; and
- Increases in ambient temperature.

A well-designed odour control system shall be capable of accepting a large variation in the contaminant loads and still maintain the designed Odour Threshold at the outlet.

Apart from the nuisance at the WWTP site boundary, high concentrations of odorous gases may give rise to problems within the workplace and may need control. The Occupational Exposure Limit (OEL)

of H_2S is 5 ppm. This is the level at which it is deemed not to be harmful to operators exposed for 8 hours a day, 40 hours a week, over a 40 year working life. (Code of Practice Chemical Agent Regulations 2011.)

A minimum of three air changes per hour shall be enforced at the inlet works.

11.1.1. ODOUR CONTROL MAINTENANCE

All odour control systems shall, at minimum, meet the following maintenance requirements:-

- Where active odour control is in place, the odour vent shall be on fixed element of screen rather than odour cover.

Refer to section 4.3.2 for general maintenance requirements.

11.2. DESIGN BASIS

Odour control systems shall be based on the following technology: -

- Adsorption onto solids;
- Chemical oxidation; and
- Biological oxidation.

Odour masking, incineration, ozone and ultraviolet scrubber systems shall not be considered.

If chemical oxidation is selected, safety equipment shall be utilised (e.g. safety showers, and eyewash stations). Refer to the following suite of specifications:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

Although odour control problems will tend to be process specific, it will be the responsibility of the Contractor / Designer to propose the best WLC solution. Whole life costs are to be considered on a case by case basis.

It should be noted that due to the possible changes in the characteristics of the sewage with time, any system which is supplied must be flexible enough to allow expansion without a total re-design of the odour control system, including collection systems.

Where combined technologies are proposed to remove the odour in two stages or more stages, the first stage would be expected to remove the majority of the contaminants by oxidation methods and the second stage would polish the remaining low level of contaminants by adsorption onto solids.

The odour control system shall be available for use at all times and therefore should be designed in a duty/standby mode. An allowance shall be made for 100% standby capacity in the extraction fan sets, recirculation pump sets, and adsorption onto solids chambers. In the event of duty pump or fan failures, the standby set shall start automatically.

Odour Control Equipment shall be in accordance with the latest version of: -

- WIMES 8.05 – Odour Control Equipment

together with Uisce Éireann Amendments and generic data sheets.

Fans shall be in accordance with the following specifications:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

The treated air shall be exhausted through a purpose built exhaust stack. The factors which are required to be determined when designing an exhaust stack will include: -

- Capacity;
- Material;
- Noise and vibration;
- Shape;
- Visible impact of stack and plume;
- Temperature;
- Access for maintenance;
- Sampling; and
- Lightning protection.

The following suite of specifications should be referenced with regards to ventilation / ductwork systems:

- *None currently available but will be updated as the Uisce Éireann suite of specification documents is created / expanded.*

Odour control systems for wastewater treatment works and sludge recycling centres shall be designed in accordance with I.S. EN 12255-9.

Unless a minimum H_2S concentration discharge is accepted elsewhere, H_2S shall not exceed 250 parts per billion.

If required, dispersion modelling shall be conducted using the US EPA (United States Environmental Protection Agency) AERMOD dispersion model. The output of the model shall be predictions of

ambient concentrations at receptor points for the averaging period of 1 hour, which is post-processed to predict percentiles.

AERMOD dispersion modelling will be required on sites matching one or more of the following criteria:

- Historic odour issues;
- Sensitive receptors within a distance of 100m (minimum);
- When inlet works are to be relocated; or
- Upon addition of major infrastructure (e.g. storm tanks).

Each model shall use the following data about the odour sources:

- Source location in OS coordinates
- Source type (point/area)
- H_2S emission rate (g/s or g/m^{2}s)
- Gas temperature (K)
- Stack height (m)
- Stack diameter (m)
- Efflux velocity (m/s)

All source data and model parameter value used must be valid and robustly sourced / determined. The model report must contain details of the source of all input data and the reasoning behind the selection of all parameter values.

The output of the modelling exercise shall be used to specify the required odour control treatment process.

11.3. SPECIFIC REQUIREMENTS

Each flow stream shall be fitted with volume control dampers (VCDs), non-return valves and isolation valves. VCDs shall be locked in position following commissioning. VCDs shall not be utilised for isolation purposes. Main components, which may be exposed to corrosive agents during normal running or otherwise, shall be manufactured from austenitic stainless steel grade 1.4401 to BS EN 10088.

The inlet ducts shall fitted with mesh screen and disposable dust filters.

All ductwork associated with the odour control system shall be manufactured in accordance with DW151 Specification for plastics ductwork - uPVC and PP as published by the Heating and Ventilation Contractors Association. To ensure sufficient mechanical strength the ductwork shall be coated with GRP (300 g/m^2). The system should be designed to avoid static electrical charges being built up.

Where polishing filters are proposed a de-humidifier controlled by a relative humidistat shall be required to ensure that the relative humidity of the airstream is limited to 70 - 80% before delivery to the polishing filter.

The use of final effluent as a recirculating fluid in the bio-scrubbers shall not be permitted. The distribution nozzles shall be enclosed and dispersal of aerosols into the atmosphere shall be minimised.

The noise shall be below 65 dBA at 1.0 metre from the unit.

A focus on odour prevention should be a priority. The following considerations should be taken for the inlet works:-

- Placement of troublesome odour producers shall be placed away from receptors;
- Reduce retention of wastewater;
- Incorporate flow balancing to avoid peaking of septic loads;
- Measures shall be taken to reduce turbulence; if wastewater is known to be septic, extra concern will be placed on turbulence created at the screens and inclusion of bell-mouths;
- Maintain suitable velocities to avoid deposition of material in unwanted areas;
- Prevent the creation of dead zones; attention shall be placed on by-passes;
- Consider the use of scum removal if significant build-up is observed;
- Screenings shall be appropriately washed and dewatered;
- Skips shall be covered;
- Facilitate cleaning of equipment with the inclusion of a washwater supply;
- Allow for easy and expedited emptying of storm tanks during periods of reduced flow; and
- Channels shall not contain stagnant water when not in use.

If odour control measures are required, it is more favourable to treat low volumes of higher concentrated odours than high volumes of less concentrated odours. Due to this, emphasis shall be placed on minimising the number of air changes.

Where appropriate, odour control equipment can be used to treat multiple odour sources. The use of odour control in this way will be chosen on a site-by-site basis, with consideration for site layout and requirements of the odour control unit.

Vent discharge location shall be highlighted during design to accentuate dispersion.

11.4. PROCESS CONTROL AND OPERATING REGIME

Where deemed necessary by Uisce Éireann, the system shall be fully automated and monitored by continuous gas monitoring equipment to control the airflow and establish efficiency.

12. PACKAGE INLET WORKS

Where appropriate, this section shall be read in conjunction with the latest issue of WIMES for the plant specified, including the Uisce Éireann amendments and generic data sheets.

The following WIMES documents apply to Package Inlet Works: -

- WIMES 2.03 – Package Inlet Works for WWTP;

Packaged systems may be utilised, as permitted by Section 4 of this document, for individual stages, combined stages or the complete inlet works installation.

When proprietary, packaged units are utilised, which contain multiple stages within a single unit (i.e. combined grit removal and fine screens) the order of process stages does not need to fully comply with the requirements of Section 4 of this document; e.g. a common example being a small, packaged grit removal and fine screening unit which has the grit removal stage up stream of the fine screen.

All elements, components and parts of a packaged unit must still comply with all the requirements outlined within the relevant sections of this document and all other Uisce Éireann specifications.

P-FAP SHEET

This table shall be read in conjunction with technical note TRPM-TN004 (Sewage and Catchment Characterisation) by Thompson RPM for guidance on scoring characteristics.

	Topic	Issue	Points Score Basis	Points	Score
1	Catchment Population (40)	Population Equivalent (25)	Up to 40,000 PE	25	
			40,000 – 100,000 PE	20	
			100,000 – 500,000 PE	15	
			Over 500,000 PE	5	
		% Seasonal Variation (15)	Over 100%	+15	
			100% - 60%	+10	
			60% - 20%	+5	
			Less than 20%	+0	
2	CSOs / Screens (20)	% CSOs In Catchment with (6mm) Screens (20)	Over 75%	+20	
			75% - 50%	+15	
			50% - 25%	+10	
			Less than 25%	+5	
3	Catchment Characteristics (40)	% Combined / Separate System (15)	Over 80% combined	+15	
			80% - 65%	+10	
			65% - 50%	+5	
			Less Than 50%	+0	
		% Pumped / Gravity Flow to WWTP (15)	Over 80% pumped	+15	
			80% - 65%	+10	
			65% - 50%	+5	
			Less Than 50%	+0	
		Catchment Sewer Gradient (10)	Steep	+10	
			Average	+5	
			Flat	+0	
				TOTAL CALCULATED PEAKING FACTOR =	
				MANUAL ADJUSTMENT FACTOR =	
				FINAL ASSESSED PEAKING FACTOR FOR DESIGN PURPOSES =	

Note – **the minimum allowable peaking factor shall be 50**, regardless of the output of the calculation above.

APPENDIX B SCREENINGS VOLUME CALCULATION

Screenings Volume Calculation		
Catchment PE	User Entered Value	=
Screenings Product Rate (m^3/1000 PE/day)	Value From Specification (minimum)	= 0.045
Daily Volume (m^3)	= (Catchment PE / 1000) x 0.045	=
Hourly Volume (m^3)	= Daily / 24	=
Peaking Factor (PF)	User Enter Value (refer to Appendix B)	=
Maximum Screenings Load	**= PF x Hourly Volume**	**=**
Screens and Screenings Handling equipment to be sized based on the Maximum Screenings Load.		
Compacted Screenings Storage i.e. skips or wheelie bins, to be sized based on Daily Volume.		

APPENDIX C GRIT VOLUME CALCULATION

Grit Volume Calculation		
Works Dry Weather Flow (l/s)	User Entered Value	=
Works Daily Flow (m^3)	= Works DWF x 3600 x 24 / 1000	=
Grit Production Rate (m^3/1000m^3)	Value From Specification (minimum)	=
Daily Volume (m^3)	= (Works Daily Flow / 1000) x Grit Production Rate	=
Hourly Volume (m^3)	= Daily / 24	=
Peak Multiplier (PM)	Value From Specification (minimum)	= 10
Maximum Grit Load	**= PM x Hourly Volume**	**=**
Grit Removal and Grit Handling equipment to be sized based on the Maximum Grit Load.		
Grit Storage i.e. skips or wheelie bins, to be sized based on Daily Volume.		

APPENDIX D ANNEX A – CHANGES DETAILED

Annex A - Specification Update					
Document Sponsor	**Doc. Ref. or Section**	**Date of Change**	**Innovation Description**	**Specification Change**	
Ken Conroy	Section 4.3 Page 21	25/01/2024	Promoting more sustainable solutions in the overall design of the WWTP	Original Clause	The overall design and layout of a WWTP shall minimise adverse environmental impacts. Such measures may include covering of structures where necessary, minimisation of odour release and noise, sympathetic colour schemes, boundary fencing and planting schemes, as required by all planning, regulatory and environmental requirements.
				Revised Clause	The overall design and layout of a WWTP shall minimise adverse environmental impacts. Such measures may include utilising technologies that decrease the potable water demand and energy consumption, covering structures where necessary, minimising odour release and noise, sympathetic colour schemes, boundary fencing and planting schemes, as required by all planning, regulatory and environmental requirements.

Ken Conroy	Section 4.3 Page 22	25/01/2024	The requirement to use Final Effluent over potable water where possible in the WWTP process	Original Clause	All inlet works installations which utilise clean (potable) water for washwater must comply with "Guidance on the use of I.S. EN 1717 in the Uisce Éireann Supply System" to ensure that the water supply system is adequately protected from backflow. All wastewater sites are deemed a Fluid Category 5 risk. Generally protection will be achieved utilising barrier pipework and break tank with an AA or AB type air gap. The AA and AB air gaps shall be as per I.S. EN 13076:2003 and I.S. EN 13077:2008 respectively.
				Revised Clause	In inlet works installations in which final effluent (FE) is of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, the use of FE washwater should be preferred and must follow the requirements of TEC-700-99-03. The requirement for a potable water backup to the FE system shall be determined as part of the HAZOP process and / or under written instruction from Uisce Éireann Asset Planning (Wastewater). In cases where the above sustainable measure is unfeasible, clean (potable) water should be utilised for washwater. All connections to potable systems must comply with "Guidance on the use of I.S. EN 1717 in the Uisce Éireann Supply System" to ensure that the water supply system is adequately protected from backflow. All wastewater sites are deemed a Fluid Category 5 risk. Generally protection will be achieved utilising barrier pipework and break tank with an AA or AB type air gap. The AA and AB air gaps shall be as per I.S. EN 13076:2003 and I.S. EN 13077:2008 respectively.

Ken Conroy	Section 6.1.3 Page 30	25/01/2024	The requirement to use Final Effluent over potable water where possible in the WWTP process	Original Clause	Wherever possible, final effluent rather than potable water shall be utilised for screen washwater and launder transfer water. Where final effluent is used then covers shall be provided to contain the aerosol effect. Any deviation from using final effluent for washwater must be supported with a WLC assessment
				Revised Clause	Final effluent (FE) of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, should be utilized rather than potable water for screen washwater and launder transfer water. The FE must follow the requirements of TEC-700-99-03, and covers shall be provided to contain the aerosol effect. Any deviation from using final effluent for wastewater must be supported with a WLC assessment.
Ken Conroy	Section 7.3 Page 40	25/01/2024	The requirement to use Final Effluent over potable water where possible in the WWTP process	Original Clause	Wherever possible, final effluent rather than potable water should be utilised for screen washwater and launder transfer water. In place of this, dedicated final effluent launder pumps, and then a potable washwater system will be used in that order of preference. If effluent launder pumps are chosen, a standby pump will be mandatory.
				Revised Clause	Final effluent (FE) of suitable quality, with sufficient quantity and consistent availability as per TEC-700-99-03 indicates, should be utilized rather than potable water for screen wash water and launder transfer water. The FE must follow the requirements of TEC-700-99-03. Moreover, dedicated final effluent launder pumps and then a potable washwater system will be used in that order of preference. If effluent launder pumps are chosen, a standby pump will be mandatory.