
Wastewater treatment plants - Part 3: Preliminary treatment

Kläranlagen - Teil 3: Abwasservorreinigung

Stations d'épuration - Partie 3: Prétraitements

Ta slovenski standard je istoveten z: EN 12255-3:2000

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Odpadna voda

Sewage water

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Kläranlagen - Teil 3: Abwasservorreinigung

This European Standard was approved by CEN on 17 August 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Waste water engineering", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2001, and conflicting national standards shall be withdrawn at the latest by March 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

It is the third part prepared by the Working Groups CEN/TC 165/WG 42 and 43 relating to the general requirements and processes for treatment plants for over 50 PT. The parts of the series are as follows:

- Part 1: General construction principles
- Part 3: Preliminary treatment
- Part 4: Primary settlement
- Part 5: Lagooning processes
- Part 6: Activated sludge processes
- Part 7: Biological fixed-film reactors
- Part 8: Sludge treatment and storage
- Part 9: Odour control and ventilation
- Part 10: Safety principles
- Part 11: General data
- Part 12: Control and automation
- Part 13: Chemical treatment
- Part 14: Disinfection
- Part 15: Measurement of the oxygen transfer in clean water in activated sludge aeration tanks
- Part 16: Physical (mechanical) filtration

NOTE For requirements on pumping installations at wastewater treatment plants and in their water feed field, provided initially as part 2 "Pumping installations for wastewater treatment plants", see EN 752-6 "Drain and sewer systems outside buildings - Part 6: Pumping installations.

The parts EN 12255-1, EN 12255-3 to EN 12255-8 and EN 12255-10 and EN 12255-11 became implemented together as a European package (Resolution BT 152/1998). The date of withdrawal (dow) of all conflicting national standards is 2001-12-31. Until the date of withdrawal is reached the National and the already published European standards both coexist.

1 Scope

This part of this European Standard specifies the requirements for preliminary treatment of wastewater at wastewater treatment plants for over 50 PT.

The primary application is for wastewater treatment plants designed for the treatment of domestic and municipal wastewater.

Preliminary treatment may include one or more of the following options:

- screening;
- grit removal,
- grease separation;

- flow balancing and flow separation.

NOTE Flow measurement and/or sampling provision may be included with any of the chosen options.

Differences in wastewater treatment throughout Europe have led to a variety of systems being developed. This standard gives fundamental informations about the systems; this standard has not attempted to specify all available systems.

Detailed information additional to that contained in this standard may be obtained by referring to the bibliography.

2 Normative references

This European Standard incorporates by dated or undated references, provision from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1085

Wastewater treatment — Vocabulary

prEN 12255-1:1996

Wastewater treatment plants — Part 1: General construction principles

prEN 12255-10:2000

Wastewater treatment plants — Part 10: Safety principles

prEN 12255-11:1998

Wastewater treatment plants — Part 11: General data

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3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 1085 apply.

4 Requirements

4.1 General

Preliminary treatment units are an important part of the overall wastewater treatment process, since they serve to ensure that the subsequent main treatment stages operate effectively. The preliminary process requires the removal of large floating and suspended solids, grit, grease and oil. Unless preliminary units are correctly designed, variations in flow may cause operational problems in the subsequent processes. This is particularly true of smaller plants.

The type and size of units are influenced by the overall system and the nature of the wastewater to be treated. Combined sewerage systems usually have greater variations in flow than separate systems so that storm water separation arrangements and/or flow balancing may be necessary. Grit removal may be required to prevent damage to following treatment units and pumps. Where treatment plants receive significant amounts of organic industrial wastes, e. g. from food processing, the provision of grease and oil removal units is essential.

4.2 Planning

The design considerations for a preliminary treatment system shall include a combination of the acceptable options to fulfil the process. Selection shall be based on an assessment of the characteristics of the wastewater to be treated, the size of the installation and its technical and economic consequences on subsequent processes.

The requirements for the installation should be determined after consideration of the following factors:

- the effect of the flows on the subsequent treatment processes;
- the need to limit retention time in order to avoid septicity and/or premature sedimentation
- fine screening and its influence upon sludge treatment and the necessity for primary treatment;
- grit removal with or without grease and oil separation;
- requirements for the disposal of grit and, the necessity for or possibility of grit washing;
- the reliability of the treatment process;
- the need to provide frost protection for exposed pipework and equipment where it is warranted.

Once the requirements for the installation have been determined, consideration should be given to the requirements for the chosen site, taking into account collection and disposal of screenings, grit, grease and oil.

In addition, further general requirements are shown in prEN 12255-1:1996, prEN 12255-10:2000 and prEN 12255-11:1998.

4.3 Process

4.3.1 Screening

When screening is selected as an option, the screens shall remove suspended solids and debris from the flow stream.

NOTE 1 Screen aperture size may be influenced by the requirements of sludge disposal and subsequent process requirements or the discharge permit conditions for the final effluent.

The following minimum apertures for screens are a guide:

- a) 20 mm to 50 mm : coarse screens protecting plant and to prevent flow blockage;

NOTE 2 Coarse screens are used to protect mechanical plant by removing floating and large suspended solids in the form of paper, rags and plastics material.

- b) 10 mm to 20 mm : medium screens to prevent flow blockages;

- c) 2 mm to 10 mm : fine screens to reduce debris accumulating in the sludge.

NOTE 3 Screens may be accompanied by washing, de-watering and compaction of screenings.

The design velocities through screens shall not exceed 1,2 m/s at maximum flow. The velocity in the approach channel should not fall below 0,3 m/s at minimum flow.

The potential health hazards which can arise from the handling and disposal of screenings shall be taken into account. See prEN 12255-10:2000 for further details.

With the exception of overflows to a storm water holding tank where screening may not be necessary, wherever inlet overflows are installed screens shall be provided.

Screenings shall be disposed of in accordance with national regulations.

The normal configuration of screening installations is the multiple-channel type, a bypass with a hand-raked coarse screen being required for single-channel installations. Provision shall be made to ensure that each channel can be closed down separately.

The structural design of the screen shall be capable of withstanding 0,5 m hydraulic head.

The difference between upstream and downstream sewage levels shall be calculated for the maximum flow considering the aperture of the screen and the covering with retained material.

The raking cycle should not exceed two minutes. Where this is not possible (e. g. deep installations) the design should accommodate higher loads, level differences and freeboard. The useful load of the mechanical rake shall be taken as 1 kN per m of screen width, with a minimum of 0,6 kN.

The drive shall be designed for continuous operation and shall be appropriate for the largest solids expected.

The scraping and driving elements shall be protected against mechanical and/or electrical overloading.

Unless otherwise agreed, the design service life of the equipment for screening installations shall correspond to service life class 3, as specified in prEN 12255-1:1996.

4.3.2 Grit removal

Grit removal units shall be designed to remove grit particles with a minimum diameter of 0,3 mm and a settling velocity of 0,03 m/s.

A horizontal velocity of flow of 0,3 m/s is the optimum suitable for the removal of such grit particles in constant velocity channels and cross-flow settling basins.

NOTE Combined sewerage systems contain significant amounts of grit which enter the sewers via road gullies and run off from paved areas. Separate sewerage systems may also contain grit, particularly in coastal or sandy areas.

Separated grit may be washed and any organic matter removed should be returned to the flow for further treatment. The grit shall be disposed of in accordance with the health and safety requirements specified in prEN 12255-10:2000.

Grit chambers should be constructed to operate in multiple channels. In the case of single channel installations, a bypass or alternative facility should be provided. Design features shall ensure that each channel may be taken out of service individually.

Chambers shall be designed to withstand surge loads of grit as may occur during heavy rainfall and/or after long periods of drought. Pumps, scrapers and drives shall be designed accordingly.

Scraper loading shall be assumed to be 10 kN/m² of the scraper, or 5 kN/m² where the scraper adjusts automatically to the level of the material to be removed.

Pumps shall be suitable in both design and material, for use in grit chambers (e. g. have a single channel or disk impeller). They shall be submersible and the suction should be adjustable in height whilst the pumps are in operation.

Where air-lift pumps are used they shall be provided with a backflushing facility.

The velocity of compressed air in pipes of aerated grit chambers shall not exceed 20 m/s to prevent noise pollution.

The construction principles of travelling bridges on grit chambers are specified in prEN 12255-1:2000.

The design service life of drives, bridge scrapers and pumps shall correspond to class 3; that of air supply systems of air-lift pumps to class 2 and, that of air supply equipment for permanent aeration systems to class 3; all as specified in prEN 12255-1:2000.

4.3.3 Grease and oil separation

Because of the deleterious effect of grease it shall be removed rather than being emulsified or solubilised. Where domestic and municipal wastewater includes discharges from hotels, restaurants and food processing operations, a grease and oil removal stage should be included in the design of the plant.

NOTE 1 As an alternative to grease removal as a separate stage, it may be possible to combine grease/oil and grit removal in a single unit or in the primary settlement stage.

Where commercial kitchens or similar establishments are situated upstream of the plant, dedicated grease traps should be installed on the respective kitchen drains.

Grease and oil removed from the wastewater shall be disposed of in accordance with the health and safety requirements of prEN 12255-10:2000. The design of the grease separator shall facilitate the safe and efficient removal of separable solids, grease and oil.

NOTE 2 Grease and oil removed from the wastewater may be de-watered before disposal.

4.3.4 Flow balancing and flow splitting

Flow balancing may require flow measurement. Flows in excess of the design capacity of subsequent stages shall be diverted into flow balancing tanks. This shall take place after screening and grit removal where these processes are provided.

The accuracy of flow measurement should not be significantly affected by the presence of suspended solids.

NOTE 1 Reduction in flow variations through the treatment processes may be beneficial but the cost and complexity of flow balancing is not easily justified on smaller plants.

All flow balancing and flow splitting installations shall be designed for ease of cleaning.

Where it is not permissible to by pass, influent flow balancing shall be included in the treatment process.

Provision shall be made for the removal of solids deposited in balancing tanks.

NOTE 2 It is important that the organic solids are returned to the treatment flow.

Provision may be made for aeration of balancing tanks in order to avoid anaerobic conditions and nuisance odours.

4.4 Maintenance

The requirements for access, spare parts and maintenance of plants are given in prEN 12255-1:1996.

4.5 Health and safety

The health and safety requirements as specified in prEN 12255-10:2000 shall be fulfilled.