SLOVENSKI STANDARD
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Wastewater treatment plants - Part 4: Primary settlement

Kläranlagen - Teil 4: Vorklärung

Stations d'épuration - Partie 4: Décantation primaire

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13.060.30 Odpadna voda Sewage water

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Wastewater treatment plants - Part 4: Primary settlement

Stations d'épuration - Partie 4: Décantation primaire

Kläranlagen - Teil 4: Vorklärung

This European Standard was approved by CEN on 9 November 2001.

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 Management Centre 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 Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Wastewater 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of an identical text or by endorsement, at the latest by July 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

It is the fourth part prepared by the Working Groups CEN/TC 165/WG 42 and 43 relating to the general requirements and processes for treatment plants for a total number of inhabitants and population equivalents (PT) over 50. 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 required

— Part 12: Control and automation

— Part 13: Chemical treatment – Treatment of wastewater by precipitation/flocculation

— Part 14: Disinfection

— Part 15: Measurement of the oxygen transfer in clean water in aeration tanks of activated sludge plants

— Part 16: Physical (mechanical) filtration[1)]

NOTE For requirements on pumping installations at wastewater treatment plants, 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".

EN 12255-1, EN 12255-3 to EN 12255-8 and EN 12255-10 and EN 12255-11 were implemented together as a European package (Resolution BT 152/1998).

[1)] In preparation.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the performance requirements for the primary settlement 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.

Differences in wastewater treatment throughout Europe have led to a variety of systems being developed. This standard gives fundamental information 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 reference, provisions 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 (including amendments).

EN 1085, *Wastewater treatment — Vocabulary.*

EN 12255-1, *Wastewater treatment plants — Part 1: General construction principles.*

EN 12255-3, *Wastewater treatment plants — Part 3: Preliminary treatment.*

EN 12255-10, *Wastewater treatment plants — Part 10: Safety principles.*

EN 12255-11, *Wastewater treatment plants — Part 11: General data required.*

EN 12566-1, *Small wastewater treatment systems for up to 50 PT — Part 1: Prefabricated septic tanks.*

3 Terms and definitions

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

3.1
lamella separator
system of regularly spaced, inclined plates or tubes, designed to increase the effective settling area in a settlement tank

4 Requirements

4.1 General

Primary settlement serves the purpose of separating settleable solids, which are removed on a regular basis in the form of raw sludge. Grease and other floating materials which can cause malfunction of a wastewater treatment plant can also be separated and removed during this process**.** Where large quantities of grease are expected a separate grease separation step is recommended prior to primary settlement (see EN 12255-3).

The type and size of unit(s) will depend on the overall system, PT, sludge removal and ground conditions prevailing on the construction site.

Primary treatment may include the following types of settlement tank:

— upward flow (including Imhoff) - generally square or circular in plan;

— horizontal flow - generally rectangular in plan;

— lamella separator.

Primary settlement may not be required e.g. where biological treatment is by lagooning or by certain activated sludge processes. The consequences for subsequent processes of omitting this step shall be considered.

Septic tanks can be used for the function of primary settlement.

NOTE The design, construction and operation of septic tanks is specified in EN 12566-1.

4.2 Planning

The requirements for the performance of primary settlement should be determined after consideration of the following factors:

— the quality and quantity of sludge produced;

— the effect of the residual loads on the subsequent treatment processes;

— the need to limit retention time in order to avoid septicity.

Those requirements specific to the performance of the primary settlement plant that are specified in EN 12255-11 shall be applied.

Additional requirements are specified in EN 12255-1 and EN 12255-10.

4.3 Process

4.3.1 General

Solids removal and detention times at maximum and minimum flows shall be in accordance with the requirements of any downstream process. Where applicable, peak flow shall take into account pumped inflow and/or return flow rates.

Wastewater shall enter the tank via a stilling device which shall be capable of dissipating the input energy and ensuring even distribution over the entire settlement zone or lamella plate pack.

The procedure for effluent draw-off shall be designed to minimise disturbance to the settling zone and allow removal of floating matter.

4.3.2 Required Capacity

The total primary settlement tank capacity required shall take into account the PT and the dry weather peak hourly flow to the plant.

4.3.3 Upward Flow Tanks (including Imhoff Tanks)

Upward flow tanks may be square or circular in plan. Tanks without mechanical scrapers shall have a hopper bottom for sludge collection.

NOTE Tanks square in plan are not usually employed for populations in excess of 5 000 PT.

The tank should be so designed that the upward flow velocity is restricted to within a typical range of 1,0 $m^3/(m^2 \cdot h)$ to 2,0 $m^3/(m^2 \cdot h)$ surface area at dry weather peak hourly flow.

The minimum sidewall height between the top of the hopper and top water level shall be from 0,3 m to 1,5 m for individual tanks serving populations > 50 PT to 1 000 PT.

4.3.4 Horizontal Flow Tanks

Horizontal flow tanks are typically rectangular in plan with a sludge hopper situated at the inlet end of the tank. They shall conform to the following minimum values:

— 1,5 m water depth at outlet;

— 3:1 length to breadth ratio;

— 0,3 m freeboard in uncovered tanks.

Maximum weir overflow rate shall not exceed 30 $m^3/(m \cdot h)$ at dry weather peak hourly flow.

4.3.5 Lamella Separator

Where these tanks are used they should be equipped with inclined settling plates or tubes, typically forming a counter current system by water circulating from the bottom to top and sludge moving from top to bottom. The lamellae shall be so spaced as to avoid clogging and shall be determined by the effectiveness of upstream screening and grease removal. The angle of plates/tubes shall be within a range between 55° and 65° measured from the horizontal.

The space between lamellae and the bottom of the tank shall be designed to ensure an even distribution of wastewater and a sufficient space for the settled sludge.

Sludge should be collected in one or more hoppers and in larger tanks a scraper mechanism may be used to move the sludge to hopper(s) at one end of the tank.

The design should allow ease of cleaning of settling plates or tubes on a regular basis.

4.3.6 Sludge Collection and Removal

4.3.6.1 Upward Flow Tanks

Small tanks typically do not have a scraper mechanism to assist sludge removal, and therefore shall have a hopper with smooth sides. The angle of slope of the sides of the hopper measured from the horizontal, shall not be less than 50º for conical and 60º for pyramidal hoppers.

As tank size increases (typically for those serving above 1 000 PT) a hopper with a 50° respectively 60° floor slope becomes impractical due to the depth of excavation required. In these cases a shallow sloping floor is required to collect sludge and allow it to be scraped to the central hopper for removal. The floor slope should be between 3º and 30º measured from the horizontal, depending on the size of tank and the type of scraper to be used.

NOTE Where sludge removal is by suction a floor slope may not be required.

4.3.6.2 Horizontal Flow Tanks

Very small tanks without a mechanical scraper to assist sludge removal shall have a floor slope of not less than 1:100 to permit emptying to the sludge hopper at the inlet end of the tank. These tanks should be completely emptied for sludge removal. A minimum of two tanks is required to ensure continuity of treatment.

Large tanks should have a scraper and/or suction mechanisms installed and a sloping floor may not be required.