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**Čistilne naprave za odpadno vodo - 4. del: Primarni usedalnik**

Wastewater treatment plants - Part 4: Primary treatment

Kläranlagen - Teil 4: Vorklärung

Stations d'épuration - Partie 4 : Traitement primaire

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**ICS:**

13.060.30      Odpadna voda      Sewage water

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EUROPEAN STANDARD

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English Version

## Wastewater treatment plants - Part 4: Primary treatment

Stations d'épuration - Partie 4 : Traitement primaire

Kläranlagen - Teil 4: Vorklärung

This European Standard was approved by CEN on 9 January 2023.

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

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## European foreword

This document (EN 12255-4:2023) 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of an identical text or by endorsement, at the latest by September 2023, and conflicting national standards shall be withdrawn at the latest by September 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12255-4:2002.

It is the fourth part prepared by the Working Group CEN/TC 165/WG 40 relating to the general requirements and processes for treatment plants for a total number of inhabitants and population equivalents (PT) over 50.

The EN 12255 series, *Wastewater treatment plants*, consists of the following parts:

- *Part 1: General construction principles*
- *Part 2: Storm management systems*
- *Part 3: Preliminary treatment*
- *Part 4: Primary treatment*
- *Part 5: Lagooning processes*
- *Part 6: Activated sludge process*
- *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*

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NOTE 1 Part 2 is under preparation.

NOTE 2 For requirements on pumping installations at wastewater treatment plants, see EN 752, *Drain and sewer systems outside buildings — Sewer system management* and EN 16932 (all parts), *Drain and sewer systems outside buildings — Pumping systems*.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

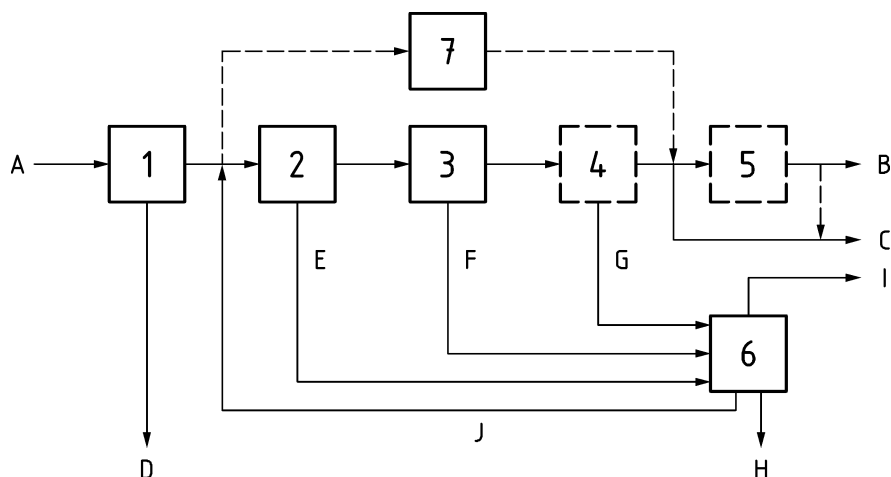
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## Introduction

Differences in wastewater treatment throughout Europe have led to a variety of systems being developed. This document gives fundamental information about the systems; this document has not attempted to specify all available systems. A generic arrangement of wastewater treatment plants is illustrated below in Figure 1:



### Key

- 1 preliminary treatment
- 2 primary treatment
- 3 secondary treatment
- 4 tertiary treatment
- 5 additional treatment (e.g. disinfection or removal of micropollutants)
- 6 sludge treatment
- 7 lagoons (as an alternative)
- A raw wastewater
- B effluent for re-use (e.g. irrigation)
- C discharged effluent
- D screenings and grit
- E primary sludge
- F secondary sludge
- G tertiary sludge
- H stabilized sludge
- I digester gas
- J returned water from dewatering

**Figure 1 — Schematic diagram of wastewater treatment plants**

Detailed information additional to that contained in this document can be obtained by referring to the bibliography.

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

**EN 12255-4:2023 (E)****1 Scope**

This document specifies the design requirements for plant and equipment to remove solids, other than screenings and grit, from raw wastewater, at wastewater treatment plants for over 50 PT.

It includes primary treatment with sedimentation, fine screens and micro-screens.

NOTE 1 The removal of screenings and grit is covered in EN 12255-3.

NOTE 2 Dissolved air flotation (DAF) is not covered in detail in this document because it is not commonly used for primary treatment in municipal wastewater treatment plants. It can be used for primary treatment of industrial wastewater, but then the design is specific to the application.

**2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

EN 16323:2014, *Glossary of wastewater engineering terms*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 16323:2014 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

**3.1****dissolved air flotation****DAF**

separation of solids from wastewater whereby air is dissolved in recirculated wastewater under pressure, generates micro-bubbles when the pressure is released within a tank, which attach to particles and floats them to the wastewater surface as scum

**3.2****lamella separator**

device comprising regularly spaced, inclined plates or tubes designed to increase the effective settling area

[SOURCE: EN 16323:2014, term number 2.3.2.6]

**3.3****micro-screen**

screen with a typical mesh size between 0,1 mm and 1,0 mm



### 3.4

#### **fine screen**

screen with a slot or perforation diameter between 1 mm and < 8 mm

[SOURCE: EN 12255-3]

## 4 Symbols and abbreviations

BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
FOG	Fat, Oil and Grease
rbdCOD	readily biodegradable COD
P <sub>tot</sub>	Total Phosphorus
TKN	Total Kjeldahl Nitrogen
TS	Total Solids
TSS	Total Suspended Solids

## 5 Requirements

### 5.1 General

Primary treatment has the objective of removing solids and the associated organic load from raw wastewater (solid-liquid separation). Retained solids are removed continuously or on a regular basis in the form of primary sludge. The kind of solids removed depends on the process employed: primary clarifiers and lamella separators remove solids depending on their size and density by sedimentation (setttable solids) or by flotation (fat, oil and grease), but they do not effectively remove solids with a density close to that of the wastewater. Screens remove solids from wastewater based on their particle size and rigidity, independent of their density.

The type and size of units employed will depend on the overall system, on the inflow and solids load and their variabilities, on the available space and ground conditions.

Primary treatment can include the following units:

a) Primary clarifier (settling tank or lamella separator):

- upward flow;
- horizontal flow;
- clarifier/sludge storage tank combination;
- lamella separator;
- imhoff tank.

Figure A.1 to A.6 in Appendix A show sketches of typical gravity clarifiers and lamella separators.

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## b) Micro-screen:

- rotating cylindrical screens with flow from the inside out;
- continuous belt screen which is horizontal or slightly sopped upwards;
- other micro-screens which might be developed.

Figure A.7 in Appendix A shows sketches of typical micro-screens, i.e. of a belt and drum screen.

## c) Dissolved air flotation:

- system with or without addition of coagulants or flocculants;
- system with or without lamella separators.

Figure A.8 in Appendix A shows a sketch of a typical dissolved air flotation unit.

Primary treatment is not required where secondary wastewater treatment and simultaneous aerobic sludge stabilization is achieved. However, upstream preliminary treatment with fine screens for the removal of solids and grit removal is always required if there is no primary treatment with sedimentation.

Primary treatment can be enhanced through coagulant and flocculant (polymer) addition.

**5.2 Planning****5.2.1 Required Data and Information**

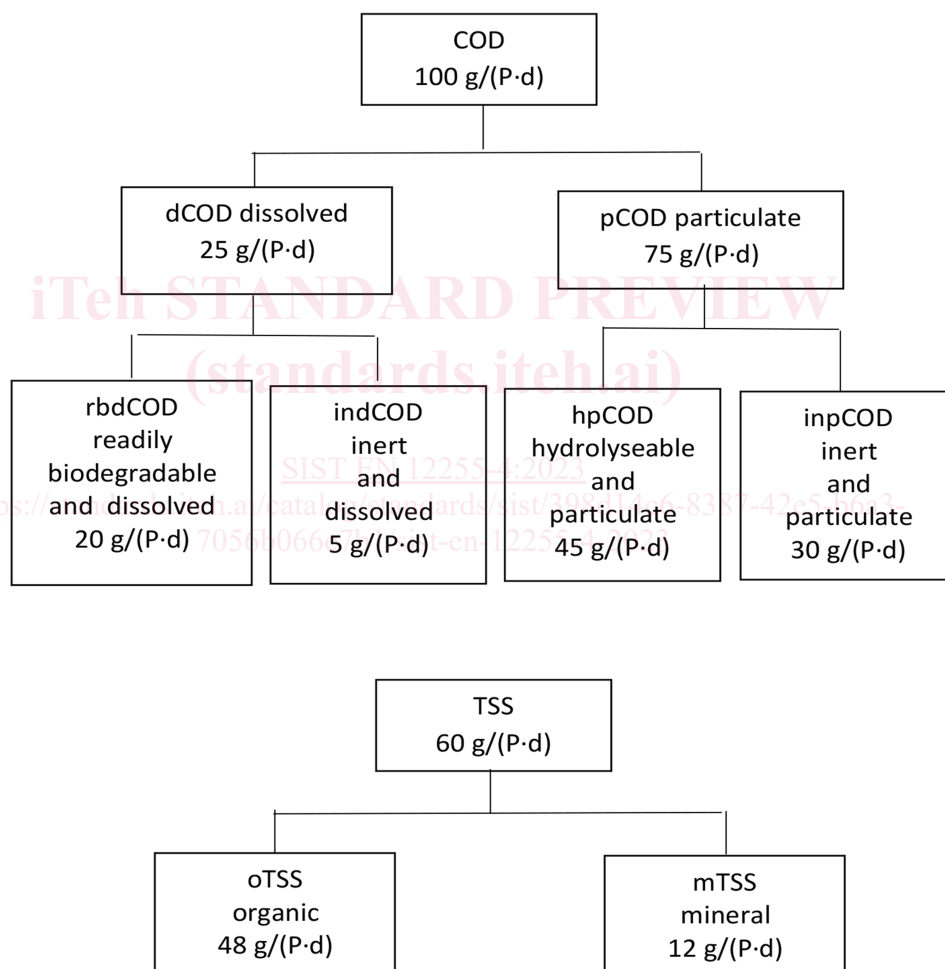
Performance requirements shall be determined considering the following factors:

- the nature and quantity of flow, including its variation (in particular storm events);
- chemical Oxygen Demand (COD) and Suspended Solids (TSS) loads and their variations;
- ratio of dissolved (or particulate) COD to total COD;
- ratio of readily biodegradable COD (rbdCOD) to total COD; knowledge of this ratio is required where biological Nitrogen removal is performed during subsequent biological treatment; the ratio of Biochemical Oxygen Demand (BOD) to COD may be used as a substitute;
- total Kjeldahl Nitrogen (TKN) load; this parameter is also required where biological Nitrogen removal is performed during subsequent biological treatment;
- slot or perforation width of the headworks screens; lamella separators and micro-screens require fine screens (see Part 3) with a maximum slot width of 4 mm or a perforation diameter of maximum 6 mm;
- the quantity and quality of primary sludge generated, including its peak during storm events, which depends on the quality and operation of the sewer system;
- type of sludge stabilization and requirements concerning the primary sludge solids concentration (gravity or mechanical sludge thickening is usually needed);
- the quantity and quality of the effluent and its variation; where nitrogen removal is required, the COD/TKN-ratio of the effluent should not be below 6:1 so that enough rbdCOD for denitrification

remains in the effluent. More specifically, the ratio of rbdCOD to TKN in the effluent should not be lower than 1:1,2;

- redundancy requirements;
- health and safety requirements;
- concentrations of Sulfide and Chloride in the influent (they can cause concrete and metal corrosion).

Figure 2 shows the composition of COD and TSS in raw wastewater. Typical average specific loads are shown, but they can vary depending on local conditions. It should be noted that 85-Percentiles of the specific loads are about 20 % higher.



**Figure 2 — Typical composition of COD and TSS**