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Wastewater treatment plants - Part 3: Preliminary treatment

Kläranlagen - Teil 3: Abwasservorreinigung

Stations d'épuration - Partie 3 : Prétraitements

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ICS:

13.060.30 Odpadna voda Sewage water

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English Version

Wastewater treatment plants - Part 3: Preliminary treatment

Stations d'épuration - Partie 3 : Prétraitements

Kläranlagen - Teil 3: Abwasservorreinigung

This European Standard was approved by CEN on 3 December 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 12255-3:2024) 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of an identical text or by endorsement, at the latest by July 2024, and conflicting national standards shall be withdrawn at the latest by July 2024.

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 12255-3:2000.

EN 12255-3:2024 includes the following significant technical changes with respect to EN 12255-3:2000:

a) comprehensive revision and additions in all sections;

b) the addition of design recommendations;

c) adaptation to the current state of the art;

d) updating of the Normative references;

e) editorial revision.

It is the third part prepared by 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. EN 12255 with the generic title "Wastewater treatment plants" consists of the following Parts:

— *Part 1: General design and construction principles*

— *Part 2: Storm water 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*

NOTE 1 Part 2 is under preparation.

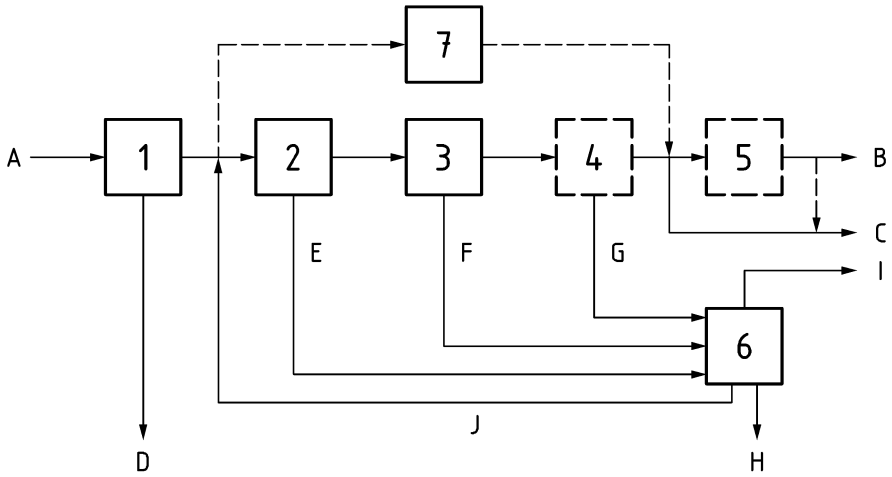
NOTE 2 For requirements on pumping installations at wastewater treatment plants see EN 752 “Drain and sewer systems outside buildings — Sewer system management” and EN 16932 (all parts) “Drain and sewer systems outside buildings — Pumping systems”.

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.

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 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	digested 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.

1 Scope

This document specifies design principles and performance requirements for preliminary wastewater treatment using screens with a mesh size above 50 µm, at plants serving more than 50 PT. It also includes grit removal and grease separation.

NOTE 1 For micro-screens with a mesh size below 50 microns see EN 12255-16.

NOTE 2 The primary application of this document is for wastewater treatment plants designed for the treatment of domestic and municipal wastewater. However, it contains information that can also be useful for commercial and industrial wastewater pretreatment and for combined sewer overflows (CSO).

This document applies in combination with EN 12255-1 and EN 12255-10.

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, *Glossary of wastewater engineering terms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16323 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
aerated grit separator
structure for separating sand and other mineral matter from wastewater, using air to induce circulation

[SOURCE: Modified from EN 16323:2014, term number 2.3.9.1 “aerated grit chamber”, to recognize that not all separators are chambers]

3.2
bar screen
device comprising bars to separate objects from fluids

3.3
blocking factor
f_B
ratio of the area of a screen being blocked by withheld matter, to the open area of the clean screen

3.4
grit chamber
grit separating trap with a circular or rectangular footprint

3.5
grit channel
grit separating tank with a rectangular footprint

3.6
grit classifier
equipment for draining water from grit

3.7
grit slurry
wet mineral and organic matter removed from a grit separator

3.8
grit separator
device to separate grit, sand or similar mineral material from wastewater

[SOURCE: EN 16323:2014, term number 2.3.2.4]

3.9
grit treatment
separation of organic matter from grit

3.10
grit washer
equipment for removal of organic matter and water from grit

3.11
mesh screens
screen with a mesh woven from filamentous material

Note 1 to entry: E.g. stainless-steel wires or plastic fibres.

3.12
perforated plate screen
screen with perforated plates containing holes through which the wastewater flows

3.13
screen cycle time
t_C
period between the start of a screen's cleaning cycle and the start of the next cleaning cycle during continuous screen operation

3.14
screen medium
element of a screen retaining solids and permeable to fluids

3.15
screenings
matter retained by a screen or a sieve

[SOURCE: EN 16323:2014, term number 2.3.2.14]

3.16
screenings treatment
dewatering and compaction of screenings with or without prior washing

3.17
separation medium
element in a screenings press separating screening from draining water

4 Symbols, abbreviations and indices

Symbols	Units	Definitions
A	m^2	area
A_1	m^2	immersed upstream area of a clean screen medium of perforated plate or mesh screens; for straight screen media ($A_1 = W \cdot h_1 / \sin \alpha$)
A_2	m^2	immersed downstream area of a clean screen medium of bar screens; for straight screen media ($A_2 = W \cdot h_2 / \sin \alpha$)
C_x	kg/m^3 or mg/l	concentration of x
d	mm or µm	diameter of sand or grit
DSR	%	dry solids ratio
e	mm	slot width at its narrowest point
f_B	—	blocking factor
f_o	—	ratio of the screen's permeable open area to the cross section of the upstream flow (to be specified by the screen manufacturer)
g	m/s^2	gravitational acceleration (9,81 m/s^2)
h	m	water level height above the channel floor
h_1	m	water level height upstream of a screen
h_2	m	water level height downstream of a screen
Δh	m	head loss ($\Delta h = h_1 - h_2$)
h_{EL}	m	energy head loss [$h_{EL} = \Delta h + {v_1}^2/(2\,g) - {v_2}^2/(2\,g)$]
L_x	kg/h	load of x
m_x	kg	mass of x
Q_x	m^3/s or l/s	flow of x
R^2	—	regression value
s	mm	bar width at its widest point
t	s	time

Symbols	Units	Definitions
t_C	s	cycling time for screen cleaning
Δt	s	duration
V	m^3 or l	volume
v_1	m/s	upstream velocity [$v_1 = Q / (W \cdot h_1)$]
v_2	m/s	downstream velocity [$v_2 = Q / (W \cdot h_2)$]
v_{max}	m/s	maximum velocity in slots or perforations of a clean screen
v_{min}	m/s	minimum velocity in a channel upstream of a screen
W	m	width of the channel
WP	mg/g	washing performance
α	°	angle of a screen medium relative to the horizontal
β	—	hydraulic form factor for flow between bars (see Figure 2)
η	%	removal ratio
μ	—	outflow factor of perforations (for sharp edged perforations ≈ 0,6)
ρ	kg/m^3	density

Abbreviations	Definitions
ATEX	ATEX Directive of the European Union (FR: **AT**mosphères **EX**plosibles)
BOD	biochemical oxygen demand
COD	chemical oxygen demand
DS	dried solids
FOG	fat, oil and grease

Indices	Definitions
COD	chemical oxygen demand
Dr	Droste formula
Dos	dosage
DW	dry weather conditions
end	after treatment
Fr	fraction
GS	grit separator
GT	grit treatment
GST	grit separation and treatment system