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Standard DWA-A 262E

Principles for Dimensioning, Construction and Operation of Wastewater Treatment Plants with Planted and Unplanted Filters for Treatment of Domestic and Municipal Wastewater

November 2017

Grundsätze für Bemessung, Bau und Betrieb von Kläranlagen mit bepflanzten und unbepflanzten Filtern zur Reinigung häuslichen und kommunalen Abwassers

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The German Association for Water, Wastewater and Waste (DWA) is strongly committed to the development of secure and sustainable water and waste management. As a politically and economically independent organisation it is professionally active in the field of water management, wastewater, waste and soil protection.

In Europe DWA is the association with the largest number of members within this field. Therefore it takes on a unique position in connection with professional competence regarding standardisation, professional training and information. The approximately 14,000 members represent specialists and executives from municipalities, universities, engineering offices, authorities and companies.

Imprint

Publisher and marketing:
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Water, Wastewater and Waste (DWA)
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Print:
XYXYXYXYXYXYXYXYXYXY

ISBN:
978-3-88721-641-2 (Print)
978-3-88721-642-9 (E-Book)

Printed on 100 % recycled paper

Foreword

This document is a revision of the Standard DWA-A 262 (March 2006). This revision is based on a variety of findings gained in recent years from experience with planted and unplanted filters in Germany and across Europe. Prior to publication of the "yellow print" (a draft released for public review in April 2016), the proposed changes to the Standard were discussed with technical experts in January 2014.

Wastewater treatment with planted and unplanted filters is characterized by a simple structural design, a simple mode of operation, a low production of biomass and secondary sludge, a low use of external energy, and a high treatment efficiency, even for treatment systems with a small number of sewer connections. Horizontal flow filters are described in this Standard only as a downstream (tertiary) treatment stage, no longer as a main (secondary) biological treatment stage, since there is not sufficient knowledge in comparison to vertical flow filters. However, this does not exclude their application. As long as the water management requirements and effluent parameters are met and proper operation is ensured, existing systems can continue to be operated.

Changes

Compared to the Standard DWA-A 262 (March 2006), the following changes have been made:

a) modification to the title of the Standard;

b) adaptation to European standards and changes that have occurred in laws and regulations in the meantime;

c) consideration of recent findings on primary treatment with multicompartment septic tanks;

d) newly added: treatment systems with raw wastewater filters for combined sewer networks and for separated sewer networks;

e) newly added: treatment systems with lava sand filters for combined sewer networks and for separated sewer networks;

f) newly added: two-stage process with vertical flow filters;

g) newly added: actively aerated filters;

h) newly added: two-layer filter trenches;

i) newly added: seasonally loaded treatment systems;

j) newly added: systems for greywater treatment.

The Standard is aimed at wastewater treatment plant planners and operators as well as specialist authorities.

This Standard on small wastewater treatment systems (< 50 P) deals with the requirements resulting from reasons of water protection that are not covered by unified European standards, both for CE-marked and non CE-marked wastewater treatment systems as well as non-mass-produced small wastewater treatment systems.

The design principles presented here apply to Central European climatic conditions with warm summers and cold winters without permafrost. In other climatic conditions, changes in the design are possible, or even necessary. Regions with permafrost are fundamentally unsuitable for filters.

In order to provide a clear and easy-to-read text, this document uses the feminine form (in German) in a generalized way for personal occupational and functional titles. However, all information applies equally to all genders.

Previous Versions

Standard DWA-A 262 (March 2006)

Standard ATV-A 262 (July 1998)

Technical Report ATV-H 262 (August 1989)

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User Notes

This Standard has been produced by a group of technical, scientific and economic experts, working in an honorary capacity and applying the rules and procedures of the DWA and the Standard DWA-A 400. Based on judicial precedent, there exists an actual presumption that this document is textually and technically correct and also generally recognised.

Any party is free to make use of this Standard. However, the application of its contents may also be made an obligation under the terms of legal or administrative regulations, or of a contract, or for some other legal reason.

This Standard is an important, but not the sole, source of information for solutions to technical problems. Applying information given here does not relieve the user of responsibility for his own actions or for correctly applying this information in specific cases. This holds true in particular when it comes to respecting the margins laid down in this Standard.

1 Scope

This Standard sets out a common basis for the design, construction, and operation of planted and unplanted filters for biological treatment of municipal wastewater.

The treatment of wastewater that differs significantly in nature from municipal or household wastewater, as well as the treatment of separated partial wastewater streams - with the exception of greywater - fall outside of the scope of this Standard.

The scope of this Standard includes planted and unplanted filters for:

- small wastewater treatment systems treating domestic wastewater with an inflow of up to 50 P;
- wastewater treatment systems serving fewer than 50 P for which extraneous water must be taken into account. By definition, these are not small wastewater treatment systems, because small wastewater treatment plants may not be connected to sewer networks where extraneous water (e.g., rainwater flowing into shaft covers or infiltration of groundwater into the sewer network) is an issue. These systems must be considered as municipal wastewater treatment plants;
- municipal wastewater treatment plants with either separated or combined sewer networks;
- combined wastewater treatment plants providing additional biological treatment or polishing;
- seasonal wastewater treatment plants operated only in summer.

Generally, the treatment plants described herein are able to meet the wastewater treatment requirements according to the Size Class #1, Appendix 1, Part C of the German Wastewater Ordinance ($BOD_5 \leq 40$ mg/l, COD ≤ 150 mg/l in randomly collected samples; four out of five samples must be within the limit). In addition, vertical flow filters and aerated horizontal flow filters are suitable for further nitrification ($S_{NH4} \leq 10$ mg/l) at filter effluent water temperatures of at least 12°C.

Design advice for achieving total nitrogen removal is provided. However, long-term phosphorus removal in the filters cannot be expected. For this, a separate treatment step is required (not the subject of this Standard). The removal of hygienically relevant microorganisms by planted and unplanted filters is principally possible, but design specifications cannot be established at this time.

For many years, filters have been used for seasonal wastewater treatment. These include systems in alpine areas (higher than 2,000 meters above sea level) treating greywater as well as domestic wastewater. Beyond that, filters have also been used for treating wastewater generated at seasonal