



DWA Set of Rules

Standard DWA-A 178E

Stormwater Filtration Systems

June 2019

Retentionsbodenfilteranlagen
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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 organization, it is professionally engaged in the fields of water management, wastewater, waste and soil protection.

In Europe, DWA is the association with the largest number of members in this field. It therefore occupies a unique position in connection with its professional expertise regarding standardization, professional training and the provision of information to both professionals and the general public. The around 13.500 members represent the specialists and executives from municipal authorities, universities, engineering firms, authorities and commercial enterprises.

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German Association for
Water, Wastewater and Waste (DWA)
Theodor-Heuss-Allee 17
53773 Hennef, Germany
Tel.: +49 2242 872-333
Email: info@dwa.de
Internet: www.dwa.de

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Foreword

This Standard describes nature-based solutions for the treatment of stormwater, highway runoff and discharge from combined sewer overflows. While in Germany, the term 'Retention Soil Filter' (RSF) is used and accepted for such planted gravity flow systems, international literature commonly uses the terms 'bioretention filter' for the use of stormwater and highway runoff as well as 'treatment wetlands for combined sewer overflows'. Since the main function of the here presented design is stormwater filtration, and to avoid confusion with other designs, we will use the term 'stormwater filtration system' in the following.

The Guideline DWA-M 178 "Empfehlungen für Planung, Konstruktion und Betrieb von Retentionsbodenfilteranlagen zur weitergehenden Regenwasserbehandlung im Misch- und Trennsystem" ["Recommendations for the planning, construction and operation of stormwater filtration systems for advanced stormwater treatment in combined and separate systems", in German] was published in 2005.

Extensive operating experience is now available, so that the principles of stormwater treatment using stormwater filtration systems can be summarised in a Standard. Furthermore, stormwater filtration systems for the treatment of road runoff are gaining in importance and are thus integrated into the guideline. Additionally, specifications and planning principles have been harmonised.

Current developments in the DWA Set of Rules have been incorporated into the design. The fine fraction of total suspended solids (SS63) was introduced as a dimensioning parameter and as a verification parameter for purely emission-side considerations.

A design limit value for the permissible SS63 filter surface load of $7 \text{ kg}/(\text{m}^2 \text{ a})$ was derived from extensive surveys, which show that low-cost operation of stormwater filters is only possible from an SS63 filter surface load of $4 \text{ kg}/(\text{m}^2 \text{ a})$ and that no hydraulic problems occur with a load of up to $10 \text{ kg}/(\text{m}^2 \text{ a})$ when operated in accordance with the process.

Many years of experience now justify publication as a Standard.

Authors

This Standard was compiled by the DWA working group ES-3.5 "Stormwater Filtration Systems" on behalf of the DWA main committee "Drainage systems" (HA ES) in the technical committee ES-3 "System-related planning".

The following members belong to the DWA working group ES-3.5 "Stormwater Filtration Systems":

FUCHS, Stephan	Dr.-Ing., Karlsruhe (Spokesperson)
ANSELM, Jörn	Prof. Dr.-Ing., Oytén
BORN, Winfried	Dr.-Ing., Vellmar
CHRISTOFFELS, Ekkehard	Dr. rer. nat. Dipl.-Ing., Vettweiß
DAHMEN, Heinrich	Dipl.-Ing., Vettweiß
DIEFENTHAL, Karl	Dipl.-Ing., Cologne
DITTMER, Ulrich	Prof. Dr.-Ing., Kaiserslautern
FELMEDEN, Jörg	Prof. Dr. Ing., Detmold
GROTEHUSMANN, Dieter	Dr.-Ing., Hanover
HALLER, Bernd	Dipl.-Ing., Karlsruhe
JOSWIG, Kay	Dipl.-Ing., Berlin
KERPEN, Thomas	Dipl.-Ing., Aachen
KNÜPPER, Holger	Dipl.-Ing., Viersen
MAUS, Christian	Dipl.-Ing., Cologne
MÜNTER, Franz	Dipl.-Ing., Frankfurt/M
NOWAK, Jens	Prof. Dr.-Ing., Berlin
ROTH, Jürgen	Dipl.-Ing., Berlin
RÜTER, Johannes	Dipl.-Ing., Berlin
RUPPELT, Jan	Dr.-Ing., Essen
SCHWEFRINGHAUS, Martin	Dipl.-Biol., Wuppertal
SCHWINGER, Helmut	Dipl.-Ing., Augsburg
TONDERA, Katharina	Prof. Dr.-Ing., Lyon, France (Deputy spokesperson)
WALDHOFF, Axel	Dr.-Ing., Hamburg

The DWA Technical Committee ES-3 "Plant-related planning" has the following members:

FUCHS, Stephan	PD Dr.-Ing., Karlsruhe (Chairperson)
HELMREICH, BRIGITTE	Prof. Dr. rer. nat. habil., Garching (Deputy chairperson)
BOSSELER, Bert	Prof. Dr.-Ing., Viersen
ECKSTÄDT, Hartmut	Prof. Dr.-Ing. habil., Kritzmo
HALLER, Bernd	Dipl.-Ing., Karlsruhe
JEDLITSCHKA, Jens	MinR (retired) Dipl.-Ing., Wörthsee
ROEDIGER, Markus	Dr.-Ing., Stuttgart
STECHA, Helmut	Dipl.-Ing., Wiesbaden

Project manager at the DWA federal office:

BERGER, Christian	Dipl.-Ing., Hennef Water and Waste Management Department
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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

1.1 Preliminary remarks

Stormwater filtration systems (SFSs) are efficient instruments for the treatment of discharged combined sewage and stormwater runoff from separate sewer systems and traffic areas (hereinafter referred to simply as stormwater treatment). They are two-stage systems. They consist of a preliminary stage and a sealed, throttled, vertically flowing stormwater filter (SF) planted with reeds including a ponding zone above the filter surface.

This Standard explicitly does not include special applications of the process implemented on a pilot scale. It relates exclusively to the planning, basic design requirements, construction and operation of stormwater filtration systems. The target values of the treatment are:

- effective solids retention,
- the oxidation of organic carbon compounds (COD, BOD) and ammonium,
- the permanent retention of particle-bound substances such as heavy metals, polycyclic aromatic hydrocarbons (PAH) and petroleum derived hydrocarbons (PDH).

1.2 Objectives

In Germany, according to the Water Resources Act, a permit for the discharge of wastewater into a water body may only be granted if the quantity and harmfulness of the wastewater is minimised in accordance with the state of the art, and the discharge is compatible with the characteristics of the water body and the legal requirements. Depending on the country or region this Standard is applied, these legal requirements might differ and need to be considered, and the protection goals of the water body must be clarified with the relevant authorities.

Protection goals for water bodies can be

- limitation of material pollution (discharge loads, discharge concentrations),
- limitation of the hydraulic load.

PREVIEW

Stormwater filtration systems (SFSs) are highly effective means of treating stormwater in combined and separate sewer systems, as well as for treating road runoff. These are two-stage systems. They consist of a pretreatment stage and a stormwater filter that is sealed against the subsoil, operated at reduced flow, with vertical flow-through and planted with reeds (SF).

The Guideline DWA-M 178 „Empfehlungen für Planung, Konstruktion und Betrieb von Retentionsbodenfilteranlagen zur weitergehenden Regenwasserbehandlung im Misch- und Trennsystem“ (“Recommendations for the planning, construction and operation of stormwater filtration systems for advanced stormwater treatment in combined and separate systems”, in German) was published in 2005.

Extensive operating experience is now available, so that the principles of stormwater treatment using stormwater filtration systems can be summarised in a Standard. As stormwater filtration systems are increasingly being used for the treatment of road runoff water, the new Standard also serves to harmonize the specifications and design principles.

Current developments in the DWA Set of Rules have been incorporated into the design. The fine fraction of suspended solids (SS₆₃) was introduced as a dimensioning parameter and as a verification parameter for purely emissionside considerations.

The Standard explicitly does not include special applications of the process implemented on a pilot scale. It relates exclusively to the planning, basic design requirements, construction and operation of stormwater filtration systems. The target values of the treatment are:

- effective solids retention,
- the oxidation of organic carbon compounds (COD, BOD) and ammonium,
- the permanent retention of particlebound substances such as heavy metals, polycyclic aromatic hydrocarbons (PAH) and petroleum derived hydrocarbons (PDH).

This Standard is aimed at officials in licensing authorities and all those involved in the planning and operation of sewer networks, including the operation and use of sewer networks for drainage and road construction

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German Association for Water, Wastewater and Waste

Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V. (DWA)

Theodor-Heuss-Allee 17 | 53773 Hennef · Germany

Phone +49 2242 872-333 | info@dwa.de | en.dwa.de