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On-site non-potable water systems - Part 1: Systems for the use of rainwater

Vor-Ort Anlagen für Nicht-Trinkwasser - Teil 1: Anlagen für die Verwendung von Regenwasser

Réseaux d'eau non potable sur site - Partie 1 : Systèmes pour l'utilisation de l'eau de pluie

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Vor-Ort Anlagen für Nicht-Trinkwasser - Teil 1: Anlagen für die Verwendung von Regenwasser

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 165.

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European foreword

This document (prEN 16941-1:2015) has been prepared by Technical Committee CEN/TC 165 "Wastewater engineering", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

The series of standards prEN 16941 "*On-site non-potable water systems*" consists of the following parts:

- *Part 1: Systems for the use of rainwater*
- *Part 2: Systems for the use of greywater* (in preparation)

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Introduction

Ecological and sustainable water management is a goal of rainwater management. Herein rainwater harvesting and infiltration, as well as the decentralized retention of rainwater, are alternatives to the customary drainage of rainwater. Rainwater harvesting also reduces the potable water demand and the discharge of water.

In order to keep the natural cycle of water, excess water from the rainwater harvesting system should be infiltrated or otherwise evacuated into surface water bodies. Discharge into sewer systems should only occur if inevitable.

On-site collection and use of rainwater as a substitute for potable water covers a variety of applications like toilet flushing, laundry, irrigation, climate control of buildings, cleaning, etc. at private and rented properties, residential areas, community developments, industrial sites, hotels, streets, parks, golf courses, theme parks, car parks, stadia, etc.

A generic flow chart of rainwater use on-site is presented in Figure 1.

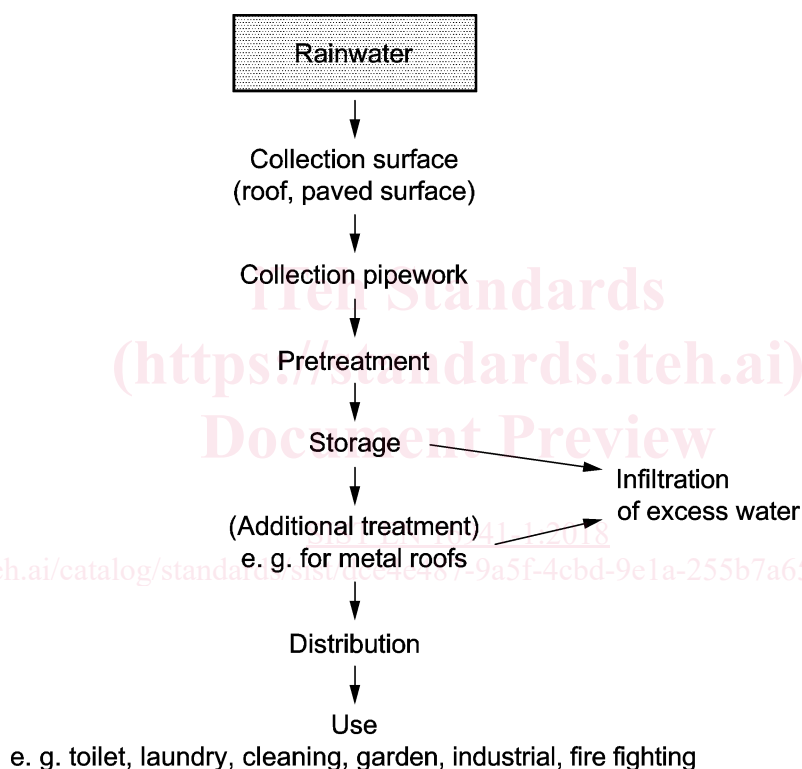


Figure 1 — Generic flow chart of rainwater use

1 Scope

This European Standard specifies the design, sizing, installation, identification, commissioning and maintenance of rainwater harvesting systems for the use of rainwater on-site as a substitute for potable water. This standard also specifies the minimum requirements for these systems.

Excluded from the scope of this standard are:

- the use as drinking water,
- decentralized attenuation,
- infiltration.

NOTE Conformity with the standard does not exempt from compliance of the obligations arising from local or national regulations.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 476, *General requirements for components used in drains and sewers*

EN 805, *Water supply - Requirements for systems and components outside buildings*

EN 806-2, *Specification for installations inside buildings conveying water for human consumption - Part 2: Design*

EN 806-3, *Specification for installations inside buildings conveying water for human consumption - Part 3: Pipe sizing - Simplified method*

EN 809, *Pumps and pump units for liquids - Common safety requirements*

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EN 1717:2000, *Protection against pollution of potable water in water installations and general requirements of devices to prevent pollution by backflow*

EN 12056-1, *Gravity drainage systems inside buildings - Part 1: General and performance requirements*

EN 12056-2, *Gravity drainage systems inside buildings - Part 2: Sanitary pipework, layout and calculation*

EN 12056-3, *Gravity drainage systems inside buildings - Part 3: Roof drainage, layout and calculation*

EN 12056-4, *Gravity drainage systems inside buildings - Part 4: Wastewater lifting plants - Layout and calculation*

EN 12056-5, *Gravity drainage systems inside buildings - Part 5: Installation and testing, instructions for operation, maintenance and use*

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

EN 12566-3, *Small wastewater treatment systems for up to 50 PT - Part 3: Packaged and/or site assembled domestic wastewater treatment plants*

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EN 13076, *Devices to prevent pollution by backflow of potable water - Unrestricted air gap-Family A - Type A*

EN 13077, *Devices to prevent pollution by backflow of potable water - Air gap with non-circular overflow (unrestricted) - Family A - Type B*

EN 13341:2005+A1:2011, *Static thermoplastic tanks for above ground storage of domestic heating oils, kerosene and diesel fuels - Blow moulded and rotationally moulded polyethylene tanks and rotationally moulded tanks made of anionically polymerized polyamide 6 - Requirements and test methods*

EN 13564 (all parts), *Anti-flooding devices for buildings*

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

EN 60335-2-41, *Household and similar electrical appliance - Safety - Part 2-41: Particular requirements for pumps*

3 Terms and definitions

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

3.1**rainwater**

water arising from atmospheric precipitation

[SOURCE: EN 16323:2014, 2.1.1.1, modified]

3.2**rainwater harvesting**

collecting rainwater from surfaces in order to be used

3.3**rainwater harvesting system**

system collecting rainwater from surfaces in order to be used, comprising of four main elements: collection, treatment, storage and distribution

3.4**storage device**

unit for the storage of harvested rainwater

3.5**cistern**

fixed container for holding water at atmospheric pressure for use as part of the plumbing system

3.6**non-potable water**

water which has been made available for use, except drinking

3.7**non-return valve**

device that prevents backflow of water

[SOURCE: EN 16323:2014, 2.2.5.12, modified: "wastewater" was changed to "water"]

3.8

volume of useable water

maximum volume of water that can be extracted from a storage device in normal use which is usually from the overflow to the lowest extraction point

4 Functional elements of rainwater harvesting systems

Any rainwater harvesting system is described through four main functional elements: collection, treatment, storage and distribution.

Rainwater harvesting systems shall be designed installed, marked, operated and maintained in such a way that the required level of safety is ensured at any time and that the required servicing work can be easily carried out.

Rainwater harvesting systems shall not cause flooding and therefore shall include potential bypasses and/or properly dimensioned overflows.

5 Design

5.1 Collection

5.1.1 General

The purpose of collection is to harvest rainwater and transport it to a storage device.

When considering the collection of rainwater, the following factors should be taken into account, as these can affect the quality and/or quantity of the collected water:

- the local rainfall pattern;
- the size of the collection surface;
- the surface's materials and their drainage characteristics;
- sizing and material of pipe work;
- the levels of pollution of the collection surface;
- the risk of contaminating the system.

5.1.2 Collection surfaces

5.1.2.1 Qualitative aspects

The characteristics of the collection surface shall be taken into consideration depending on the intended use of the rainwater.

Common roof materials, e.g. tiles and slate, do not cause any issues for rainwater harvesting. Examples of other collection surfaces and their potential effects are given in Table 1.

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Table 1 — Examples of potential effects of collection surface on the quality of harvested rainwater

Collection surface	Potential effect
Green roof	colouration
Bitumen containing material	colouration
Cement with asbestos fibres	emission of fibres in the long term
Copper or zinc roofs	increased concentrations of heavy metals
Weathered rough surfaces	wash out of solids

Pollutants from other sources, e.g. traffic areas, industry and animals have to be taken into account.

5.1.2.2 Quantitative aspects

Collection surfaces made of different materials have different characteristics regarding the drainage of rainwater. The volume of the harvested rainwater is influenced by the surface yield coefficient (e). Unless otherwise specified, typical values are given for different materials in 6.1.2, Table 2.

NOTE The surface yield coefficient differs from the run-off coefficient as specified in EN 12056-3, where it is used for the hydraulic design of pipes. The surface yield coefficient aims to determine the average yield.

5.1.3 Collection piping system

Collection piping systems shall allow the rainwater to flow freely from the collection surface to the storage device by gravity or siphonic action with access for inspection, maintenance and cleaning.

The non-pressure pipes and fittings shall meet the general requirements according to EN 476 and the relevant product standards. The dimensioning shall be done in accordance with EN 12056-1, EN 12056-2 and EN 12056-3. Underground rainwater pipes shall be installed according to EN 1610.

5.2 Treatment**5.2.1 General**

The main purpose of treatment is to ensure a specific water quality depending on the intended use. Additional purposes are the protection of the system components and the reduction of maintenance. Treatment may involve biological, chemical or physical processes or a combination of them. Treatment shall be done before, in and potentially after the storage device.

It covers several operations:

- removal of coarse particles upstream of the storage (see 5.2.2);
- retention of fine particles by sedimentation and flotation in the storage device (see 5.3);
- filtering downstream of the storage device, depending on the intended use. Disinfection, deodorization and/or discoloration may be required additionally (see 5.2.3).

A rainwater harvesting system provides water suitable for flushing toilets, laundry and garden watering in most residential, industrial and commercial situations without the necessity of additional treatment (5.2.3) identified by risk assessment referred in 5.2.2.

The treatment system shall:

- be water resistant and durable;

- be accessible for maintenance (see Clause 11);
- not affect the hydraulic operation of the drainage system;
- withstand the maximum stresses and loads exerted during its handling, installation, use and maintenance;
- have a hydraulic efficiency ratio of at least 90 %.

The flow section of the overflow of the treatment device shall be designed for the discharge of maximum flow without damage.

5.2.2 Preliminary treatment

Preliminary treatment (e.g. filters, separators) is always necessary. It shall be located upstream of the storage of the water and may consist of more than one device. The type and dimensioning of preliminary treatment shall be adapted to the kind of the collection surface.

The purpose of preliminary treatment is to prevent the inflow of most coarse solids and organic matter into the storage device. The maximum particle size entering the storage device shall be equal or less than 1 mm for in-house use. If solids are retained, they shall be evacuated continuously or during a manual intervention.

5.2.3 Additional treatment

Additional treatment (e.g. filtration, disinfection) of the stored water is necessary if the intended use demands higher quality of the treated rainwater.

5.3 Storage

5.3.1 General

The purpose of the storage device is:

- to conserve a suitable volume of rainwater for the intended use and the site's collection possibilities;
- to treat the incoming water (sedimentation, flotation);
- to protect the quality of this water from risks of deterioration.

The rainwater harvesting system shall, at least, include one storage device which may be positioned either above or below ground.

NOTE Depending on the intended use of the harvested rainwater, different kinds of storage devices can be used.

The storage device shall be protected against frost, extreme temperatures and direct sunlight, for instance buried underground.

The structural behaviour shall be taken into account when positioning the storage device.

5.3.2 Materials

The materials used shall not have a negative effect on the quality of the stored water and the environment of the installation. The storage device shall allow natural ventilation and shall be made from non-translucent material.