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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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ICS:

93.025	Zunanji sistemi za prevajanje vode	External water conveyance systems

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

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

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This European Standard was approved by CEN on 28 August 2017.

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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 16941-1:2018) has been prepared by Technical Committee CEN/TC 165 “Wastewater 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of an identical text or by endorsement, at the latest by July 2018 and conflicting national standards shall be withdrawn at the latest by July 2018.

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

EN 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)

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

Introduction

Ecological and sustainable water management is a goal of rainwater management. Herein rainwater harvesting and infiltration, as well as the decentralized detention 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 can be infiltrated or otherwise evacuated in line with national or regional requirements.

On-site collection and use of rainwater 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.

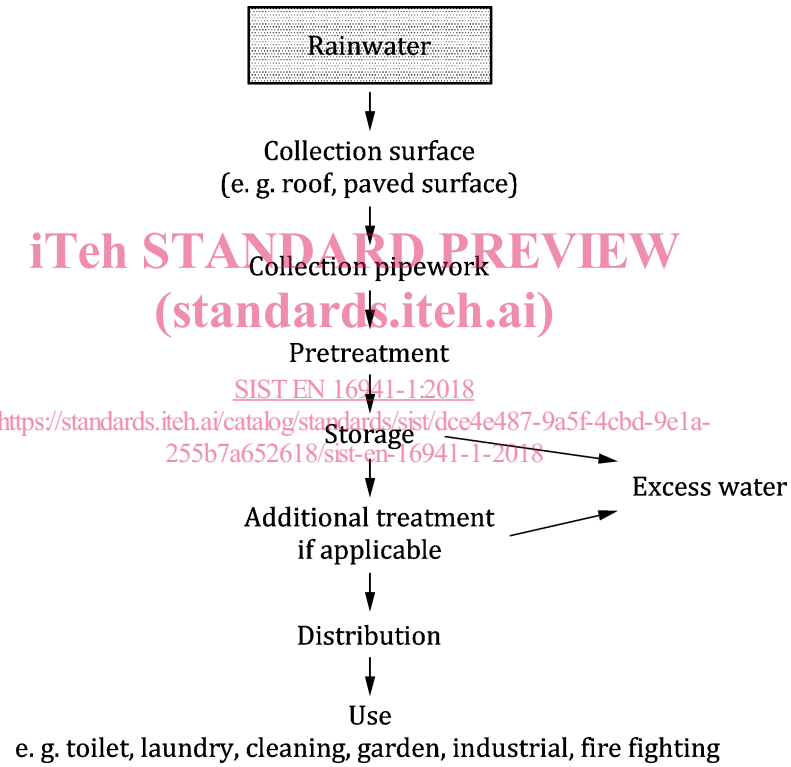

Figure 1 — Generic flow chart of rainwater use

1 Scope

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

Excluded from the scope of this European Standard are:

— the use as drinking water and for food preparation;

— the use for personal hygiene purposes;

— decentralized attenuation;

— infiltration.

NOTE Conformity with the standard does not exempt from compliance with 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, *Specifications 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*

EN 1295-1, *Structural design of buried pipelines under various conditions of loading - Part 1: General requirements*

EN 1610, *Construction and testing of drains and sewers*

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

EN 12050 (all parts), *Wastewater lifting plants for buildings and sites*

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

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

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

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

EN 60335-2-41, *Household and similar electrical appliances - Safety - Part 2-41: Particular requirements for pumps (IEC 60335-2-41)*

EN ISO 4064 (all parts), *Water meters for cold potable water and hot water (ISO 4064)*

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 for collecting rainwater from surfaces in order to be used, which consists of collection, treatment, storage and distribution elements

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 for drinking, food preparation and personal hygiene

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.

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 piping systems;

— 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 (e.g. roofs and paved areas) shall be taken into consideration depending on the intended use of the rainwater. Pollutants from other sources, e.g. traffic, industry and animals have to be taken into account.

Common roof materials, e.g. glazed tiles and slate, do not cause any negative effect on the quality of harvested rainwater.

Other roof collection surfaces may have potential to negatively affect the quality of the water harvested (see examples in Table 1).

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 fibres	emission of fibres in the long term
Copper, lead or zinc roofs	increased concentrations of heavy metals
Weathered rough surfaces	wash out of solids

Where paved areas or roof areas allowing human amenity are used for collection possible pollutants due to the use of these areas shall 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 should allow the rainwater to flow from the collection surface to the storage device by gravity or siphonic action. Access for inspection, maintenance and cleaning has to be planned and installed.

Collection pipework from the roof within the rainwater harvesting system should not discharge into open gullies because additional contamination could occur.

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 and EN 12056-3. Underground rainwater pipes shall be designed according to EN 1295-1 and 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 upstream within and potentially downstream of the storage device.

Treatment 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 shall provide water suitable for flushing toilets, laundry and garden watering in most residential, industrial and commercial situations without the necessity of additional treatment (see 5.2.3) unless identified by risk assessment referred to in 5.9.

The treatment system shall:

— be water resistant and durable;

— be accessible for maintenance (see Clause 11);

— not affect the hydraulic operation of the overall drainage system;

— withstand the maximum stresses and loads exerted during its handling, installation, use and maintenance; and

— 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.

5.2.2 Preliminary treatment

Preliminary treatment (e. g. filters, separators) shall be designed and located upstream of the storage device and may consist of more than one device. The type and dimensioning of preliminary treatment shall be selected according to the nature and size 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 removed regularly or during a manual intervention.

5.2.3 Additional treatment

Additional treatment (e. g. filtration, disinfection) of the stored rainwater shall be included if the intended use demands higher quality.

5.3 Storage

5.3.1 General

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

The purpose of the storage device is:

— to conserve a suitable volume of rainwater for the intended use and the collection possibilities;