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

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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 COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

European foreword	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions.....	7
4 Functional elements of rainwater harvesting systems	8
5 Design.....	8
5.1 Collection	8
5.1.1 General.....	8
5.1.2 Collection surfaces	9
5.1.3 Collection piping system	9
5.2 Treatment.....	9
5.2.1 General.....	9
5.2.2 Preliminary treatment.....	10
5.2.3 Treatment in storage device	10
5.2.4 Additional treatment	10
5.3 Storage	11
5.3.1 General.....	11
5.3.2 Materials	11
5.3.3 Dimensions.....	11
5.3.4 Capacity	11
5.3.5 Structural behaviour	11
5.3.6 Watertightness	12
5.3.7 Connections and internal pipe system	12
5.3.8 Access	12
5.3.9 Overflow	12
5.4 Back-up water supply.....	13
5.4.1 General.....	13
5.4.2 Backflow protection device.....	13
5.5 Pumping	16
5.5.1 General.....	16
5.5.2 Submerged pump.....	16
5.5.3 Non-submerged pump.....	17
5.5.4 Expansion vessel	17
5.5.5 Pump control unit.....	18
5.6 System control with monitoring.....	18
5.7 Metering	18
5.8 Distribution.....	18
5.9 Risk assessment	19
6 Sizing	19
6.1 Storage device	19
6.1.1 General.....	19

6.1.2	Determination of the available volume of rainwater	20
6.1.3	Determination of the non-potable water demand per day.....	21
6.1.4	Calculation methods	22
6.2	Back-up water supply	22
7	Installation	23
8	Differentiation and identification	24
9	Commissioning	25
10	Quality of non-potable water	25
11	Maintenance	25
Annex A (informative) Examples of calculation methods for storage capacity		26
A.1	General	26
A.2	Examples of calculation methods	26
A.2.1	Basic approach with annual time step	26
A.2.2	Detailed approach	27
Annex B (informative) Examples of rainwater harvesting systems with different back-up supply arrangements		31
Annex C (informative) Example for a commissioning sheet		34
C.1	Commissioning sheet	34
Annex D (informative) Example of dye testing for distribution pipework cross-connections.....		36
Annex E (informative) Inspection and maintenance		37
E.1	Inspection and maintenance instruction sheet	37
E.2	Logbook.....	38
Bibliography		39

prEN 16941-1:2022 (E)

European foreword

This document (prEN 16941-1:2022) has been prepared by Technical Committee CEN/TC 165 “Waste water engineering”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16941-1:2018.

In comparison with the previous edition, necessary technical and editorial updates and further technical and editorial alignments with EN 16941-2 have been made.

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 treated greywater*

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[oSIST prEN 16941-1:2022](https://standards.iteh.ai/catalog/standards/sist/072b2eea-74e3-4a15-bca3-224fb39b0f73/osist-pren-16941-1-2022)

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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 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.

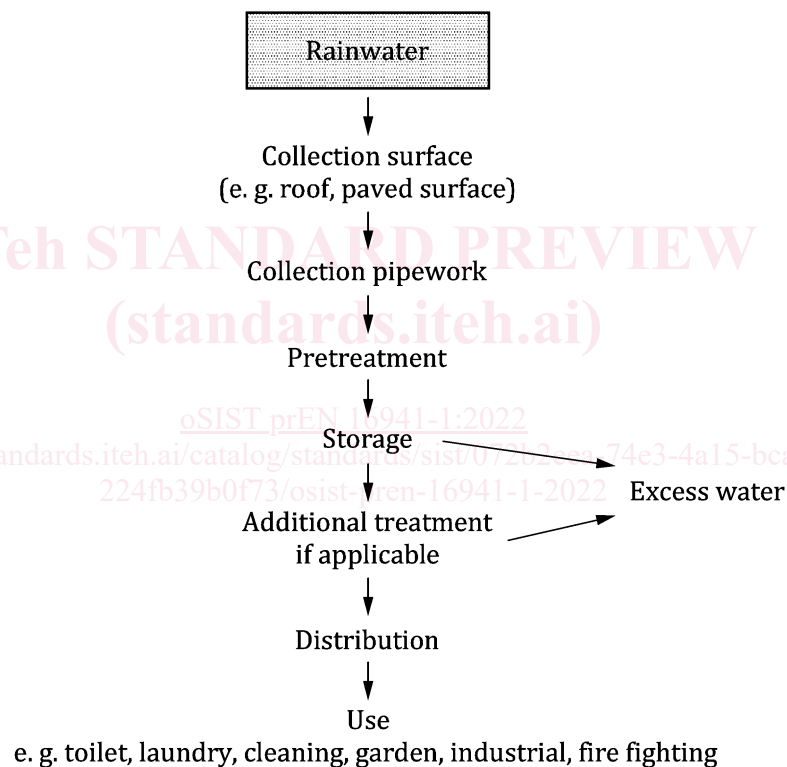


Figure 1 — Generic flow chart of rainwater use

prEN 16941-1:2022 (E)**1 Scope**

This document 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 document also specifies the minimum requirements for these systems.

Excluded from the scope of this document are:

- the use as drinking water and for food preparation;
- the use for personal hygiene purposes;
- attenuation;
- infiltration.

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

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

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

EN 806 (all parts), *Specification for installations inside buildings conveying water for human consumption*

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 all parts)*

3 Terms and definitions

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

water arising from atmospheric precipitation

[SOURCE: EN 16323:2014, 2.1.1.1, modified] [standards/sist/072b2eea-74e3-4a15-bca3-224fb39b0f73/osist-pren-16941-1-2022](https://standards.sist/072b2eea-74e3-4a15-bca3-224fb39b0f73/osist-pren-16941-1-2022)

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

prEN 16941-1:2022 (E)**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

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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 air pollution and the 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 the 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 harvested rainwater quality and the intended use of the treated rainwater shall be considered in order to determine which treatment is needed and which method is appropriate, e.g. physical, chemical or biological or the combination of them.

prEN 16941-1:2022 (E)

The harvested rainwater shall be treated to a quality for the intended use.

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, discolouration and/or biological treatment 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 Treatment in storage device

The incoming rainwater is treated in the storage device by separation of coarse particles from the incoming rainwater (sedimentation and/or flotation processes). Biological degradation of organic substances may occur.

5.2.4 Additional treatment

Additional treatment (e.g. filtration, disinfection, biological treatment) 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;
- to treat the incoming water (sedimentation, flotation); and
- to protect the quality of this water from risks of deterioration.

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 materials (e.g. concrete, steel, Polyvinyl chloride (unplasticized) (PVC-U), Polyethylene (PE), Polypropylene (PP), Glass Reinforced Polyester (GRP-UP)) used for prefabricated factory built storage devices shall meet the conditions described in EN 12566-3.

The material shall be non-translucent and/or UV stable. Where translucent material is used, light shall be excluded.

The materials constituting the submerged components shall be corrosion resistant.

5.3.3 Dimensions

When prefabricated components are used, the overall dimensions, access and connection dimensions and tolerances shall be stated by the manufacturer. Individual storage devices may be connected to each other.

5.3.4 Capacity

The nominal capacity is the maximum volume of water that can be retained within the storage device and shall be stated by the manufacturer or designer.

The capacity can be determined by testing or calculation.

5.3.5 Structural behaviour

Storage devices shall withstand the maximum stresses and loads exerted during its handling, installation, use and maintenance. This shall be assessed either by calculation or testing.

Above-ground storage devices shall withstand the action of hydrostatic pressure without generating excessive deformation adversely affecting their function.