SLOVENSKI STANDARD
oSIST prEN 18049-1:2024

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Vodnjaki za črpanje vode - 1. del: Načrtovanje

Wells for water extraction - Part 1: Design

Brunnen zur Wassergewinnung - Teil 1: Design

Forages pour l'extraction de l'eau - Partie 1 : Conception

Ta slovenski standard je istoveten z: **prEN 18049-1**

ICS:

93.025	Zunanji sistemi za prevajanje vode	External water conveyance systems

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EUROPEAN STANDARD

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ICS

English Version

Wells for water extraction - Part 1 Design

Puits pour l'extraction de l'eau - Partie 1 : design

Brunnen zur Wassergewinnung - Teil 1 Design

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 451.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 18049-1:2024) has been prepared by Technical Committee CEN/TC 451 “Water wells and borehole heat exchangers”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

Within its program of work, Technical Committee CEN/TC 451 requested CEN/TC 451/WG 1 “*water wells*” to prepare the following standard:

EN 18049-1, Wells for water extraction — Part 1: design.

The EN 18049 series under the main title Wells for water extraction will consist of the following parts:

— *Part 1: design;*

— *Part 2: XXX;*

— *Part 3: XXX;*

1 Scope

This document covers all types of water wells, whether for public or private use, abstracting from or injecting water to the groundwater, in a variety of applications. These include potable water abstraction, industrial use, irrigation, dewatering, infiltration or recharge, and geothermal applications, or for groundwater observation (see Clause 13).

This document does not apply to horizontal wells and closed loop geothermal systems.

The document defines design requirements of water wells for public and private users in accordance with groundwater protection goals. It gives guidelines for all planning steps from preliminary to final executive project design.

A sequential method for designing and dimensioning a well is specified. Based on the hydrogeological conditions and the objectives of the well, a step-by-step process for dimensioning the well is defined. This methodology includes dimensioning for the drilling, filter packs, sealing and a screen. Furthermore, selection of appropriate materials, the pump and all other additional well equipment is outlined. With regard to the planning process references are provided for drilling methods, geophysical well logging, well development and pumping tests.

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 14396, *Fixed ladders for manholes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
abandoned well
also called decommissioned a term used when a well's use is permanently discontinued or if it is in a condition that makes it uneconomic to repair

3.2
alignment of the well
measure of the straightness of adjacent sections of a well

Note 1 to entry: Often tested by running a dummy tool into the well.

3.3
annular space (annulus)
space between a drilled hole and the well casing

3.4
aquifer
water-bearing geological layer comprising permeable rock, fractures or unconsolidated materials (gravel, sand, or silt)

3.5
aquifer stimulation
type of development that is carried out to alter the formation physically to improve its hydraulic properties

3.6
aquifer test
special case of a pumping test using additional observation wells to obtain information about the characteristics of a aquifer

3.7
aquitard
geologic formation having very low permeability

3.8
artesian aquifer
confined aquifer in which the piezometric surface is above the ground level

3.9
artesian well
wells (bore holes) that penetrate artesian aquifers

3.10
auger
machine having a rotating helical shaft for boring into the earth

3.11
bailer
cylindrical, bucket-like device with a footvalve used to collect or remove mud and rock cuttings from, the borehole

3.12
borehole
hole created by drilling into the ground

3.13
bottom hole assembly
lower portion of the drill string, which may consist of (from the bottom up) the bit, bit sub, a mud motor (in certain cases), stabilizers, drill collars, heavyweight drill pipe, jarring devices (jar) and crossovers for various thread forms

3.14
cable tool
group of machines for drilling by the breaking and crushing action of heavy drilling tools suspended on a cable which are repeatedly lifted and dropped

3.15
casing
tube (usually steel or plastic) that is installed in a well to maintain the well opening and to provide a seal

3.16
cementing
specific case of grouting where only cement and water are used

3.17
centralisers
devices used to ensure that casing or riser tubes are installed centrally within the borehole

3.18
confined aquifer
aquifer whose upper and lower boundaries are low permeability layers which confine the groundwater under greater than atmospheric pressure

3.19
unconfined aquifer
aquifer with an upper surface as a water table, whose piezometric surface is at atmospheric pressure (an unconfined surface)

Note 1 to entry: The level of this groundwater can fluctuate, creating a saturated zone and an unsaturated zone

3.20
core
continuous cylinder of rock, cut from the bottom of a borehole as a sample of an underground formation

3.21
cuttings
small pieces of rock or broken material derived from the drilling process, which can be used for sampling

3.22
Down-the-hole hammer
DTH
self-rotating air-activated percussive drilling bit

3.23
drawdown
decrease in ground water level caused by pumping, measured as the difference between the static and the dynamic water level at a particular time

3.24
drill bit
cutting tool used in well drilling

3.25
drilling additives
specific components of the drilling fluid that can be used to restore the drilling mud properties or to act in a particular way as required

3.26
drill collar
component of a drill string that provides weight on the bit for drilling

3.27
drill pipe
steel pipe used to carry and rotate the drilling tools in a well, and to permit the circulation of drilling fluid

3.28
drilling fluid
drilling mud
water or air-based fluid used in the water well drilling operation to remove cuttings from the hole, to clean and cool the bit, to reduce friction between the drill string and the sides of the hole, and to seal the borehole

3.29
dynamic water level
cf. static water level
piezometric surface influenced by drawdown or injection, as opposed to the natural water level at rest at the same point;

Note 1 to entry: More specifically, drawn down or raised water level, whether or not stabilized, in a pumping well or injection structure

Note 2 to entry: Static level (natural groundwater level): the piezometric surface in a borehole not influenced by pumping, sampling or by injection of water

3.30
filter cake
suspended solids that are deposited on a porous medium during the process of filtration

3.31
free flowing well
(see artesian well)

3.32
formation
general term for the geological units surrounding the borehole

3.33
formation stabiliser
sand or gravel placed in the annulus of the well between the borehole wall and the well screen to provide temporary or long-term support for the borehole

3.34
geophysical well logging
generic name for a suite of technologies that indicate absolute or relative properties of geological formations, aquifers and wells

3.35
filter pack
gravel pack
coarse sand, fine gravel, glass beads, or other suitable materials, that is placed between the borehole wall and screen

Note 1 to entry: Filter packs are used to retain the formation and improve the hydraulic condition around the well.

3.36
grout
cement- and/or clay-based sealing material (e.g. swelling clay) used to create a sanitary seal in the annular space to prevent crossflow between aquifers and/or contaminants from entering the well

3.37
head
for the purpose of this standard means hydraulic head

3.38
head loss
energy which is lost due to friction as water moves from an aquifer through the well (filter pack, screen, pump, riser pipes) to the surface

3.39
hydraulic conductivity
capacity of subsurface materials (sand, rock etc.) to allow a fluid (i.e. water) to flow through it. For an isotropic porous medium and homogenous fluid, the volume of water that moves in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow

Note 1 to entry: In the SI System, the units are m3/s/m2 or m/s.

3.40
hydraulic head [m]
height above a datum plane (such as sea level) of the top of the column of water that can be supported by the hydraulic pressure at a given point in a ground water system. For a well, the hydraulic head is equal to the distance between the water level in the well and the datum plane

3.41
impermeable
resistant to flow of or penetration by water or other liquids

3.42
injection well
well constructed for the purpose of injecting water directly into the aquifer

3.43
kelly
long square or hexagonal steel bar connecting the rotary table with the drill string enabling rotary motion, while allowing the drill string to be lowered or raised during rotation

3.44
Managed Aquifer Recharge
MAR
Managed Aquifer Recharge (MAR) is the deliberate recharge of water to aquifers for subsequent recovery or environmental benefit e.g. achieved through injection wells

3.45
monitoring well
well constructed or used for the purposes of water level or water quality data collection

Note 1 to entry: Monitoring wells are often installed to provide an early warning of contamination occurring down gradient from a landfill or industrial facility. See also Observation wells.

3.46
observation well
well constructed in a specific location for the purpose of observing(measuring) changes in water level

Note 1 to entry: An existing well perhaps drilled for a different purpose may also be used to observe water level changes. Observation wells are typically used for short duration data collection such as before, during and after an aquifer test. Wells that are used to collect data on a long term basis are usually referred to as monitoring wells.

3.47
packer
device used to isolate particular portions of the aquifer in a borehole

3.48
partial penetration
when the depth of the intake portion of the well is less than the full thickness of the aquifer

3.49
piezometer
(see monitoring well)

3.50
polymer mud
water based drilling fluid with polymers

3.51
production well
water well designed to meet a particular demand of groundwater

3.52
pumping test
controlled pumping with associated measurements of water level changes that are used to determine aquifer characteristics and the hydraulic properties of wells

3.53
rig
machine used to drill a well

3.54
rising main
drop pipe
pump column
pipe connecting the submersible pump to the wellhead

3.55
rotary table
revolving or spinning section of the drill floor that provides 3. power to turn the drill string in a clockwise direction

Note 1 to entry: The rotary motion and power are transmitted through the kelly bushing and the kelly to the drill string

3.56
saline intrusion
entry of sea water into a coastal aquifer