SLOVENSKI STANDARD
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Water wells - Part 1: Design

Brunnen zur Wassergewinnung - Teil 1: Design

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

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ICS:

93.025	Zunanji sistemi za prevajanje vode	External water conveyance systems

SIST EN 18049-1:2026 **en,fr,de**

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Water wells - Part 1: Design

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

Brunnen zur Wassergewinnung - Teil 1: Design

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European foreword

This document (EN 18049-1:2026) has been prepared by Technical Committee CEN/TC 451 “Water wells and borehole heat exchangers”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by April 2027, and conflicting national standards shall be withdrawn at the latest by October 2029.

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

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, Water wells — Part 1: Design.

The EN 18049 series under the main title water wells will consist of the following parts:

— *Part 1: Design;*

— *Part 2: Construction;*

— *Part 3: Operation and abandoning.*

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Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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1 Scope

This document is applicable to 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, aquifer recharge, and geothermal applications, or for groundwater observation (see Clause 13).

This document does not apply to horizontal wells, groundwater quality monitoring wells in potentially contaminated sites, and closed loop geothermal systems.

This 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, sealings and screens. 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 14396:2004, *Fixed ladders for manholes*

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3 Terms and definitions

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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
well which is 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

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3.4
aquifer
water-bearing geological layer comprising permeable rock, fractured rock 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 often using additional observation wells to obtain information about the characteristics of an aquifer

3.7
aquitard
geologic formation having very low permeability

Note 1 to term: An aquitard with extremely low permeability can be termed aquiclude.

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

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3.9
artesian well
free flowing 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 can consist of (from the bottom up) the bit, bit sub, a mud motor (in certain cases), stabilisers, 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

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

3.20
cuttings
small pieces of rock or broken material derived from the drilling process, which can be used for sampling

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3.21
down-the-hole hammer
DTH
self-rotating air-activated percussive drilling bit

3.22
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

3.23
drill bit
cutting tool used in well drilling

3.24
drilling additives
drilling fluid additives
drilling mud 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

3.25
drill collar
component of a drill string that provides weight on the bit for drilling

3.26
drill pipe
steel pipe used to carry and rotate the drilling tools in a well, and to permit the circulation of drilling fluid

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3.27
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

3.28
dynamic water level
piezometric surface influenced by pumping or injection, as opposed to the static water level (3.63)

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

3.29
filter cake
suspended solids that are deposited on a porous medium during the process of filtration

3.30
free flowing well
(see artesian well)

3.31
formation
general term for the geological units surrounding the borehole

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3.32
formation stabiliser
sand or gravel placed in the annulus of the well between the borehole wall and the well screen and casing to provide temporary or long-term support for the borehole

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3.33
geophysical well logging
terminology for a suite of technologies that indicate absolute or relative properties of geological formations, aquifers and wells

3.34
filter pack
gravel pack
coarse sand, fine gravel, glass beads, or other suitable materials, that are placed between the borehole wall and screen to retain the formation and improve the hydraulic condition around the well

3.35
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

3.36
hydraulic head loss
energy loss within a fluid system, e.g. due to friction or turbulence, as water moves from an aquifer through the well (filter pack, screen, pump, riser pipes) to the surface

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3.37
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 perpendicular to the direction of flow

Note 1 to entry: In the SI System, the units are $m^3/s/m^2$ or m/s.

3.38
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

3.39
impermeable
resistant to flow of or penetration by water or other liquids

3.40
injection well
well constructed for the purpose of injecting water directly into the aquifer

3.41
infiltration well
well constructed for the purpose of allowing water to flow into the aquifer under the force of gravity

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3.42
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

3.43
managed aquifer recharge
MAR
managed aquifer recharge (MAR) is the artificial recharge of water into aquifers for subsequent recovery or environmental benefit

Note 1 to entry: MAR can include many techniques, such as Aquifer Storage and Recovery (ASR) for example.

3.44
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.

3.45
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.

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3.46
packer
device used to isolate particular portions of the aquifer in a borehole

3.47
partial penetration
when the depth of the intake portion of the well is less than the full thickness of the aquifer

3.48
piezometer
small diameter monitoring well used for water level observation (see monitoring well)

3.49
polymer mud
water based drilling fluid with polymers

3.50
porosity
property of a rock or soil containing interstices or voids, expressed as a ratio of the volume of the voids, connected or isolated, over the total volume

Note 1 to entry Porosity can be intergranular or fissured and is responsible for storage capacity as well as hydraulic conductivity. In hydrogeology, effective porosity (also called drainage porosity) refers to connected interstices where water can be moving and being drained out from a sample.

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

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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
the 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 section of the drill floor that provides torque to rotate the drill string

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 saline water into an aquifer

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3.57
saline water
salt water
water that contains high concentrations of dissolved solids, mainly sodium chloride

3.58
screen
well screen
slotted tube or wire wound screen usually made of steel or plastic material with apertures used to allow water to enter a well while preventing sediment or rock particles from entering the well

3.59
sieve analysis
determination of the particle-size distribution of a soil, sediment, or rock by measuring the mass of the particles that will pass through a standard set of sieves and reporting the results as the percentage retained or passing

3.60
sinkhole
depression in the land surface caused by collapse of overlying soils or rock into pre-existing cave systems, usually in areas of limestone geology

3.61
slurry
thin mixture of liquid, especially water, and any of several finely divided substances, such as cement or clay particles, but capable of pumping

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3.62
specific capacity
rate of discharge of a well per unit depth of drawdown. It is used as a measure of well efficiency. The ideal for a well is high discharge and low drawdown

Note 1 to entry Units are $m^3/s/m$ or m^2/s.

3.63
static water level
static or rest water level is the level at which water stands in a well when the water level is at equilibrium with atmospheric pressures when it is neither under the influence of pumping nor injection

Note 1 to entry: It is a measure of the depth from the ground surface or from a known reference point to the water level. The water level may also be measured relative to a datum such as sea level (see also, dynamic water level)

3.64
subsidence
dropping of the land surface for example as a result of over-pumping ground water. Cracks and fissures can appear in the land

Note 1 to entry: Subsidence is usually an irreversible process.

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