SLOVENSKI STANDARD
oSIST prEN ISO 18674:2013

01-december-2013

Geotehnično preiskovanje in preskušanje - Geotehnične meritve - Splošna pravila (ISO/DIS 18674:2013)

Geotechnical investigation and testing - Geotechnical monitoring by field instrumentation - General rules (ISO/DIS 18674:2013)

Geotechnische Erkundung und Untersuchung - Geotechnische Messungen - Allgemeine Regeln (ISO/DIS 18674:2013)

Reconnaissance et essais géotechniques - Mesures géotechniques - Principes (ISO/DIS 18674:2013)

Ta slovenski standard je istoveten z: **prEN ISO 18674**

ICS:

93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works

oSIST prEN ISO 18674:2013 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 18674

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Geotechnical investigation and testing — Geotechnical monitoring by field instrumentation — General rules

Reconnaissance et essais géotechniques — Mesures géotechniques — Principes

ICS: 13.080.20;93.020

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 18674:2013(E)

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Foreword

1 Scope

This Standard applies to performance monitoring of the ground, structures interacting with the ground and geotechnical works.

Specifically, this Standard applies to field instrumentation and measurements carried out

— in connection with site investigations of soils and rocks in accordance with EN 1997-2;

— in connection with the Observational Design procedure in accordance with EN 1997-1;

— for ground behaviour evaluation, e.g. unstable slopes, consolidation etc.

— for the proof or follow-up of a new equilibrium within the ground, after disturbance of its natural state by construction measures (e.g. foundation loads, excavation of soil, tunnelling);

— for the proof or follow-up of the stability, serviceability and safety of structures which may be influenced by geotechnical construction;

— for perpetuation of evidence;

— for the evaluation and control of geotechnical works.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 14688-1, *Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description*

ISO 14689-1, *Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description*

ISO 22475-1, *Geotechnical investigation and testing – Sampling by drilling and excavation methods and groundwater measurements – Part 1: Technical principles for execution*

ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

EN 1997-1, Eurocode 7, Geotechnical design – General rules

EN 1997-2, Eurocode 7, Geotechnical design – Ground investigation and testing

Geotechnical investigation and testing – Geotechnical monitoring by field instrumentation – *Part 2: Displacement measurements along a line: Extensometers*

Geotechnical investigation and testing – Geotechnical monitoring by field instrumentation – *Part 3: Displacement measurements across a line: Inclinometers and deflectometers*

NOTE Further parts on total pressure cells, piezometers, hydraulic settlement gauges, strain gauges, load cells, geodetic monitoring instruments and vibration monitoring instruments are in preparation.

3 Terms and symbols

3.1 Terms

For the purpose of this document the terms and definitions of ISO/IEC Guide 99:2007 apply as well as the following terms and definitions:

3.1.1
geotechnical monitoring
observation of the ground behaviour and/or performance of geotechnical structures before, during and/or after construction.

NOTE 1 Geotechnical monitoring is an integral part of the Observational Design procedure (see EN 1997-1: 2004).

NOTE 2 Geotechnical monitoring is based on field observation, including construction site inspection.

3.1.2
field instrument
measuring tool to assist field observation

NOTE Monitoring by field instruments comprises the measurement of physical parameters, in particular the change of the parameter values.

3.1.3
geotechnical key parameter
physical parameter indicative of the geotechnical problem under consideration and subject to geotechnical monitoring

EXAMPLES Displacement (absolute or relative), settlement, heave, strain, inclination, stress, pore pressure, earth pressure, force, temperature.

3.1.4
geotechnical monitoring project
entirety of aspects and processes which, in a specific project, are relevant for geotechnical monitoring. It includes planning, specifying, procurement, delivery and installation of a project-specific monitoring system and collecting, processing and evaluating of the monitoring data

3.1.5
geotechnical monitoring concept
preliminary plan for the measurement of geotechnical key parameters within the conceptual design phase, considering type of measurement, measuring locations and schedule of carrying out the measurements

3.1.6
geotechnical monitoring plan
advancement of the monitoring concept within the specification design phase

3.1.7
geotechnical monitoring programme
entirety of those components of a monitoring project which can be systematically planned, consisting of monitoring plan and monitoring system

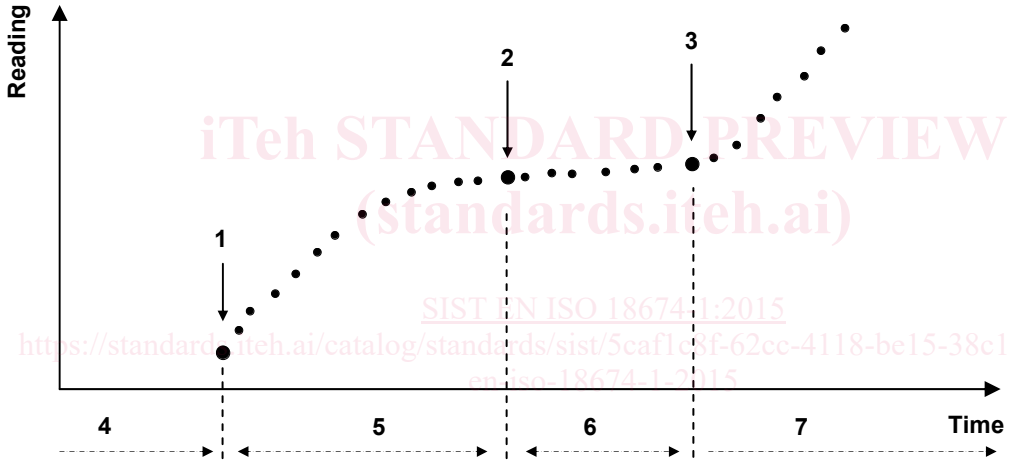
3.1.8
geotechnical monitoring system
hardware and software to provide field data. It includes instruments, signal transmission (e.g. electric cables), data acquisition and auxiliary units.

3.1.9
commissioning
demonstration and acceptance of the correct functioning of an installed monitoring system

NOTE The commissioning criteria should be defined in the monitoring programme

3.1.10
instrument data sheet
manufacturer's document containing instrument technical specifications

3.1.11
initial measurement
first measurement after installation (see Figure 1)



Legend

1 initial measurement
2 zero measurement
3 reference measurement
4 installation period
5 stabilisation period
6 period of baseline measurements
7 construction period

Figure 1 – Definition of distinct measuring points in the initial phase of a geotechnical monitoring project

3.1.12
zero measurement
measurement carried out after stabilisation of installation effects (see Figure 1)

NOTE 1 The zero measurement is often taken as reference for subsequent measurements, as it is commonly related to local space and time co-ordinates.

NOTE 2 The zero measurement is commonly carried out with increased measuring effort, e.g. repetition of measurements, to provide a reliable datum for subsequent measurements.

3.1.13
baseline measurements
measurements carried out, subsequent to the zero measurement, over a period of time before any construction starts, to help in the definition of changes that occur from causes other than construction.

EXAMPLES Seasonal changes in groundwater levels, tidal and moisture content changes, climatic changes such as temperature and incidence of sunlight

3.1.14
reference measurement
measurement which serves as reference base for previous and subsequent measurements

NOTE 1 The reference measurement is also known as datum measurement.

NOTE 2 A new reference measurement is often used for a new construction phase

NOTE 3 The reference measurement is often derived from several measurements

3.1.15
value change measurement
difference between a measurement and the reference measurement

3.1.16
point measurement
measurement of a physical parameter at a point

EXAMPLES Displacement of a measuring point; force of an anchor at its head; stress state in the ground; porewater pressure in an embankment; water discharge rate at the downstream toe of a dam.

3.1.17
line measurement
measurement of a physical parameter along a line

EXAMPLE Inclinometer measuring survey of a borehole

NOTE The measurement of the distance between two measuring points, for example the convergence measurement in tunnelling, is a special case of a line measurement.

3.2 Symbols

For the purpose of this document, the symbols of Table 1 apply.

Table 1 — Symbols

Symbol	Name	Unit
d	borehole diameter	m
i	number of measurement, measurement direction or measuring point	-
l	distance	m
u, v, w	displacement component in x-, y-, z- direction, respectively	m
u	porewater pressure	Pa
x, y, z	local co-ordinates	m
z_w	piezometric level	m
α	angle, inclination	Degree or mm/m
ε_n	strain normal to measuring plane	-
$\varepsilon_x\ \varepsilon_y\ \varepsilon_z$	normal strain with reference to borehole co-ordinates	-
$\gamma_{xy}\ \gamma_{yz}\ \gamma_{zx}$	shear strain with reference to borehole co-ordinates	Degree
$\sigma_1\ \sigma_2\ \sigma_3$	principal stress	Pa
σ_n	normal stress with reference to measuring plane	Pa
$\sigma_x\ \sigma_y\ \sigma_z$	normal stress components with reference to borehole co-ordinates	Pa
$\tau_{xy}\ \tau_{yz}\ \tau_{zx}$	shear stress components with reference to borehole co-ordinates	Pa

NOTE Symbols with more than one meaning (e.g. i, u) are distinguishable on the basis of their use

4 Principal requirements

4.1 Geotechnical monitoring in connection with geotechnical design

Geotechnical monitoring shall be designed, implemented and evaluated in connection with the geotechnical design.

NOTE Figure C.1 in Annex C shows the position of geotechnical monitoring in connection with the design and the construction of geotechnical structures; see also “observational method” in EN 1997-1: 2004, Sections 2.7 and 4.5

4.2 Geotechnical monitoring in connection with specific question(s)

Each geotechnical monitoring project shall be based on at least one specific question that is to be answered. The question shall be formulated at the start of the monitoring project and actualised throughout the project with the aid of information from the measurements.

NOTE It is implied that monitoring of construction procedures and long-term monitoring of existing safety-sensitive structures are included.

4.3 Requirements on a geotechnical monitoring project

4.3.1 In a geotechnical monitoring project, all items and courses of action, as depicted in Figure 2, shall be considered.

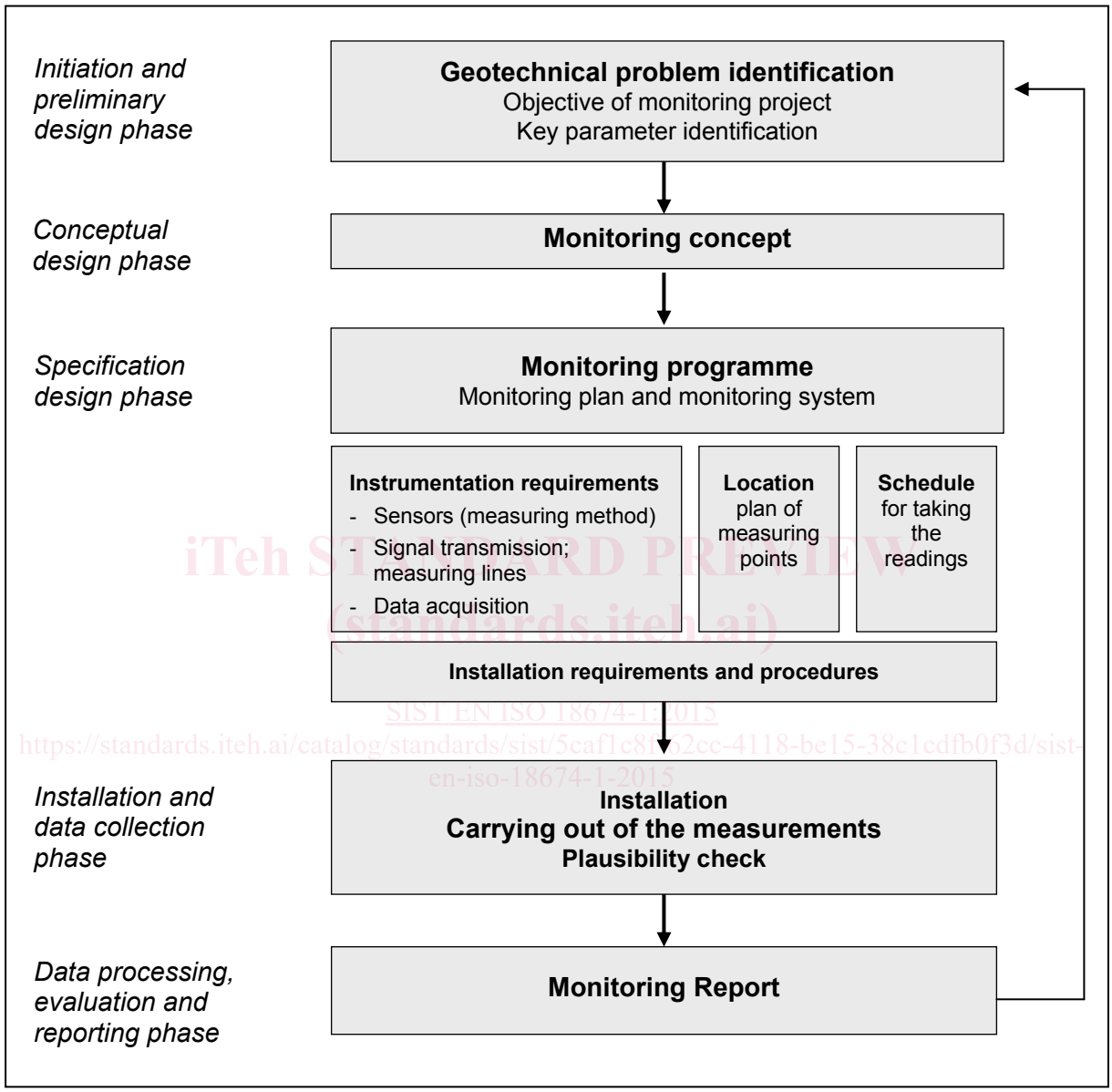


Figure 2 – Topics and course of action of a geotechnical monitoring project

4.3.2 Within the initiation and preliminary design phase, reference shall be made to the geotechnical problem to be addressed (see EN 1997-1: 2004). The key parameters shall be identified and their expected range estimated. The accuracy and the uncertainty with which the key parameters are to be measured and their geotechnically tolerable limits shall be specified.

4.3.3 Within the conceptual design phase, a concept shall be developed on how to measure the key parameters of the geotechnical problem under consideration.

NOTE Aspects for consideration are the principal type of the instruments, frequency of measurements, redundancy in the system and the anticipated operation time of the monitoring system.

4.3.4 Within the specification design phase, the monitoring concept shall be refined and transferred into a comprehensive monitoring programme. This programme encompasses the monitoring plan and the monitoring system and, as such, includes all components of a monitoring project which can be planned ahead of the measurements. Important aspects of this phase are the instrument selection based on instrument data sheets (Annex A) together with expected field performance and the specification of the instrument installation procedure.

NOTE 1 The monitoring plan includes the specification of the measuring procedure, the location of the monitoring points, the monitoring schedule and the type of data collection (manual reading or data logging with or without remote data access).

NOTE 2 The measuring procedure may encompass the measuring principle (physical base of the measurement; e.g. vibrating wire principle) and of the measuring method (e. g. compensation method, digital/analogue method).

NOTE 3 Field instruments comprise a large variety of sensors with different measuring principles which all have their specific advantages and disadvantages depending on the type of application. Examples of sensors with different measuring principles are vibrating wire, current-loop, inductive, capacitive, resistance strain gauge and fibre-optical sensors.

4.3.5 Within the installation and data collection phase, it shall be attempted

- to install the instrument system as early as possible prior to construction for baseline measurements (see Figure 1);
- to carry out the installation in such a way as to achieve good conformance of the measuring instruments;

  NOTE Good conformance is associated with only insignificant, if any, alterations of the measured values by the presence of the instrument
- to operate and handle the instruments in accordance with the manufacturer's instructions.

  NOTE For carrying out of the measurements, see 7.

4.3.6 Within the data processing, evaluation and reporting phase, attention shall be paid to the fact that the monitoring data are often affected by instrument, installation and environmental effects (see 5.3). In all phases of the evaluation process, plausibility checks of the monitoring data are essential. Checking shall include instrument as well as geotechnical aspects (see 8.5).

4.3.7 The monitoring results shall be evaluated in respect to the geotechnical problem under consideration.

4.4 Geodetic measurements

For the support, evaluation and control of geotechnical measurements it is often necessary to refer to geodetic measurements.

NOTE For comparison of geotechnical and geodetic measurements, see Annex C, Table C.1.

4.5 Safety requirements

National safety regulations shall be followed.

EXAMPLES Regulations for

- personal health- and safety equipment;
- clean air if working in confined spaces;
- ensuring the safety of the measuring system and its components.