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Nordic Innovation Centre

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## NORDTEST SAMPLER CERTIFICATION

SCHEME HANDBOOK  
VERSION 2-0

**NORDTEST**  
a Nordic Innovation Centre brand



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## NORDTEST SAMPLER CERTIFICATION SCHEME HANDBOOK. VERSION 2-0

Key words: Personnel certification, environmental sampling, handbook

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### 1 SCHEME PRINCIPLES

The procedures of this handbook describe the principles of the Nordtest personnel certification scheme for samplers. The scheme is operating in all Nordic and Baltic countries.

The certification scheme is established according to the globally accepted process of assessment, subsequent surveillance and periodic re-assessment of the competences for certified persons. The certification scheme and the certification bodies connected to this scheme shall meet the requirements of ISO/IEC 17024.

This scheme handbook presents the organisation and framework of the scheme (Chapter 1), the scheme operation modus (Chapter 2). A collection of supporting documents related to competence, performance and sampling requirements and to the certification process is included as appendix normative with the same status as the handbook.

#### 1.1 Scope

Certification is granted to the sampler and the scope is limited to environmental sampling, excluding aspects such as sampling planning.

Nordtest Certification of samplers can be granted for the following matrices:

**Solid wastes** as follows:

- granular wastes or by-products (*i.e.*: slag, fly ash).

**Soils** (defined as topsoils and geological sediments) from:

- contaminated sites
- soil piles.

**Groundwaters** (defined as subsurface waters) from:

- investigation wells
- drinking water supply wells.

**Bottom sediments** (defined as sedimentary materials) from:

- marine (*i.e.*: offshore, near shore and estuarine) sediments
- lake and similar standing water bodies' sediments.

**Waste waters** as follows:

- industrial waste water
- raw domestic waste water and
- treated domestic waste water.

Sampling of accidental spillages is not included in the scope for waste water sampling.

**Solid sludge** from waste water works and industrial processes (defined as sludge of min. 10% dry matter) for agricultural use and sampled from:

- well-defined stocks and beds or
- opened containers.

Certified sampling of solid sludge can only take place from batches (stockpiles or containers) of well-defined geometry. Additionally, sampling of solid sludge according to the scope of solid waste can be certified.

Certification for sampling of waste waters and solid sludges may be granted jointly.

**Surface fresh waters** from:

- flowing-water (rivers and streams)
- Still-water (lakes and ponds)

The scheme handbook covers sampling for physical/chemical, biological and microbiological characterisation.

The certification scheme is open for samplers that meet the requirements of Section 2.2 with respect to sampling performance.

The sampler can be certified to do sampling according to the principles stipulated in Section 2.3.1, with methods and equipment stipulated in Sections 2.2.1, 2.2.2, and appendix, Section 2.2.1, and following the requirements for quality control and documentation given in Sections 2.3.2 and 2.3.3, and appendix, Section 2.3.1.

## 1.2 References

For undated references the latest edition of the publication referred to applies.

### 1.2.1 Normative references

EN ISO/IEC 17024: Conformity assessment – General requirements for bodies operating certification of persons.

Standards for sampling as found in appendix, Section 2.2.1

### 1.2.2 Non normative references

EN 45010: General requirements for assessment and accreditation of certification/registration bodies.

ISO/IEC Guide 2: Standardization and related activities – General vocabulary.

EN ISO/FDIS 17000: Conformity assessment – Vocabulary and general principles.

EN ISO 9000: Quality management systems – Fundamentals and vocabulary.

## 1.3 Terms and definitions

The handbook applies the terms and definitions given in EN ISO/IEC 17024, ISO/IEC Guide 2, EN ISO/FDIS 17000 and EN ISO 9000. In addition the following terms and definitions are used:

### *Composite sample*

Two or more sub-samples mixed together in appropriate proportions, either discretely or continuously (blended composite sample), from which the average value of a desired characteristic may be obtained

### *Duplicate*

One of the two (or more) samples or sub-samples obtained separately at the same time and place by the same sampling procedure or sub-sampling procedure (\* for replicate sample)

### *Field control*

Matrix, with known contents of the parameters in question, brought to the sampling site and transferred to the sample containers of the same type as used for sampling

### *Field blanks*

Clean matrix transferred to a sample container of the same type as used for the samples, transported to the laboratory and analysed with the samples

### *Instructor*

Person that provides training at a training course.

### *National representative*

Member of Nordtest Technical Group representing a country that is participating in the scheme

### *Participating country*

Country that applies certified sampling according to the present handbook

### *Sample*

Portion of material selected from a larger quantity of material

### *Sampler*

Person carrying out the sampling procedures at the sampling point

### *Sampling*

The process of preparing, conducting and reporting sampling

### *Sampling plan*

A site and time specific description of how the sampling method (written sampling procedure) is to be applied

### *Stockpile*

Temporary heap of material

### *Uncertainty*

Parameter, associated with the result of a measurement, that characterises the dispersion of the values that could reasonably be attributed to the measured quantity.

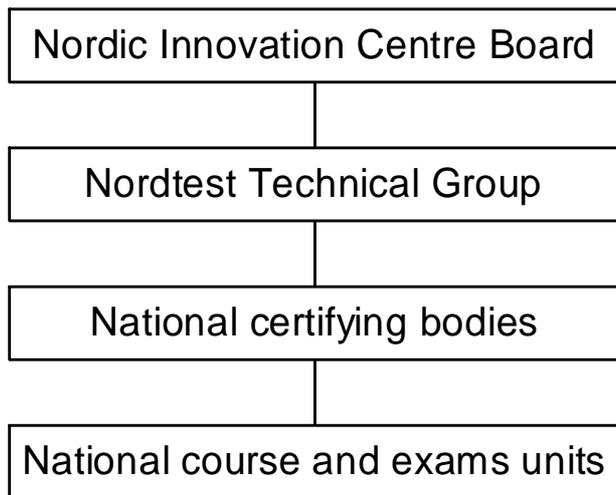


Figure 1. Organisation of the Nordtest Sampler Certification Scheme.

## 1.4 Organisation and location

The scheme organisation is shown in Figure 1.

### 1.4.1 Duties and responsibilities

#### NICe Board

The Nordic Innovation Centre (NICe) board has the overall responsibility for the scheme and the scheme handbook including maintenance and development. The NICe board must approve all new versions of the handbook. In addition, the NICe board approves appointments for the Nordtest Technical Group (NTG) and is represented in the NTG.

#### Nordtest Technical Group

The Nordtest Technical Group (NTG) is open for:

- one representative of the Nordic Innovation Centre board
- one representative of a certifying body from each participating country in the scheme
- one national representative from each participating country
- one representative for samplers or samplers organizations from each participating country.

As many as possible of the Nordic ministries of the environment or other relevant ministries are represented as national representatives.

The NTG appoints among its members a chairman and a secretary. The NTG members are appointed for a period of 4 years and can normally be reappointed for only one additional period. All NTG members must sign an agreement to respect the confidentiality required, as stipulated in ISO 17024.

The NTG will convene once a year in a participating country. Costs of the NTG will be covered by Nordic Innovation Centre, NICe, after annual application.

The responsibilities of the NTG are:

- to advise the NICe board on all issues related to the Nordtest Sampler Certification Scheme
- to perform simple maintenance of the scheme
- to suggest required maintenance and development of the scheme, including the scheme handbook, to the NICe board
- to promote international collaboration for the scheme
- to suggest appointments of new members of the NTG to the NICe board
- to initiate regular (normally annually) joint Nordic Baltic seminars for the course units and certifying bodies as applies.

For technical development of the scheme beyond simple maintenance, the NTG will seek funding for the work by e.g.: application to the Nordic Innovation Centre.

In the NTG, simple maintenance tasks will predominantly be undertaken by the representatives of the certifying bodies.

#### Secretariat

The Nordic Innovation Centre (NICe) Secretariat is secretariat for the NTG. The NICe board representative can appoint one of the scheme certifying body to undertake the secretariat functions. The specific responsibilities are:

- to maintain an archive of all decisions taken by the NTG in the form of meeting minutes, as well as of all versions of this handbook
- to maintain a list of all handbook versions with dates for the NTG
- to archive all handbook versions with dates for the NTG
- to maintain a list over complaints on the scheme and actions taken for the NTG
- to maintain a list of national certifying bodies, including status with respect to accreditation
- to arrange regular (normally annually) joint Nordic Baltic seminars for the certifying bodies and course units at the participants costs, as appropriate.

#### Certifying bodies

The certifying body shall define its policies and procedures in accordance with the requirements in ISO 17024 and in this scheme handbook. All organisations that fulfil the requirements of this handbook and ISO 17024 are entitled to establish themselves as certifying bodies under the scheme.

The certifying body must:

- register with the NTG before initiating certification according to the scheme
- appoint a scheme committee according to ISO 17024
- seek and obtain accreditation of their quality manual complying with this handbook and ISO 17024 (the certification process). The accreditation body used must operate according to ISO 45010

- have access to technical experts for certification with qualifications and experience within the specific type of sampling taken up by the body (as mentioned in ISO 17024)
- identify, enter contract with and register at the least one course unit for performing training and exams
- survey that the course and exams unit contracted operates according to the contract
- keep, maintain and publish a register of samplers certified by the body, with the indication of scope and dates of certification, renewal and recertification
- participate in meeting for certifying bodies arranged by the NTG.

The certifying body can not reject to enter contract with a course and exams unit, if the unit agrees to the requirements set in this handbook and ISO 17024. The tasks of certifying bodies operating this scheme are further defined in the procedures of this handbook, Sections 2.4.

### Course and exams units

Course and exams units are responsible for training and exam arrangements according to the requirements of this handbook and ISO 17024. All organisations that fulfil the requirements of this handbook are entitled to establish themselves as course and exams units under the scheme.

The course unit that refer to this scheme must:

- contract with a certifying body registered with the NTG for certification within the scope taken up by the course unit, see appendix, Section 1.3 for contract contents
- comply with national requirements for approval if relevant
- have access to equipment and facilities that enable teaching according to the course and exams requirements given in this handbook
- use instructors that have qualifications and experience within the field of teaching and exams compliant with specifications of requirements written in the contract with the certifying body
- offer exams for samplers after previous participation in basic training courses
- offer exams for samplers both after and without previous participation in special training courses
- archive all exams questions and candidates answers for at the least 5 years
- make exams questions and candidate answers available for inspection by the contracting certifying body upon request
- participate in meetings for course and exams units arranged by the NTG
- establish a system for handling of complaints in relation to the given training courses and exams and make the system available for inspection by the certifying body at request.

The tasks of the course units operating under this scheme are further defined in the procedures of this handbook,

Section 2.1 and appendix, Sections 1.2, 2.1.1, 2.1.3 and 2.1.4.

Exams can be performed by the certifying body in stead of by the course unit. If this is the case, all responsibilities and tasks described for exams in this handbook are transferred to the certifying body, and this must be written in the contract between the certifying body and its course unit (-s).

Exams can be performed by the certifying body in stead of by the course unit. If this is the case, all responsibilities and tasks described for exams in this handbook are transferred to the certifying body, and this must be written in the contract between the certifying body and its course unit (-s).

### Employer

The scheme does not define responsibilities for the employers of certified samplers.

### Sampler

The responsibilities and requirements for samplers certified according to this scheme are defined in the procedures of this handbook, Sections 2.1, 2.2 and 2.3.

Signing a sampling report referring to a certificate, it is the responsibility of the certified sampler assures that:

- sampling has been carried out by the person signing the sampling report
- sampling has been performed according to the specified written sampling procedures recorded in the sampling report
- all changes in sampling procedures compared to the written sampling procedures are recorded, documented and reported (sampling report)
- sampling has been performed with adequately controlled equipment, see Section 2.2.2
- sampling quality is as stated in the report
- sampling is within the scope of the samplers certificate
- sampling documentation is archived safely as prescribed in the quality system.

The certified person signing the report thus have the technical responsibility for the sampling.

The sampler may be self-employed or employed. If affiliation is changed, the sampler must document ability to comply with performance and sampling requirements with the new affiliation.

## 1.5 Scheme operation

The scheme lays down the overall principles and procedures for operation in this handbook. Certification, training and exams are operated by independent bodies and units.

### 1.5.1 Document control

All versions of this handbook are consecutively numbered by a two digit number: X-Y. Major changes will be reflected

by a shift to a higher first digit (X), whereas minor changes will be reflected in a shift to a higher second digit only (Y).

Each new version must be signed by the chairman of the NTG and by a representative of the NICE board.

A list of all handbook versions with dates of coming into force is maintained by the NTG, and all versions of the handbook must be archived by the secretariat.

### 1.5.2 Confidentiality

Decisions made by the NTG and the NICE board on issues concerning the scheme are public and must be made available as minutes from meetings.

The NTG can decide to grant confidentiality to sensitive topics related to specific organizations, companies and persons. The NTG shall be obliged not to compromise confidentiality as committed by the certification bodies.

### 1.5.3 Complaints

Complaints over the scheme must be directed to the NTG, where they are commented and submitted to the NICE board with a recommendation for action.

A list of complaints over the scheme and actions must be maintained by the NTG.

### 1.5.4 Access to the handbook

This handbook is public.

### 1.5.5 Scheme maintenance

Scheme maintenance is the responsibility of the NTG, which shall seek financing for major revisions from the NICE board.

## 2 SCHEME OPERATION

The procedures of this chapter describe the principles of the scheme operation under 4 main headlines:

- competence requirements
- performance requirements
- sampling requirements
- the certification process.

### 2.1 Competence requirements

Certification requires that the sampler can document theoretical and practical competence with respect to sampling and to sampling of those matrices covered by the certificate.

Competence can be obtained by participation in courses, by experience or by *on the job* training, however participation in a general course on sampling principles is mandatory. Documentation of competence by experience or *on the job*

training shall be submitted to the course unit before admitted to the exams.

Courses must be taken at and exams passed at course and exams units complying with this handbook and under contract with a certifying body operating this scheme, see appendix, Sections 1.2 and 1.3.

#### 2.1.1 Training and courses

Nordtest certification of samplers can be given only if the following requirements are met:

- the sampler has completed a general course in sampling principles, documentation and quality control
- the sampler has completed a specialist course in sampling methods for the specific matrix for which the certificate is sought.

Training course requirements are given in appendix, Section 2.1.1.

The general sampling course is mandatory.

As an alternative to the specialist courses, the sampler may acquire competence similar to that acquired on the specialist courses by *on the job* training<sup>1</sup>. The fulfilment of the requirements must be confirmed and documented by one person experienced with and certified for sampling of the matrix covered by the certificate using a training declaration as given in appendix, Section 2.1.2.

As a second alternative, an experienced sampler that can document 5 years of sampling experience as described in Section 2.1.3 can as an alternative to participation in specialist courses provide documentation for the experience using the sampling record template in appendix, Section 2.1.6 as described below, Section 2.1.3.

Course units can, subject to approval by the contracting certifying body, grant credit for previous courses covering parts or all of both the general and specialist courses for participation in previous courses to the extent that these cover parts or all of the required contents. The sampler must pass the corresponding scheme exam.

Course units can, subject to approval by the contracting certifying body, provide individual combinations of courses (general and specialist, general and parts of specialist, different specialist), as long as the course contents and the exams requirements specified in appendix sections 2.1.1, 2.1.3 and 2.1.4 are fulfilled.

When relevant, on the job training or experience must be documented separately for each matrix that the applicant seeks certification for. The on the job training or experience documentation must be submitted to the certifying body as part of the competence documentation.

Irrespective of the method of training and experience, exams as described in appendix, Section 2.1.3 must be passed.

<sup>1</sup> An example of adequate *on the job* training would be 50 hours of work over the last year with experienced staff on sampling of the matrix to be covered by the certificate, including reporting and introduction to quality control and documentation.

## 2.1.2 Exams

The persons seeking certification shall prove competence by passing exams. The requirements on exam contents are described in appendix, Section 2.1.3, and grading in appendix, Section 2.1.4. Exams are arranged by the course and exams units having signed a contract, appendix, Section 1.3, with the certifying unit intended to issue the certificate and registered for operation of the Nordtest Sampler Certification Scheme. The course units must provide access to exams also for samplers that have not participated in specialist courses.

Exams are of 3½ hour's duration and are theoretical only.

If the samplers specialist competence is obtained as *on the job* training or by experience, the documentation for adequate training or experience, Section 2.1.1, in the form of a training declaration as given in appendix, Section 2.1.2, must be available for the course unit before admitting the sampler to the exam.

The minimum requirement for passing the exams for both the general and advanced courses shall be a score of 70%. A score of less than 70% will fail and the right to retake the examination next time is being offered. Redoing the sampling course is optional prior to retaking an examination.

## 2.1.3 Maintenance of competence and experience

Competence must be maintained during the certificate period. Maintenance can be documented by participation in courses, seminars, on the job training or other<sup>2</sup>.

Continuous experience in sampling is necessary to maintain the Nordtest Sampler Certificate. The documentation for experience is by documented sampling of the actual matrices<sup>3,4</sup>.

The amount of sampling work per year required as experience maintenance depends upon the role of the sampler:

- Samplers providing sampling as an independent service or function to several plants, operations, locations or sites must document a total of 50 hours of sampling<sup>5</sup> per year
- Samplers performing sampling as self-control or self-monitoring at the plant or operation of one employer must document practical routine sampling by taking not less than 12 samples at not less than 5 occasions within each year.

If the sampler is certified to sampling more than one matrix, the total experience requirement is the sum of individual experience requirements but reduced with 25% for two matrices (totally 75 hours or 18 samples, equally distributed), 33% for three matrices and 50% for four or more matrices.

The quality of the sampling done by the certified sampler during the certificate period is documented in the form of quality control data from the sampling<sup>6</sup>. The sampler must maintain documentation for experience, quality control and complaints and training in an accessible file, see appendix, Sections 2.1.6, 2.4.5, 2.4.6 and 2.1.5 for required contents.

The competence maintenance list, the sampling record, the quality control summary scheme and the complaint summary schemes or equivalent documentation form the background of the surveillance of Nordtest Sampler Certificates during the certificate period, but additional information may be required by the certifying body.

## 2.2 Performance requirements

Samplers can report certified sampling if all of the following performance requirements are fulfilled:

- sampling is performed by the person signing the report, who has a valid certificate for sampling of the matrix in question
- adequate, written sampling procedures, Section 2.2.1, appendix, Section 2.2.3 and equipment, Section 2.2.2, are available for the sampler
- lists of equipment and written sampling procedures shall be available and updated
- a sampling plan is available
- control of equipment maintenance or check of equipment function documented before use, see Section 2.2.2
- access to a basic quality system, see Section 2.2.3.

The sampler shall assure access by the certifying body to inspection of the sampling equipment, methods and competence documentation during the certification, renewal, recertification processes, and in case of suspicion that a given certificate is compromised. The objective of the visits by the certifying unit is to ascertain that the sampler in practice meets the requirements. Negotiation of admittance for the certification body to the sampling facilities during inspection is the responsibility of the certified person.

A sampling plan with reference to the written sampling procedure selected for the specific sampling must be elaborated and available at the location where sampling is undertaken. The sampling plan shall address the factors to be controlled to ensure the validity of sampling. The production of a sampling plan is not covered by the certificate.

<sup>2</sup> An example could be a 1 day course, seminar or equivalent per year, see appendix, Section 2.1.5 for an template for a competence maintenance list.

<sup>3</sup> As an example, this can be done filling in the sampling record template in appendix, Section 2.1.6.

<sup>4</sup> If the sampler has not done sampling to the required extent, the certifying body may offer a practical test that allows the sampler to prove maintenance of practical competence.

<sup>5</sup> Sampling is defined as the process of preparing, conducting and reporting sampling, but sampling does not include e.g.: transport.

<sup>6</sup> As an example, this can be done filling in the quality control summary scheme, appendix, Section 2.4.5, and the complaint summary scheme, appendix, Section 2.4.6.

### 2.2.1 Sampling methods

Certified sampling must be done in accordance with the standards listed in appendix, Section 2.2.1. Methods lists, appendix, Section 2.2.2 must be available.

The sampler must for each sampling method be able to document access to prepared method documentation in the form of written sampling procedures describing the procedures in full details and additionally, the parameters to register during sampling, the required quality control and the documentation to be elaborated. Suggestions for contents of written sampling procedure are given in appendix, Section 2.2.3.

All additions, deviations and exclusions from the written sampling procedure must be registered during sampling with the appropriate sampling data and shall be included in all documents containing the subsequent results, and shall be communicated to the appropriate personnel or the customer.

The sampling method shall include instructions for protection and storage during transportation (if relevant) of the samples taken, including all provision to protect the integrity of the samples.

### 2.2.2 Sampling equipment

Certified sampling must be done with relevant equipment listed for different purposes in appendix, Sections 2.2.4. Equipment lists, equipment data sheets and equipment maintenance lists must be available, see appendix, Sections 2.2.5, 2.2.6 and 2.2.7 for templates.

The sampler must be able to document access to equipment accepted for performance of sampling covered by the certificate, see appendix, Section 2.2.4. If the equipment does not belong to the sampler or the samplers employer, the owner of the equipment must be noted in the equipment list.

The sampling equipment shall be capable of achieving the quality required and shall comply with the specifications as given in the written sampling method, see appendix, Section 2.2.3. A calibration program shall be established for the sampling equipment according to the specifications given in the sampling method, if relevant. Before use, the sampling equipment shall be calibrated or checked to establish that it meets the specifications required, as appropriate.

Up-to date instructions for the use and maintenance of the sampling equipment (including any relevant manual provided by the manufacturer of the equipment) shall be readily available for use by the sampler.

Each item of equipment used for sampling shall, when practicable, be uniquely identified. Datasheets shall be maintained of each item of sampling equipment significant to the outcome of the sampling, see appendix, Section 2.2.6. The records shall include at least the following:

- the identity of the sampling equipment (equipment number or name)
- the manufacturers name, type identification and serial number or other unique identification

- description of checks that the equipment complies with the specification
- the current location of the equipment, where appropriate
- the manufacturers instructions, if available, or reference to their location
- dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration
- the maintenance plan, where appropriate, and maintenance carried out to date
- any damage, malfunction, modification or repair to the equipment.

A list that includes available sampling equipment shall be maintained. Example of equipment list for sampling equipment is given in appendix, Section 2.2.5.

The sampler shall document access to procedures for safe handling, transport and storage, use and planned maintenance of the sampling equipment to ensure proper functioning and prevent contamination or deterioration.

Sampling equipment that has been subject to mishandling or has shown to be defective must be taken out of service. It must be guaranteed to prevent its use or clearly labelled "out of service" until it has been repaired and by calibration or test shown to perform correctly.

When, for whatever reason, equipment goes outside the direct control of the sampler, the sampler shall ensure that the function and calibration status of the sampling equipment are checked and shown to be satisfactory before the sampling equipment is returned to service.

In cases where the client or a third party owns the sampling equipment used for certified sampling, the certified person has the responsibility for the use of the equipment, including a documented control of performance.

### 2.2.3 Quality system

The sampler must have access to a quality system that describes the sampling methods, equipment, documentation and quality control. The required contents of the quality system are described in appendix, Section 2.2.8.

## 2.3 Sampling requirements

The sampling requirements given in this section with subsections must be fulfilled.

### 2.3.1 Principles

Sampling reported by the certified sampler must be in accordance with the methods and the equipment requirements given in appendix, Sections 2.2.1 and 2.2.4.

For each matrix, the basic principles to which Nordtest sampler certification can be done are listed below.

For **waste**, the following basic principles can be used for certified sampling:

- sampling from moving streams
- sampling from stopped belt
- sampling from stationary lot.

For **groundwater**, the following basic principles can be used for certified sampling:

- sampling with positive displacement pumps for volatiles and non-volatiles
- sampling with suction pumps for non-volatiles
- sampling with bailers for non-volatiles.

For **soil**, the following basic principles can be used for certified sampling:

- sampling from piles with hand drilling tools
- sampling *in situ* with hollow stem or solid flight augers
- sampling *in situ* with dedicated samplers from open boreholes and pits.

For **bottom sediments**, the following basic principles can be used for certified sampling:

- gravel with grab systems
- sand and clay with either grab or corer systems
- consolidated bottom sediments with either grab or corer systems, with grab without determination of sampling depth
- unconsolidated bottom sediments with dedicated corer systems.

For **waste water**, the following basic principles can be used for certified sampling:

- flow-weighted composite sampling using automatic sampling equipment
- time-weighted composite sampling using automatic sampling equipment
- discrete samples taken at fixed intervals and held in individual containers using automatic sampling equipment
- random sampling using manual sampling equipment.

For **sewage sludge**, the following basic principles can be used for certified sampling:

- random grab samples from a body of sludge
- composite samples from a body of sludge.

For **surface fresh waters**, the following basic principles can be used for certified sampling:

- sampling with open-mouth samplers for non-volatiles
- sampling with cylinder devices for non-volatiles
- sampling suction pumps for non-volatiles
- sampling with positive displacement pumps for volatiles and non-volatiles.

## 2.3.2 Quality control

During sampling, appropriate quality control (QC) must be performed. The required QC depend upon the matrix sampled, and an aid for selection of QC tools can be found in appendix, Section 2.3.1, as well as standards, drafts and manuals for performing QC and statistical treatment of QC data, appendix, Section 2.2.1.

Basic requirements are:

- quality control procedures as required in this handbook are performed and documented, see this section
- the documentation of sampling must show that the quality requirements are fulfilled, see Section 2.3.3.

Required items are, as appropriate:

- control of equipment performance and calibration (Section 2.2.2 and appendix, Sections 2.2.4 and 2.3.1)
- control of compliance of parameters with equipment material and method principles, sample contamination and analyte loss (appendix, Sections 2.2.1 and 2.2.4)
- sampling of duplicates for estimation of sampling repeatability (appendix, Section 2.3.1)
- sampling blanks (field, equipment, transport, container) for estimation of false positive risks (appendix, Section 2.3.1)
- sampling control for estimation of false negative risks (appendix, Section 2.3.1)
- sampling at reference stations and intersampler comparisons for control of sampling error (appendix, Section 2.3.1).

The QC results must be reported in the sampling report, including at the least an estimate of sampling uncertainty and for relevant parameters/matrices documentation for sampling blanks and controls, sampler intercomparisons and reference station sampling.

## 2.3.3 Documentation

The sampler shall document the sampling and the sample route in:

- a sampling report. Requirement for content of the sampling report is given in appendix, Section 2.3.2
- an appropriate field record prepared in the field. An example of a field record is given in appendix, Section 2.3.3
- a chain of custody report giving the route of the samples from the matrix sampled to analyses, test or characterisation. The report must accompany the samples through all steps. An example of a chain of custody report can be found in appendix, Section 2.3.4.

Furthermore, the quality system must have a written procedure describing how the documentation (field and

sampling reports, quality control data and chain of custody reports) is filed and archived. It is a minimum requirement, that files are maintained for 5 years.

## 2.4 The certification process

A certifying body complying with this scheme handbook can certify according to the Nordtest Sampler Certification Scheme, appendix, Section 1.1. The certifying body must fulfil the requirements in ISO 17024 on personnel certification. The certifying body must be accredited for personnel certification by an accreditation body operating according to EN 45010 within two years after start of the scheme or after January 2007 within 1 year after registration as certifying body for the scheme. Certificates issued before accreditation must be renewed administratively upon accreditation to reflect the accredited status of the certificates.

The overall certification process is presented in Figure 2.

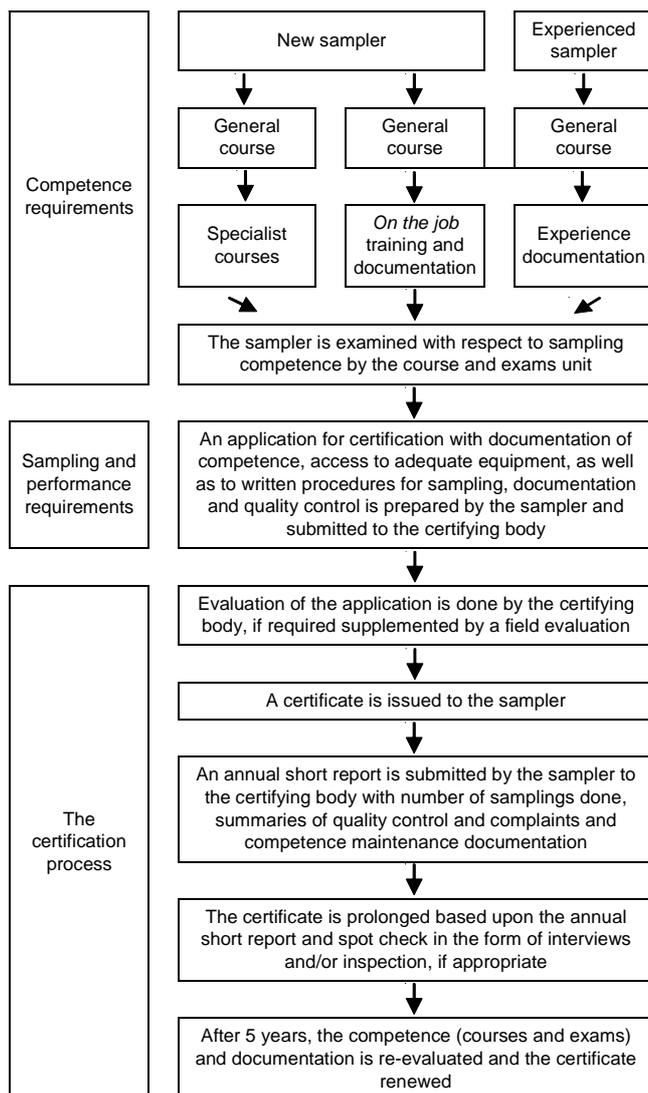


Figure 2. Overall certification procedure.

### 2.4.1 Certification

The certification is granted by the certifying body upon application from the sampler, appendix, Section 2.4.1, and based upon the competence documentation (Section 2.1), the performance documentation (Section 2.2) and the documentation for sampling requirements (Section 2.3), see certification checklist, appendix, Section 2.4.2. The sampling method compliance, equipment handling and documentation praxis may further be evaluated in the field, unless satisfying performance and methodology can be documented by other means<sup>7</sup>, or if the surveillance procedure of the certifying body includes field inspection of all samplers once every 5 years. This shall be described in the certifying body's quality manual, and the description shall be endorsed by the certifying body's scheme committee and be published

The certification is based upon satisfactory evaluation according to the specific criteria established in the present Handbook, ISO 17024 and other relevant documents. If explanation is required as to the application of these documents, it shall be endorsed by the scheme committee of the certifying body, and published by the certifying body.

If national requirements for certification of samplers exist, the certifying body shall include these in the certification process.

The format of the certificate is given in appendix, Section 2.4.3. The certificate is the property of the certifying body.

### 2.4.2 Use of the certificate

Sampling done by a certified sampler respecting the requirements of this handbook, any additional requirements of the quality documents and national requirements as formulated by the certifying bodies in their quality manuals can be reported with reference to the certificate and the sampling report can bear the scheme logo.

Only sampling of matrices that are covered by the samplers certificate may be reported with reference to the certificate and with the scheme logo on the report.

### 2.4.3 Surveillance

The certification body shall define a surveillance process to monitor the certified sampler's practical compliance with the certification scheme.

Surveillance shall be based upon annual performance short reports submitted by the sampler including:

- documentation for competence maintenance, appendix, Section 2.1.5
- sampling record, appendix, Section 2.1.6
- QC data summary, appendix, Section 2.4.5
- complaints summary, appendix, Section 2.4.6.

<sup>7</sup> One example could be if the sampler is certified according to another scheme covering the same scope.

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The certifying body can add specific evaluation at regular intervals<sup>8</sup>. For any such specific evaluation, the frequency, causes/justification and contents of surveillance activities shall be described in the certifying body's quality manual, and the description shall be endorsed by the certifying body's scheme committee and be published.

#### 2.4.4 Prolongation

Annual prolongation can be granted by the certifying body upon submission of annual short report, appendix, Section 2.4.4, by the sampler if the criteria are fulfilled, appendix, Section 2.4.7:

- experience maintained as specified in section 2.1.3
- competence maintained as specified in section 2.1.3
- quality control demonstrates sampling quality overall equal to or better than the quality requirements set in the sampling methods employed
- complaints settled with complainers.

The certifying body must document the specific criteria in its quality manual. The body must complete the prolongation procedure within one month from receiving the annual short report from the sampler.

If the sampler does not submit the annual short report within 11 months from the last certification, prolongation or recertification, the certificate expires after 12 months and is no longer valid.

#### 2.4.5 Recertification

Within 5 years from certification, recertification is required. Recertification includes repetition of the certification procedure, but the sampler is not required to repeat courses and exams once passed. In the recertification process, satisfying performance during the previous certificate period must be documented as described for prolongation.

#### 2.4.6 Suspension and withdrawal

The certificate expires if not subject to prolongation every year and to recertification every 5 years. The certifying body must suspend the certificate if the sampler is not able to document ability to comply with performance and sampling requirements due to shift in affiliation (employment status). The suspension shall be cancelled by the certifying body upon receipt and accept of the required documentation from the sampler.

The sampler can apply for a temporary suspension of the certificate. If the certificate has been under suspension for more than ½ of a certificate period (5 years), the certifying body must ensure that the competence and documentation of sampling and performance are still in compliance with the requirements of the scheme.

The certificate is withdrawn, if it is used misleadingly.

<sup>8</sup> Regular intervals could be 20% of surveillance records submitted. Specific evaluation could include contact with the samplers, their immediate superiors, clients etc and checks of sampling in the field.

APPENDICES

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**APPENDICES**

## APPENDICES

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Appendix 1 SCHEME PRINCIPLES  
1.1 Certifying bodies

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The role and the responsibilities of the national certifying bodies are described in this handbook, Sections 1.4 and 2.4, and appendix, Section 2.4.

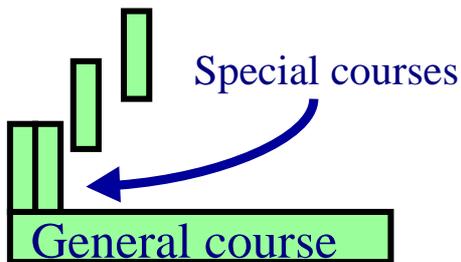
In order to open the certification system, the scheme has worked to establish national bodies that can provide at the least certification for one matrix in each country. The certifying bodies currently identified for the scheme are given in a document until now maintained by the project group. When the scheme becomes operative, the certifying bodies will be registered by the NICE secretariat.

It should be noted that any certifying body that fulfils the requirements stated in this handbook can register with the NICE secretariat with the right to operate under the scheme.

Appendix 1 SCHEME PRINCIPLES  
1.2 Course and exams units

The role and responsibilities of the national course units are described in this handbook, Sections 1.4.1 and 2.1, and appendix, Sections 2.1.1, 2.1.3 and 2.1.4.

The course structure is shown in the below figure with a general course on sampling principles and specialised courses for different matrices, see appendix, Section 2.1.1 for contents.



In order to open the course system, the scheme has worked to establish national units that can provide at the least the basic course and one matrix course in each country. The course and exams units currently identified for the scheme are given in a document until now maintained by the project group. When the scheme becomes operative, the course units that have signed contracts with a certifying body will be registered and listed by the certifying bodies.

It should be noted that any course unit that fulfils the requirements stated in this handbook can enter a contract with a certifying body with the right to operate under the scheme.

## Appendix 1 SCHEME PRINCIPLES

1.3 Contracts between certifying body and course and exams units contents

---

The contract to be entered between a certifying body and a course and exams unit must, besides the legal requirements as appropriate, specify:

- the type of courses and exams provided by the course and exam units
- that the certifying body and the course and exams unit are independent legal and economical entities
- that the course and exams unit will comply with the requirements of this handbook and any relevant requirements of ISO 17024
- the duration of the contract (at the longest five years)
- the type (at the least inspection of exams questions and answers, as spot check) and frequency (at the least every second year) of surveillance of the course and exams unit to be performed by the certifying body
- the required qualifications and experience of instructors to be used by the course and exams unit.

The contract is public.

The minimum requirements for the sampling courses are given below for each course type. The duration of courses given below is based upon 8 hours of training per course day. The minimum duration includes practical training, demonstration and exams. Course units are free to offer more extensive courses than given as minimum requirements.

By practical training is understood training under instruction of an experienced sampler with hands on exercises.

The **general sampling course** is theoretical and shall have minimum duration of 2 days and include:

- theory of sampling
- simple sampling statistics
- quality control procedures
- requirements for certification of samplers
- establishment of a quality system for sampling, theory.

All **special courses** are a combination of theory and practical training (training that must be practical is given *in italics* below) and shall have a minimum duration of 3 days and include the following topics adapted to the matrix in question:

- best practice on hygiene and safety issues with *demonstration of security equipment*
- purpose of sampling
- understanding a sampling plan (e.g.: sampling methodology, number of samples, sample size) with practical exercises *translation of a sampling plan into an action plan*
- principles of sampling techniques (standards and principles for sampling, typical equipments and sampling methods)
- limitations for the equipment
- preparing for sampling, "mobilization"
- *equipment control, calibration and maintenance*
- *practical sampling*
- *practical sub-sampling in the field (methods, equipment), if relevant*
- principles of selecting proper sample container(s) (container materials and sample amounts)
- principles of sample preservation, storage and transport
- training in quality control procedures in sampling, including:
  - *checking equipment status*
  - evaluation of risk for sample contamination
  - duplicate samples
  - blank samples (equipment, transport, container etc.)
  - samples from reference stations
  - sampler intercomparisons
- information on sampling uncertainty (influence of critical factors)

- documentation of sampling, covering:
  - sample identification
  - sample labelling
  - field records
  - chain of custody reports
  - writing sampling reports
- the chain from sampling plan over sampling and transport to analyses and result.

For each scope, the special course should include additional topics or in particular emphasis specific parts of the topics mentioned above.

The **waste** special course additional and specifics are:

- background on sampling of waste from
  - moving streams
  - stopped belt
  - stationary lot
- background on sampling of waste for purpose of
  - basic characterization
  - compliance testing
  - on-site verification
- background on sampling of waste for
  - chemical investigations
  - leaching testing
  - physical investigations
  - biological investigations
- information on waste characteristics (e.g.: waste heterogeneity and biodegradability) and special features in waste sampling (e.g.: production restriction in waste sampling, resources available).

The **soil** special course additional and specifics are:

- background on geological characterization of soils covering:
  - topsoils
  - geological sediments
- background on sampling of soil for:
  - chemical analysis of volatiles
  - chemical analysis of non-volatiles
  - biological analysis
  - analysis of physical parameters
- sampling techniques for:
  - *contaminated sites*
  - *soil piles*
- equipment handling for:
  - *hand drilling in soil piles*
  - *in situ drilling with hollow stem or solid flight augers*
  - *dedicated samplers for sampling in open boreholes or pits.*

The **groundwater** special course additional and specific are:

- background on hydrogeology and hydrochemical properties of groundwater
- background on sampling of groundwater for:
  - chemical analysis of volatiles
  - chemical analysis of non-volatiles
  - biological analysis
  - analysis of physical parameters
- sampling techniques for:
  - *investigation wells*
  - *drinking water supply wells*
- equipment handling for:
  - *sampling with positive displacement pumps for volatiles and non-volatiles*
  - *sampling with suction pumps for non-volatiles*
  - *sampling with bailers for non-volatiles.*

The **bottom sediment** special course additional and specific are:

- background, including establishing a survey programme, for proper sampling of bottom sediments for:
  - chemical investigations
  - physical investigations
  - biological investigations
- the use and limitation of commonly used sampling equipment:
  - *grab samplers*
  - *corer samplers*
  - *box corers*
- survey vessel requirements, incl. GPS
- safety issues using heavy equipment.

The **waste water and sludge** special course additional and specific are:

- information on the background for water pollution and sludge quality control
- theoretical background for proper sampling of wastewater and sludge:
  - physical/chemical and chemical investigations
  - microbiological investigations
- principles for sampling of sludge
  - criteria for sampling of sludge
  - selection of sampling regime
- principles for sampling of wastewater
  - *use of flow- and time-dependent equipment and demonstration of field measurement equipment.*

Sludge topics may be excluded from courses and exams, if certification is granted for waste water only.

The surface fresh water special course additional and specific are:

- background on limnology and hydrochemical properties of lakes, rivers and streams
- background on sampling of surface fresh water for:
  - chemical analysis of volatiles
  - chemical analysis of non-volatiles
  - microbiological and biological analysis
  - analysis of physical parameters
- sampling procedures for
  - sampling from flowing-water
  - sampling from still-water
- identification and documentation on sampling points
  - GPS
  - other issues related to identification of sampling point
- safety issues including
  - wading
  - sampling from boats
  - sampling from a cableways
  - sampling from ice-covered waters, slippery conditions and drop-offs or holes
  - working on bridges
  - weather conditions
  - bacteriological, virological and zoological hazards in lakes, rivers and streams.

On the job training declaration (template – may be copied)

Applicant name:			
Employer name:			
Address:			
City, zip, country:			
Telephone number:		Fax Number:	
Email address:			
Scopes of sampling:			

On the job training specification

Matrix/scope:			
Samplings done :			
Sampling period:			
Sampling duration:			
Quality control done and evaluated:		Reporting done:	
Matrix/scope:			
Samplings done :			
Sampling period:			
Sampling duration:			
Quality control done and evaluated:		Reporting done:	
Matrix/scope:			
Samplings done :			
Sampling period:			
Sampling duration:			
Quality control done and evaluated:		Reporting done:	
Matrix/scope:			
Samplings done :			
Sampling period:			
Sampling duration:			
Quality control done and evaluated:		Reporting done:	
Matrix/scope:			
Samplings done :			
Sampling period:			
Sampling duration:			
Quality control done and evaluated:		Reporting done:	

Trainer specification

Trainer name:			
Employer name:			
Address:			
City, zip, country:			
Telephone number:		Fax Number:	
Email address:			
Certificate no.'s:			
Certifying body (-ies):			
Scopes of sampling:			
Expiration date:			

Additional comments to the certifying body

Signatures

We hereby certify that the forgoing information is true and that we have read the certification requirements for the Nordtest Personnel Certification Scheme. We understand that submittal of false or misleading information in this application may result in withdrawal of the certificates of both applicant and trainer.

Applicant signature: \_\_\_\_\_ Date: \_\_\_\_\_

Trainer signature: \_\_\_\_\_ Date: \_\_\_\_\_

General courses are evaluated in exams with a combination of multiple choice (minimum 30 questions, three optional answers per question) and “calculation problems” (3 types). “Calculation problems” are presentations of information and data that shall be used to do calculations, to do planning or to prepare reports or forms.

For specialist courses, exams shall include a combination of multiple choice (minimum 30 questions, three optional answers per question) and cases (3 cases each with 5 specific answers asked for). The topics that must be covered by the multiple choice questions in the exams are as a minimum five questions from each of the main bullets listed for each special course in appendix, Section 2.1.1 on course contents. Additional questions are then selected among the specialist course contents to reach the total minimum number of multiple choice questions of 30. Cases are presentations of scenario followed by a request to give a general description of sampling setting in addition to answering 5 specific questions originating from the scenario. Cases shall include specific questions to be answered covering all main bullets listed in appendix, Section 2.1.1 on course contents.

Specific requirements for topics covered in calculation problems and cases in the exams are given for each course type below.

The **general sampling course** shall have “calculation problems” of the type (3 of 5 types given):

- preparation of sampling report from presented data
- preparation of chain of custody report from presented data
- selection of proper QC procedures for presented purpose
- calculation and evaluation of uncertainty estimates for case
- preparation of elements in a sampling quality system for presented purpose.

All **special courses** shall have cases of the type (2 of 6 types given):

- selection of appropriate hygiene and safety measures
- selection of sampling method and equipment
- selection of field sub-sampling methods
- selection of sample containers and handling (sample containers, preservation, storage and transport)
- calculation and evaluation of quality control data
- documentation of sampling procedure (sample report with uncertainty and chain of custody report).

The **solid waste** special course shall have cases of the type (1 of 3 types given):

- selection of sampling positions in sampling from moving belt, stopped belt and stationary lot
- handling of samples for chemical investigation, leaching test, physical investigations or biological investigations

- description of special features in waste producing process or waste storage conditions and identification of critical conditions in waste sampling.

The **soil** special course shall have cases of the type (1 of 3 types given):

- selection of sampling positions, including:
  - positions within site
  - depths during drilling
  - positions and depths in pile
- selection of samples for analysis, including:
  - evaluation of field measurements
  - evaluation of sample appearance
  - evaluation of soil and sediment properties
- elaboration of quality control procedures for soil sampling, including:
  - check of equipment status
  - evaluation of risk for sample contamination
  - QC types.

The **groundwater** special course shall have cases of the type (1 of 3 types given):

- selection in response to hydrogeology, groundwater chemistry and contamination and purpose of investigation of:
  - pump position
  - purge period
  - well purge indicator parameters
  - stop criteria
- handling of samples for parameter types:
  - volatile
  - adsorbable
  - redox sensitive
- selection of techniques for sampling from investigation wells and drinking water supply wells.

The **bottom sediment** special course shall have cases of the type (minimum 1 of 3 types given):

- handling procedures for commonly used sampling equipment:
  - grab samplers
  - corer samplers
  - box corers
- survey vessel requirements
- practical sediment sampling parameters and processes:
  - sampling positions (coordinates and depth)
  - evaluation of sampling locations
  - evaluation of sample appearance.

---

The **waste water and sludge** special course shall have cases of the type (minimum 1 of 3 types given):

- safe procedures for working in sewers and wastewater plants
- description of proper installation, calibration and sampling in relation to sewer geometry and sampling purposes for commonly used equipment:
  - time proportional samplers
  - flow proportional samplers
  - random sampling.
- description of practical sewage sludge sampling parameters (depth, subsampling, preparation of composite samples) in response to storage type, geometry and duration.

The **surface fresh waters** special course shall have cases of the type (minimum 1 of 4 types given):

- sampling procedures for:
  - sampling from flowing-water
  - sampling from still-water
  - sampling position (vertical and horizontal)
  - frequency and timing of sampling
- handling of samples for analysis of:
  - volatile parameters
  - redox sensitive parameters
  - biological analysis
  - microbiological analysis
  - physical analysis
- safety procedures for sampling from lakes and rivers:
- elaboration of quality control procedures for sampling of surface fresh water, including:
  - check of equipment status
  - QC types.

---

General courses are evaluated in a combination of multiple choice (minimum 30 questions, three optional answers per question, each with equal weight, totally 50% weight) and “calculation problems” (3 types, each with equal weight, totally 50% weight).

For specialist courses, the course unit must control that the sampler has participated in 70% of the practical part of a training course before admitting the sampler to the exam. Exams are evaluated in a combination of multiple choice (minimum 30 questions, three optional answers per question, each with equal weight, totally 50% weight) and cases (3 cases each with 5 specific answers asked for, each with equal weight, totally 50% weight).

The minimum requirement for passing the exams for both the general and specialist courses shall be a score of 70% correct answers. The exam is reported as passed or failed.

Sampler competence maintenance list (template – may be copied)

Applicant Name:			
Employer Name:			
Address:			
City, zip, country:			
Telephone Number:		Fax Number:	
Email Address:			
Certificate no.:			
Certifying Body:			
Scopes of sampling:			
Expiration dates:			

Training

Basic sampling course	
Course unit:	
Course name:	
Comments:	
Specialist courses	
Scope:	
Course unit:	
Course name:	
Comments:	
Scope:	
Course unit:	
Course name:	
Comments:	
Scope:	
Course unit:	
Course name:	
Comments:	
Scope:	
Course unit:	
Course name:	
Comments:	

Maintenance seminars, courses etc

Name, organizer, place and dates	Duration (days)	Scope	Contents (programme annexed )

Additional comments to the certifying body

Signature

I hereby certify that the forgoing information is true and that I have read the certification requirements for the Nordtest Personnel Certification Scheme. I understand that submittal of false or misleading information in this application may result in withdrawal of the certificate.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_



## 2.2 Performance requirements

2.2.1 Standards, requirements, guidelines, handbooks and manuals

---

Sampling reported with reference to a Nordtest Sampler Certificate must comply with the recognised standards and legal requirements given in the overleaf tables. Additional help in sampling can be found in the guidelines, handbooks and manuals given also in the tables.

**General sampling (applies to more than one matrix)**

	<b>International and national standards for sampling performance</b>	<b>Legal requirements to sampling performance</b>	<b>Guidelines, handbooks and manuals</b>
International	ISO 5667-1: Water Quality – sampling, Part 1: Guidance on the design of sampling programmes. ISO 5667-2: Water Quality – sampling, Part 2: Guidance on sampling techniques. DS/ISO 5667-3. Water quality – Sampling. Part 3: Guidance on the preservation and handling of samples.		
Finland			
Sweden			
Norway	NS 9420: Retningslinjer for feltarbeid i forbindelse med miljøovervåkning og – kartlegging.		
Denmark	DS 2214, Prøvetagning af vand til analyse for spormetaller.	Miljø- og Energiministeriet, 1997, Bekendtgørelse nr. 637, Kvalitetskrav til miljømålinger udført af akkrediterede laboratorier, certificerede personer m.v	
Iceland			

**Quality control of sampling**

	<b>International and national standards for sampling performance</b>	<b>Legal requirements to sampling performance</b>	<b>Guidelines, handbooks and manuals</b>
International	ISO 5667-14. Water quality – Sampling. Part 14: Guidance on quality assurance of environmental water sampling and handling.		U.S. Environmental protection agency. Data quality objectives process for hazardous waste site investigations. EPA QA/G-4 HW. Final. January 2000.
Finland			
Sweden			Svenska Geotekniska Föreningen, 2004. Fälthandbok Miljötekniska markundersökningar. Rapport 1:2004 (ISSN 1103-7237) Naturvårdsverket, 1998. Vägledning för Miljötekniska Markundersökningar. Del II. Fältdarbete, NV- Rapport 4311 Naturvårdsverket, 1996, Rätt datakvalitet, NV- Rapport 4667
Norway			
Denmark			Amternes Videncenter for jordforurening, 2003. Håndbog i prøvetagning af jord og grundvand. Teknik og Administration, rapport nr. 3. Miljøstyrelsens vejledning nr. 6, 1994. Tilslutning af industrispildevand til kommunale spildevandsanlæg.
Iceland			

## Solid waste

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	prEN 14889: Characterization of waste – Sampling of waste materials – Framework for preparation of a sampling plan. Nordtest NT ENVIR 004: Solid Waste, Particulate materials: Sampling	The Council decision 2003/33/EC about establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC	Technical Reports (TR) linked to the proposed CEN standard EN 14899:2006: CEN/TR 15312-1:2006 Characterisation of waste – Sampling of waste materials – Part 1: Guidance on selection and application of criteria for sampling under various conditions. CEN/TR 15310-2:2006 Characterisation of waste – Sampling of waste materials – Part 2: Guidance on sampling techniques. CEN/TR 15310-3:2006 Characterisation of waste – Sampling of waste materials – Part 3: Guidance on procedures for subsampling in the field. CEN/TR 15310-4:2006 Characterisation of waste – Sampling of waste materials – Part 4: Guidance on procedures for sample packaging, storage, preservation, transport and delivery. CEN/TR 15310-5:2006 Characterisation of waste – Sampling of waste materials – Part 5: Guidance on the process of defining the sampling plan. EN 932-1: Tests for general properties of aggregates. Part 1: Methods for sampling EN 932-2: Tests for general properties of aggregates. Part 2: Methods for reducing laboratory samples EN 932- 5: Tests for general properties of aggregates. Part 5: Common equipment and calibration ISO 13909, Hard coal and coke – Mechanical sampling. Part 1–8 ISO 11648-1. Statistical aspects of sampling from bulk materials. Part 1: General principles ISO/DIS 9411-1.2 Solid mineral fuels – Mechanical sampling from moving stream
Finland			SFS 5884: Production control of reclaimed concrete for earth construction. (in Finnish)
Sweden			
Norway			
Denmark		Danish Statutory Order no. 1480 of December 12, 2007 on Recycling of Residual Products and Soil in Building and Construction Work	
Iceland			

## Soil

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	<p>ISO/DIS 10381-1: Soil quality – Sampling. Part 1: Guidance on the design of sampling programmes. 1995.</p> <p>ISO/FDIS 10381-2: Soil quality – Sampling. Part 2: Guidance on sampling techniques. 2002</p> <p>ISO 10381-3: Soil Quality – Sampling. Part 3: Guidance on safety,</p> <p>ISO/DIS 10381-4: Soil Quality – Sampling. Part 4: Guidance on the procedure for investigation of natural, near natural and cultivated sites</p> <p>ISO/DIS 10381-5: Soil Quality – Sampling. Part 5: Guidance on investigation of soil contamination of urban and industrial sites</p> <p>ISO/DIS 10381-8: "Soil quality – Sampling. Part 8: guidance on sampling of stockpiles</p> <p>ISO 10381-6: Soil quality – Sampling. Part 6: Guidance on the collection, handling and storage of soil for the assessment of aerobic microbial processes in the laboratory.</p> <p>ISO 11074-2: Soil quality – Vocabulary. Part 2: Terms and definitions relating to sampling</p>		<p>U.S. Environmental Protection Agency. Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies. 1992.</p> <p>(EPA/600/R-92/128) July 1992</p> <p>Soil Screening Guidance (EPA/540/R-96/018) July 1996</p> <p>A rationale for assessment of errors in the sampling of soils. (EPA/600/R-90/013) May 1990</p>
Finland			
Sweden			<p>Svenska Geotekniska Föreningen: Fälthandbok Miljötekniska markundersökningar. Rapport 1:2004 (ISSN 1103-7237)</p> <p>Naturvårdsverket: Vägledning för Miljötekniska Markundersökningar. Del II. Fälthandbete. 1998, <i>NV-Rapport 4311</i></p>
Norway			
Denmark			<p>Miljøstyrelsen, 1998, Vejledning nr. 13, Prøvetagning og analyse af jord</p> <p>Amternes Videncenter for jordforurening, 2003, Håndbog i prøvetagning af jord og grundvand. Teknik og Administration, rapport nr. 3.</p>
Iceland			

## Groundwater

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	<p>ISO 5667-5: Water quality – Sampling. Part 5: Guidance on sampling of drinking water and water used for food and beverage processing.</p> <p>ISO 5667-11: Water quality – Sampling. Part 11: Guidance on sampling of groundwaters.</p> <p>ISO 5667-18: Water quality – Sampling. Part 18: Guidance on sampling of groundwater at contaminated sites. First ed. 2001.</p>		<p>American Society for Testing and Material. ASTM Standards on Ground Water and Vadose Zone Investigations. Standard Guide for Sampling Groundwater Monitoring Wells, pp. 193–206. 1994.</p> <p>U.S. Environmental Protection Agency. Ground-Water Sampling Guidelines for Superfund and PCRA Project Managers. 2002.</p> <p>U.S. Geological Survey. Guidelines and Standard Procedures for Studies of Ground-Water Quality: Selection and Installation of Wells, and Supporting Documentation. Water-Resources Investigations Report 96-4233. 1997</p> <p><a href="#">"Practical Guide for Ground-Water Sampling"</a> SWS Contract Report 374, November 1985.</p> <p><a href="#">"Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells"</a> U.S. EPA Region 1, September 1996.</p> <p><a href="#">"Ground Water Sampling Procedure: Low Stress (Low Flow) Purging and Sampling"</a> U.S. EPA Region 2.</p>
Finland			
Sweden	SS 028185. Vattenundersökningar. – Provtagning av dricksvatten och badvatten för kemisk analys.		<p>Svenska Geotekniska Föreningen: Fälthandbok Miljötekniska markundersökningar. Rapport 1:2004 (ISSN 1103-7237).</p> <p>Naturvårdsverket: Vägledning för Miljötekniska Markundersökningar. Del II. Fälftarbete. 1998, <i>NV-Rapport 4311</i>.</p>
Norway			
Denmark			<p>Miljøstyrelsen, 1998, Bekendtgørelse nr. 6, Oprydning på forurenede lokaliteter.</p> <p>Amternes Videncenter for jordforurening, 2003, Håndbog i prøvetagning af jord og grundvand. Teknik og Administration, rapport nr. 3.</p>
Iceland			Handbook for microbiological analyses of food and drinking water, guidance of water sampling, 2002, Environment and Food Agency and Public Health Authority.

## Bottom sediments

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	<p>ISO 5667-12: Water Quality – Sampling. Part 12: Guidance on sampling of bottom sediments.</p> <p>EN/ISO 5667-19: Water Quality – Sampling – Guidance on sampling in marine sediments.</p> <p>ISO 5667-15: Water Quality – Sampling. Part 15: Guidance on preservation and handling of sludge and sediment samples.</p> <p>ISO 16665 Water Quality – Guidelines for quantitative sampling of marine soft-bottom macro fauna (DRAFT).</p> <p>ISO 9391: Water Quality – Sampling in deep waters for macro-invertebrates – Guidance on the use of colonization, qualitative and quantitative samplers.</p> <p>CEN Water Quality – sampling of sediments.</p>		<p>Blackwell Publishing, McIntyre A, 2005, Methods for Study of Marine Benthos, third edition.</p> <p>OSPAR, Joint Assessment and Monitoring Programme (JAMP), 1997. Guidelines for monitoring contamination in sediments.</p>
Finland			
Sweden	<p>SS 028190. Vattenundersökningar – Provtagning med Ekmanhämtare av bottenfauna på mjukbottnar.</p> <p>SS/EN 5667-19. Water quality – Sampling. – Part 19: Guidelines on sampling in marine sediments.</p>		<p>SNV Rapport 3108: Recipientkontroll vatten, metodbeskrivningar, del I, undersökningsmetoder för basprogram, 1986.</p>
Norway	<p>NS 9422: Vannundersøkelse. Retningslinjer for sedimentprøvetaking i marine områder.</p> <p>NS 9423: Vannundersøkelser. Retningslinjer for kvantitative undersøkelser av sublitoral bløtbunnsfauna i marint miljø.</p> <p>NS 9806: Vannundersøkelse – Prøvetaking av sediment for bestemmelse av PAH.</p>	<p>Forskrift om utføring av aktiviteter i petroleumsvirksomheten (aktivitetsforskriften) 2004.</p>	<p>SFT, 1991, 91:01, Veiledning for miljøtekniske grunnundersøkelser.</p> <p>SFT, 1998, 98:11, Forurensede marine sedimenter. – Oversikt over tilstand og prioriteringer.</p> <p>SFT, 98:16, 1998, Forurensede ferskvannssedimenter. – Oversikt over tilstand og prioriteringer.</p> <p>SFT, TA-1979, 2004, Veileder for håndtering av forurensede sedimenter.</p> <p>Statens kartverk, 1997: Retningslinjer for stedfesting av natur- og samfunnsgeografiske data.</p>
Denmark			
Iceland			

## Waste water

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	ISO 5667-10: Water quality. Sampling. – Part 10: Guidance on sampling of wastewater. EN/ISO 5667-3. Water quality. – Sampling. – Part 3: Guidance on the preservation and handling of samples.		
Finland			Mäkelä, A., Antikainen, S., Mäkinen, I. Kivinen, J. & Leppänen, T. 1992: Vesitutkimuksen näytteenottomenetelmät. Vesihallituksen julkaisuja n:o B 10/1992. Guidance of methods of water sampling.
Sweden	SS 02 81 48. Vattenundersökningar. – Provtagning av avloppsvatten för kemisk analys. – Teknisk vägledning.	SNFS 1990:1991 Kundgörelse om föreskrifter om kontroll av vatten vid ackrediterade laboratorier m.m.	
Norway			SFT, 1993, 93:07, Veiledning for utslippskontroll ved kommunale renseanlegg. SFT, 1988, Veiledning for prøvetaking ved avløpsrenseanlegg. SFT, 1997, Veileder for prøvetaking av avløpsvann. SFT, 1976, Veiledning for prøvetaking ved avløpsanlegg. Farestveit, T. og Hoel, T., 1997, Veileder for prøvetaking av avløpsvann, NORVAR Prosjektrapport 82/1997.
Denmark			Miljøstyrelsens vejledning nr. 6, 1994. Tilslutning af industrispildevand til kommunale spildevandsanlæg. Teknisk anvisning for prøvetagning af punktkilder. (Applicable for monitoring programs.)
Iceland			

**Solid sludge**

	<b>International and national standards for sampling performance</b>	<b>Legal requirements to sampling performance</b>	<b>Guidelines, handbooks and manuals</b>
International	EN/ISO 5667-13: Water Quality. – Sampling. Part 13. ISO 5667-15: Water Quality. – Sampling. Part 15: Guidance on preservation and handling of sludge and sediment samples.	Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.	
Finland			
Sweden			
Norway		FOR-2003-07-04-951: Forskrift om gjødselvarer mv. av organisk opphav.	SFT, 1995, TA-1185, Veiledning for prøvetaking av slam. Paulsrud, B., Bøen, A., 2003, Veileder for prøvetaking av slam, kompost og andre avfallsbaserte gjødselvarer, Aquateam-rapport 03-050/Jordforsk-rapport 107/03.
Denmark		Miljø- og Energiministeriets Bekendtgørelse nr. 623 af 16 september 2003. Bekendtgørelse om anvendelse af affald til jordbrugsformål (Slambekendtgørelsen). Plantedirektoratets meddelelse SL-0 af 20 juni:1996. Plantedirektoratets meddelelse no. 732 af 6 september 1995 om tilsyn med kvaliteten af kommunalt spildevandsslam og komposteret husholdningsaffald mm til anvendelse til jordbrugsformål. Plantedirektoratets minimumskrav til akkrediteret prøvetagningsforskrift for kommunalt spildevandsslam og af komposteret husholdningsaffald. Maj 1997.	
Iceland			

## Surface fresh waters

	International and national standards for sampling performance	Legal requirements to sampling performance	Guidelines, handbooks and manuals
International	<p>ISO 5667 Water quality – Sampling. Part 4: Guidance on sampling from lakes, natural and man-made.</p> <p>ISO 5667 Water quality – Sampling. Part 6: Guidance on sampling of rivers and streams.</p> <p>ISO 5667 Water quality – Sampling. Part 3: Guidance on the preservation and handling of water samples.</p> <p>ISO 5667 Water quality – Sampling. Part 14: Guidance on quality assurance of environmental water sampling and handling.</p>	EU Water Framework Directive 2000/60/EC	<p>Wilde, F.D., January 2005, <i>Preparations for water sampling</i>: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A1.</p> <p>Lane, S.L., Flanagan, Sarah, and Wilde, F.D., March 2003, <i>Selection of equipment for water sampling (ver. 2.0)</i>: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A2.</p> <p>U.S. Geological Survey, September 2006, <i>Collection of water samples (ver. 2.0)</i>: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A4.</p> <p>Wilde, F.D., Radtke, D.B., Gibs, Jacob, and Iwatsubo, R.T., eds., April 2004, <i>Processing of water samples (version 2.1)</i>: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A5.</p>
Finland			Ari Mäkelä <i>et al.</i> Manual for sampling methods in limnological monitoring, Publications of the Water and Environment Administration, Series B 10 87 pages, Helsinki 1992 (in Finnish).
Denmark			Teknisk anvisning fra DMU, nr. 22 2005. Undersøgelser i søer, NOVANA.
Sweden			
Norway			
Iceland			



## 2.2 Performance requirements

## 2.2.3 Written sampling procedure, bottom sediments – example

Name of method:	Equipment used:	Organisation:
Sampling of marine sediments for chemical characterization	0.1 m <sup>2</sup> van Veen grab	Nordtest

**1 PURPOSE**

The purpose of this method is to provide marine sediment surface samples from a specified area and depth for chemical analysis as part of monitoring of environmental impacts in the vicinity of oil platforms.

**2 SCOPE**

The method covers procedures from start of the sampling until sending the samples to a laboratory. Additional procedures referred to can be found in the quality system files.

**3 EQUIPMENT**

The equipment used is a 0.1 m<sup>2</sup> van Veen grab. Requirements to equipment and vessel are described in other related procedures (the equipment procedure and the vessel procedure).

Requirements for sample containers, preservation and storage are described in the sample handling and storage procedure.

**4 PRIOR TO SAMPLING****4.1 Responsibility/sampling plan**

The responsibility for the sampling must be clarified in advance of planning the sampling. A main responsible, generally the laboratory/unit/project manager, is appointed and is responsible for coordination of the survey and communication with the client. A survey leader (and a shift leader if necessary) is appointed by the main responsible. The survey leader is responsible that the personnel performing the survey (the sampler) is certified to perform the sampling in question and have the required, additional qualifications, and that the practical sampling is done in accordance with the sampling plan and the method applied.

A detailed sampling plan shall be elaborated and signed by the main responsible and the survey leader to ensure that the sampling plan is clearly described and that specified requirements are defined<sup>9</sup>.

**4.2 Mobilization**

The survey leader is responsible for mobilization.

**4.3 Check of equipment**

The initial maintenance/check of equipment is as described in the equipment procedure.

**5 SAMPLING**

Sampling is done after arriving at the planned position.

**5.1 Positioning**

Using the vessel navigation system, the geographical station coordinates and required minimum accuracy as stated in the sampling programme are established.

**5.2 Grab operation**

The grab is operated with a winch. Depth registration is carried out with an echo sounder and/or a metric wheel on the winch. The winch speed shall be low (less than 1 m/s) prior to and after touching the bottom in order not to disturb the sediments. The grab containing samples is placed carefully on the dedicated stainless steel reception table when on board.

**5.3 Sample recovery**

The grab is opened from the top through the lids. The following requirements must be fulfilled in order to accept the sample:

- the sediment surface of the sample must be undisturbed: there should be more than 1 cm free space between the sediment and the lid,
- the sample must consist of enough sample material: minimum amount of sample as agreed with the laboratory and defined in the sampling plan in one grab
- the sample must not have been overturned or shaken.

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Method prepared by:	Signature:	Version number:	Date:
Sam-Arne Nøland		6-1	November 15th 2004

<sup>9</sup> Use check list in the mobilization/demobilization procedure for preparing sampling plans, not part of this method.

## 2.2.3 Written sampling procedure, bottom sediments – example

Surface water is removed with a siphon (silicon tube) without disturbing the surface.

Samples from the top 1 cm (or other layer if specified) are scraped off with a small spade or similar made of material that does not contaminate the sample. Alternatively, the sample is collected with a short cylinder/pipe which is pressed/twisted down in the sediment.

When sectioning samples in vertical layers, short cylinders/pipes are used (e.g.: a shorter version of the pipes used in corer sampling) that are not contaminating the samples. The pipe is pressed/twisted down in the sediment to the selected sample depth. Keeping the pipe in vertical position, the pipe is shut in both ends. Alternatively, a spade with side rims (height of rim equals the thickness of the wanted vertical layer) can be used.

#### 5.4 Sample description

The colour of the sediment is described using a colour chart (Munsell Soil Colour Chart), and any smell is registered. Samples should be photographed if this is assumed to give additional information that can be utilised in the interpretation of the analyses results.

#### 5.5 Sample handling

The sample amount as agreed with the laboratory performing the analysis, mostly 50 g per sample, but depends upon type of analysis. Sample amount is ensured by estimated volume or by weighing. Samples are packed in Rilsan bags or other suitable packing (e.g.: bags or cups from the laboratory). Each sample is to be double labelled, i.e.: one sticker on the first bag and one sticker in or on the outer bag. Each label should contain the following information: project name/number, year, station, sediment sample depth (layer) and what the sample is to be analysed for. The samples are to be kept cold (max. 12 hours) until freezing (–15°C), see the sample handling and storage procedure.

### 6 QUALITY CONTROL

For every 10 stations, a duplicate sample (same position within 3 m, same depth, equipment, operator etc.) is taken and analyzed. The overall sampling uncertainty including analytical variability is estimated and reported with the data.

### 7 QUALITY REQUIREMENT

The precision expressed as relative standard deviation on replicate samplings including analytical precision must be better than 25%.

### 8 RECORDS/REGISTRATIONS

All relevant information from the survey (time, weather, participants etc.) is to be registered by the survey leader. Detailed description and registrations from each station are recorded in the standardised station forms signed by the survey leader or person appointed by him/her. The station forms and other relevant registrations from the survey (equipment, vessel, personnel, sampling programme etc) are the survey log.

The station form must include the following information for each station:

- project identification
- station description
- station depth
- sampling date and time for each station (start/stop)
- the samplers name
- sample description (colour, small, gravel/sand/clay)
- meteorological data
- wave height, currents etc.
- geographical coordinates for each station, planned and realized position (or reference to a separate document, e.g.: spreadsheet)
- sampling uncertainty
- general comments
- deviations/non-conformities from this method and/or the sampling plan.

### 9 POST SAMPLING

#### 9.1 Demobilisation

The survey leader is responsible for demobilisation (including reporting any malfunctioning equipment<sup>10</sup>).

#### 9.2 Reporting

The laboratory/unit/project manager shall receive a report (survey log) from the sampling from the survey leader.

Page 2 of 2			
Method prepared by:	Signature:	Version number:	Date:
Sam-Arne Nøland		6-1	November 15th 2004

<sup>10</sup> Use, mobilization/demobilization and maintenance/check of equipment procedures, not part of this method.

Equipment used for sampling reported with reference to a Nordtest Sampler Certificate must comply with the recognised standards and legal requirements given in appendix, Section 2.2.1.

The equipment must operate according to the principles stated for the scope covered by the certificate, see Section 1.1.

Additional help in selection of equipment can be found in the guidelines, handbooks and manuals given in the references and general comments given in the appendix, Section 2.2.1.

**Solid waste**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

- Technical Reports (TR) linked to the proposed CEN standard EN 14899:2006:
  - CEN/TR 15312-1:2006 Characterisation of waste – Sampling of waste materials – Part 1: Guidance on selection and application of criteria for sampling under various conditions.
  - CEN/TR 15310-2:2006 Characterisation of waste – Sampling of waste materials – Part 2: Guidance on sampling techniques.
  - CEN/TR 15310-3:2006 Characterisation of waste – Sampling of waste materials – Part 3: Guidance on procedures for sub-sampling in the field.
  - CEN/TR 15310-4:2006 Characterisation of waste – Sampling of waste materials – Part 4: Guidance on procedures for sample packaging, storage, preservation, transport and delivery.
  - CEN/TR 15310-5:2006 Characterisation of waste – Sampling of waste materials – Part 5: Guidance on the process of defining the sampling plan.
- Standards EN 932-1, EN 932-2 and EN 932-5
- Nordtest NT ENVIR 004: Solid Waste, Particulate materials: Sampling.

Specific requirements include:

- none.

The above drafts emphasis already the most important requirements for operation control:

- mechanical sampling
  - width of sampling device
  - check of belt velocity
  - check of crusher
  - size of collection vessel
- manual sampling
  - width of scoop
  - size of collection vessel.

**Soil**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

- ISO 10381-2. Soil quality – Sampling. Part 2: Guidance on sampling techniques.

Specific requirements include:

- hand drilling tools for sampling from piles
- sampling with hollow stem and solid flight augers.

**Groundwater**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

- ISO 5667-11. Water quality – Sampling. Part 11: Guidance on sampling of groundwaters

Specific requirements include:

- sampling with positive displacement pumps for volatiles and non-volatiles
- sampling with suction pumps for non-volatiles
- sampling with bailers for non-volatiles.

**Bottom sediments**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

- ISO 5667-12: Water Quality – Sampling. Part 12: Guidance on sampling of bottom sediments
- ISO 5667-19: Water Quality – Sampling – Guidance on sampling in marine sediments
- ISO 16665: Water Quality – Guidelines for quantitative sampling of marine soft-bottom macro fauna (DRAFT)
- ISO 9391: Water Quality – Sampling in deep waters for macro-invertebrates – Guidance on the use of colonization, qualitative and quantitative samplers.

Specific requirements include:

Sediment type	Sampler <sup>11</sup>
Gravel	Grab systems; large particle size may require heavier grabs.
Sand	Both grab and corer systems can be used. A sand bed can be very hard and thus provide difficulty for light weight grabs and manually operated corer systems. Grabs of larger mass and heavy mechanical corers may be required.
Clay	Grab systems or corer systems can be used.
Consolidated bottom sediment	Both grab and corer systems can be used.
Unconsolidated bottom sediments	Ordinary grab/ corer systems are not suitable as they can sink through the soft layer. Dedicated corer system with a frame preventing sinking through the soft layer should be preferred. Samplers which depend on the free fall principle are not suitable for this bed type.

<sup>11</sup> Sampler type versus sediment type may have to be determined experimentally

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**Waste water**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

Specific requirements include:

- manual sampling equipment: For composite samples – volume of bottle well defined and known to an uncertainty of within  $\pm 5\%$
- time and volume dependent sampling devices for time-proportional and flow proportional sampling
- flow measurement equipment for flow-dependent sampling.

**Solid sludge**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

EN/ISO 5667-13 Water quality – Sampling. Part 13: Guidance on sampling of sludges from sewage and water treatment works

Specific requirements include:

- none.

**Surface fresh water**

The equipment requirements are specified in the following documents, see appendix, Section 2.2.1 for full references:

- ISO 5667-4:1987 Water quality — Sampling — Part 4: Guidance on sampling from lakes, natural and man-made
- ISO 5667-6:2005 Water quality — Sampling — Part 6: Guidance on sampling of rivers and streams

Specific requirements include:

- none.



Equipment datasheet (template – can be copied)

Equipment identification:		
Manufacturer:	Type:	Serial number:
Supplier:		
Date of procurement:	Date taken to use:	
Equipment status at procurement: New <input type="checkbox"/> Second hand <input type="checkbox"/> Renovated <input type="checkbox"/>		
Location:	Person responsible for the functioning:	
Manufacturers instructions title, publisher and date if included, otherwise reference to their location:		
Description of regular maintenance, checks and acceptance criteria, if applicable:		
Description of regular external maintenance, if applicable:		

Page 1 of 1			
List prepared by:	Signature:	Version number:	Date:

Equipment maintenance list (template – can be copied)

Equipment identification:		
Date:	Check/maintenance/problem/solution – description (with e.g.: reference to maintenance reports, certificates of calibrations)	Signature

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List prepared by:	Signature:	Version number:	Date:

The sampler must have access to a simple quality system that enables documentation of the samplers competence, access to equipment and methods, documentation of sampling and quality control procedures.

The quality system must as a minimum contain the following elements:

- personnel requirements
  - a list of the samplers training courses, exams and competence maintenance activities (appendix, Section 2.1.5)
  - a record of the samplings done by the sampler (appendix, Section 2.1.6)
- performance requirements
  - a list of methods used by the sampler (appendix, Section 2.2.2)
  - a collection of written sampling methods (appendix, Section 2.2.3)
  - a list of equipment used by the sampler and, if the equipment is not owned by the sampler or the employer, the name of the owner of the equipment (appendix, Section 2.2.5)
  - a collection of equipment maintenance lists and equipment data sheets (appendix, Section 2.2.7) or, if the equipment is not owned by the sampler or the employer, of results from check out control
  - a procedure for archiving sampling reports and data, Section 2.3.3
- sampling requirements
  - a list of results from sampling quality control (appendix, Section 2.4.5)
  - a list of complaints (appendix, Section 2.4.6)
- certification requirements
  - a collection of annual short report forms approved by the certifying body (appendix, Section 2.4.4)
  - a collection of all certificates, certificate prolongations and recertifications, including all correspondence with the certifying body on issues related to the certificate.

All documents must bear the name and signature of the author, date of preparation, version number and page number/number of pages totally, see below for example.

Page 1 of 1

Document prepared by:

Signature:

Version number:

Date:

The purpose of quality control of sampling is to ensure a stable and documented quality of the sampling. The type of quality control and the sampling quality to be reached shall be described in the sampling method. As an initial quality control, the compliance between methods, equipment and materials (e.g.: tubing, sample containers) and the parameters to be measured in the matrices sampled should be ensured.

Sampling quality control can include both the sampling precision (how similar are two samples taken close in time and space) and the sampling error (how far away from a “true” sample). Uncertainty includes both precision and error.

The sampling quality control may be done as an **initial evaluation of the uncertainty** of the sampling method applied at the sampling site or as **site quality control** during each sampling. Initial evaluation of the uncertainty is typically done for flow or time proportional sampling of streams, where sampling is repeated at intervals. Site quality control is typically done, when spot samples are taken.

**Types of quality control**

The elements in sampling quality control are sampling equipment control, repeated sampling (e.g.: duplicate sampling), field blanks, field controls, intersampler comparisons and sampling at reference stations. The primary and most important information obtained for each type of quality control is described in the below table, and further comments are given subsequently.

	Sampling parameters	Sampling precision	Sampling “error”	False positives and high	False negatives and low
Equipment calibration	✓				
Repeated sampling		✓			
Sampling blanks				✓	
Sampling controls					✓
Sampler intercomparisons			✓		
Sampling at reference stations			✓		

*Equipment check*

Control of equipment calibration and operational parameters (e.g.: pump yield) is essential in order to establish the sampling parameters.

*Sampling duplicates and replicates*

The sampling precision can be estimated by taking replicate samples with the least possible difference in time and space. The precision can be estimated as the relative standard deviation using simple statistical methods such as r charts or r statistics (duplicates) or calculation of standard deviation (of replicates), see references in appendix, Section 2.2.1. The calculated precision will in addition to the sampling precision include a variability component from matrix variability and a precision component related to the analyses, and the statistical design and interpretation shall take this into consideration.

*Sampling blanks*

Sampling clean matrix can control the risk of sample contamination, i.e.: by using a sampling blank. For many types of sampling, the use of sampling blanks is not possible due to requirements for large volumes of clean matrix or large vessels for containing the matrix. The use of a field blank, i.e.: clean matrix transferred to a sample container of the same type as used for the samples, transported to the laboratory and analysed with the samples, is a useful control for matrices and parameters with a risk of false positives or highs due to contamination of sample containers, during transport or in the laboratory.

*Sampling controls*

Sampling matrix with a known content can control the risk of loosing the property that is the target of the sampling, i.e.: by using sampling controls. For many types of sampling, the use of sampling controls is not possible due to requirements for large volumes of matrix with a known content or large vessels for containing the matrix. The use of a field control, i.e.: matrix with known content transferred to a sample container of the same type as used for the samples, transported to the laboratory and analysed with the samples, is a useful control for matrices and parameters with a risk of false negatives or lows due loss to sample containers, during transport or in the laboratory.

*Sampler intercomparisons*

The error of sampling can be estimated by letting different samplers with different methods and equipment sample the same matrix with the least variation in time and space, i.e.: by participation in sampler intercomparisons. Comparison of performance among the samplers can help minimizing the error. Sampler intercomparisons are available only for very few matrices and parameters.

*Sampling at reference sites*

The error of sampling can be estimated by letting different samplers with different methods and equipment sample the same matrix at the same site where the variation in time and

space is known, *i.e.*: by sampling at reference sites where the “true” sample qualities are known. Reference sites can be established by cooperations of samplers or their employers.

### Requirements for quality control

The requirement for quality control will depend upon the matrix, the equipment, the method and the purpose of sampling.

General requirements for certified samplers are:

- control of all target sampling parameters shall be done, when possible
- the results of initial estimation of uncertainty or sampling quality control shall be reported in the sampling report (appendix, Section 2.3.2)
- certified samplers should participate in sampler intercomparisons if available for sampling within their scope
- certified samplers should perform sampling at reference sites if available for sampling within their scope.

Initial estimation of uncertainty for time and flow proportional sampling shall include:

- estimation of sampling precision from replicates.

Site quality control of spot sampling shall include:

- one sampling duplicate shall be included per 10 samples taken and at the least one sampling duplicate per sampling series, if the number of samples is lower than 10
- field blanks shall be included in all sampling series with risk of false positives or highs
- field controls shall be included in all sampling series with risk of false negatives or lows.

Specific, additional requirements and changes of initial estimation of uncertainty and site quality control are summarized below for each matrix.

#### *Solid waste*

- sampling parameters
  - check on the width of the sampling device, the velocity of the conveyor, the width of crusher and the scoop width
- precision
  - duplicate sampling according to ISO 13909-7 during initial estimation of uncertainty
  - stopped belt sampling according to ISO 13909-8, ISO 11648-1 during initial estimation of precision
- error
  - none.

#### *Soils*

- sampling parameters
  - none

- precision
  - none
- error
  - none.

#### *Groundwaters*

- sampling parameters
  - check pump yield, field instrument calibrations
- precision
  - none
- error
  - field blanks for volatile compounds
  - field controls for adsorbable compounds.

#### *Bottom sediments*

- sampling parameters
  - check equipment calibrations: surface area and volume (fauna sampling)
- precision
  - none
- error
  - none.

#### *Waste waters*

- sampling parameters
  - initial estimation of uncertainty with control of the volume of samples
  - difference among spot sample volumes less than  $\pm 5\%$
  - total volume of sample taken during the sampling period registered and calculated amount of sample corrected
  - calibration of flow measuring equipment, preferable external calibrations
- precision
  - none
- error
  - none.

#### *Solid sludges*

- sampling parameters
  - none
- precision
  - none
- error
  - none.

#### *Surface fresh water*

- sampling parameters
  - check field instrument calibrations, pump yield
- precision
  - none
- error
  - field controls for adsorbable compounds.

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Sampling shall be reported in a sampling report which may refer to the Nordtest Sampler Certification Scheme if done by a certified sampler and the sampling is complying with the requirements set in this handbook. The following statement may be used:

*The sampling is performed by [NAME] who is certified for this type of sampling in accordance to Nordtest Sampler Certification. The certificate is issued by [NAME OF CERTIFICATION BODY] and the certificate number is [XXXX].*

In addition the report may bear the Nordtest logo.

Besides the sampling report, a field report and a chain of custody report are prepared during the sampling. An example of a field report is given in appendix, Section 2.3.3 for groundwater sampling and of a chain of custody report in appendix, Section 2.3.4.

The client can have access to the field report, method, field of custody reports and other documentation if wishing so.

The required contents of a sampling report prepared according to this handbook are described below. The required contents of sampling reports depend upon the matrix sampled. The report shall give information on:

- outcome of quality control (appendix, Section 2.3.1)
- identification of the sampling site
- reference to sampling plan
- unique identification of each sample
- position and number of samples taken
- sampling date and time
- method used
- equipment used
- further sampling details and observations necessary to evaluate the sampling results
- deviations from sampling plan and method
- unique sampling report identification (number)
- page number and total number of pages
- signature of the certified sampler.

It should be noted that for different types of sampling, varying specific information is required to make the sampling report complete and useful as e.g.: water depth and sampling depth for bottom sediments.

The required contents of field reports depend upon the matrix sampled but in all circumstances, the form should be completed in the field for each sample taken.

For explanation of the terms and parameters used in the example, reference is made to: Amternes Videncenter for jordforurening, 2003, Håndbog i prøvetagning af jord og grundvand. Teknik og Administration, rapport nr. 3.



	Time <sup>22</sup>	WT <sup>23</sup>	Q <sup>24</sup>	Position <sup>25</sup>	T <sup>26</sup>	κ <sub>25</sub> <sup>27</sup>	pH	Oxy- gen <sup>28</sup>	Turbi- dity <sup>29</sup>
Sampling									
				Sample no.					
				Colour of sample					
				Transparency of sample					
				Smell of sample					
End									

<sup>22</sup> Time, hh, mm  
<sup>23</sup> Water table in m.b.rp.  
<sup>24</sup> Pump yield in L/minut  
<sup>25</sup> Pump position in m.b.rp.  
<sup>26</sup> Temperature in °C  
<sup>27</sup> Conductivity at 25°C in mS/cm  
<sup>28</sup> Dissolved oxygen in mg O<sub>2</sub>/L  
<sup>29</sup> Turbidity in NTU

Chain of custody report					Journal no.:																																																																	
Site:				File name:																																																																		
Start:	Date <sup>30</sup>		Time <sup>31</sup>		File no.:																																																																	
End:	Date		Time		Responsible:																																																																	
Sampler, initials:					"Company":																																																																	
Journal no. sampling report:																																																																						
Sample no. start:			Total no. of samples:																																																																			
Sample no. end:			Laboratory:																																																																			
Sample ID:																																																																						
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<sup>30</sup> dd, mm, yy

<sup>31</sup> hh, mm

**Application form**

Nordtest Sampler Certification

<i>Applicant Name:</i>			
Address:			
City, zip, country:			
Telephone Number:		Fax Number:	
Email Address:			
Date of birth:			
Nationality:			
<i>Employer Name:</i>			
Address:			
City, zip, country:			
Telephone Number:		Fax Number:	
Email Address:			
Scopes of sampling:			

**General information**

Information on the form and contents of the documentation can be found in this handbook for the Nordtest Environmental Sampler Certification Scheme.

In the Nordtest scheme, samplers can be certified for sampling of:

- solid waste
- soil
- groundwater
- bottom sediments
- waste water
- solid sludge
- surface fresh waters.

Select one or more of these scopes. Add the following documentation for each scope, as appropriate:

- competence documentation with:
  - competence maintenance list including copies of exams papers
  - on the job training declaration, if relevant
  - experience documentation, if relevant
- copy of quality system with:
  - method list with at the least one example of written sampling procedure
  - equipment list
  - equipment maintenance lists
  - equipment data sheets
  - documentation procedures with one example of a field report, a chain of custody report and a sampling report
  - procedure for filing and archiving.

**Additional information**

Use the following space for any additional information or comments that you feel are relevant and want the certifying body to consider with your application. Attach additional sheets of paper, as necessary:

Use the following space for information on other certificates obtained by yourself and on certificates given to other samplers working with you or for your employer:						
Scopes you are already certified for:						
Certificate no.'s for those certificates:						
Certificates at same employer, scopes:						
Certificates at same employer, no.'s:						

**Signature**

I hereby confirm that the forgoing information is true and that I have read the certification requirements for the Nordtest Sampler Certification Scheme. I understand that submittal of false or misleading information in this application may result in withdrawal of the certificate.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

During the certification process, the certifying body must ascertain that the requirements for personnel certification as environmental sampler according to the Nordtest Sampler

Certification Scheme are fulfilled. As aid in this process, the following check list can be applied.

Scopes of sampling applied for:					
Documentation	Submitted	Accepted	Comments		
Application for certification					
Competence maintenance list					
<i>Copies of exams papers</i>					
<i>On the job training declaration</i>					
<i>Experience documentation</i>					
Quality system					
<i>Method list</i>					
<i>Example of method description</i>					
<i>Equipment list</i>					
<i>Equipment maintenance list</i>					
<i>Equipment data sheet</i>					
<i>Example of field report</i>					
<i>Example of custody chain report</i>					
<i>Example of sampling report</i>					
<i>Procedure for filing and archiving</i>					
Field inspection	Yes	No	Justification		
<i>Selected for field inspection</i>					
<i>Passed field inspection</i>					
Other certificates considered	Yes	No	Comments		
<i>Of the applicant</i>					
<i>With the same employer</i>					

## ENVIRONMENTAL SAMPLER CERTIFICATE

Number:

Date of issue:

Date of expiry:

Dates of  
 prolongation:

Scopes:

This is to certify that:

Name: \_\_\_\_\_

Employer, if relevant: \_\_\_\_\_

Address: \_\_\_\_\_

Signature: \_\_\_\_\_

fulfils all the requirements of the Nordtest Environmental Sampler Certification Scheme according to the scheme handbook with respect to competence, performance and sampling requirements.

The certificate is valid for the scopes and with affiliation/employer stated in the certificate.

Certifying body: \_\_\_\_\_

Signature: \_\_\_\_\_

Accredited according to ISO 17024 by: \_\_\_\_\_

Accreditation number: \_\_\_\_\_

Annual short report form, one submitted for each scope (template – may be copied)

Name of Sampler:	Certificate number:	Scope:	
Record period:	Sampler signature:	Date:	Page:
			1 of 1

Summary of competence maintenance during the period:

Type of activity (course, seminar etc)	Duration

Competence maintenance list enclosed.

Sampling activity during the period:

Number of samplings:	
Number of samples:	
Total duration of sampling:	

Sampling record enclosed.

Sampling quality control during the period:

Type of QC	Method quality requirement	Achieved sampling quality

Quality control summary scheme enclosed.

Complaints during the period:

Main type of complaint	Number	Settled	Outstanding

Complaint summary scheme enclosed.





During the prolongation process, the certifying body must ascertain that the requirements for personnel certification as environmental sampler according to the Nordtest Sampler

Certification Scheme are fulfilled. As aid in this process, the following check list can be applied.

Scopes of sampling for prolongation:						
Documentation	Submitted	Accepted	Comments			
Annual short report forms						
Competence maintenance lists						
<i>Copies of exams papers</i>						
Sampling records						
Quality control summary sheets						
Complaint summary sheets						
Specific evaluation	Yes	No	Justification			
<i>Selected for specific evaluation</i>						
<i>Passed specific evaluation</i>						
<i>Type of specific evaluation</i>						



norden

Nordic Innovation Centre

**Return address:**

Nordic Innovation Centre,  
Stensberggata 25  
NO-0170 Oslo, Norway

## NORDTEST

NORDTEST is a Nordic Innovation Centre brand offering competence and expertise in the field of harmonizing of norms and methods, a large Nordic net-work of experts, more than 650 recommended Nordic testing methods and 550 published technical reports.

[www.nordicinnovation.net](http://www.nordicinnovation.net)

## Nordic Innovation Centre

The Nordic Innovation Centre initiates and finances activities that enhance innovation collaboration and develop and maintain a smoothly functioning market in the Nordic region.

The Centre works primarily with small and medium-sized companies (SMEs) in the Nordic countries. Other important partners are those most closely involved with innovation and market surveillance, such as industrial organisations and interest groups, research institutions and public authorities.

The Nordic Innovation Centre is an institution under the Nordic Council of Ministers. Its secretariat is in Oslo.

For more information: [www.nordicinnovation.net](http://www.nordicinnovation.net)