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Standards DNA analysis and interpretation- Source level (001.1)

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Part I. General Introduction to Standards

§ 1. Background to and aim of the Standards

Reporting forensic experts play a crucial role in the administration of justice. The NRGD aims to ensure justified confidence in forensic expertise for stakeholders. This confidence must be based on the demonstrable independently safeguarded quality of forensic investigators and their reports on the basis of (inter)national forensic-specific standards.
The NRGD is managed by the Board of Court Experts (hereinafter: Board). The Board's core task is to rule on the applications for registration or repeat registration in the register of the NRGD (register). To that end the Board first defines the field of expertise. This is important in order to inform applicants, assessors and users of the register (e.g. judge, public prosecutor and attorney) about the activities an expert in the field of expertise in question engages in and about the activities that fall outside the field of expertise. The demarcation of the field of expertise is set out in Part II of these Standards.

The Board also determines the criteria on the basis of which an assessment is made for each field of expertise as to whether an application complies with the quality requirements. The generic requirements are set out in the Register of Court Experts in Criminal Cases Decree (Besluit register deskundige in strafzaken). These requirements are elaborated further for each field of expertise. This elaboration is set out in Part III of these Standards.

Furthermore the Board determines the assessment procedure. This procedure is described in Part IV of these Standards.

The NRGD has a system of periodic repeat registration. Court experts must demonstrate every five years that they still meet the requirements in force at that time. The Standards are dynamic and are being developed further in order to enhance the quality of the experts. These Standards set out the current state of the (sub-)field of expertise.

§ 2. Types of applicants

The NRGD distinguishes two types of applicants: the initial applicant and the repeat applicant. The initial applicant is a reporter who at the time of submission of the application is not yet registered in the register for the field of expertise to which the application relates. The repeat applicant is an expert who is already registered in the register for the field of expertise to which the application relates.

These two types of applicants are subdivided as follows:

Initial applicant:
(i) independent reporter: a reporter who has independently written and signed the required number of case reports;
(ii) reporter without work of his own: a reporter who has not independently written and signed the number of case reports required for registration.
If the assessment is favourable, the reporter without work of his own will only qualify for temporary registration.

Repeat applicant:
(i) Repeat applicant after unconditional registration (before: full registration);
(ii) Repeat applicant after conditional registration (before: temporary registration).

The initial applicant is an applicant who at the time of submission of the application does not have an NRGD registration. An initial applicant could be:
– the independently reporting expert;
– the newly-trained expert;
– the applicant whose earlier application has been rejected by the Board;
– the applicant whose registration was previously stricken.

In respect of initial applicants, it is necessary to make a clear distinction between the independent reporter and the reporter without work of his own. An example of a reporter without work of his own is the newly-trained expert. This expert has completed the forensic training (reporter's training), but has not yet been able to independently write the number of reports required for the assessment because these are written under the supervision of a tutor during the training. Another example of a reporter without work of his own is the reporter whose earlier application was rejected and who has been working (partly) under supervision following this rejection.
The Board adopts the following principle. Every applicant must draw up a List of Case Information. This list must include a specific number of cases in a period specified by the Board immediately preceding the application. If the List of Case Information includes one or more cases which have been prepared under supervision, the applicant will be qualified as a 'reporter without work of his own'. An additional requirement applies to the applicant who was rejected earlier: the case reports included in the List of Case Information must have been drawn up after the date of the Board's decision rejecting the earlier application (Policy Framework on Application after Rejection)[1]

The distinction between the various types of repeat applicants is important in the context of the assessment procedure: the documents a repeat applicant must submit, the composition of the Advisory Committee on Assessment and the assessment method.

§ 3. Justification of Standards

These Standards have been established by the Board in accordance with the Register of Court Experts in Criminal Cases Decree (Besluit register deskundige in strafzaken) and the Experts in Criminal Cases Act (Wet deskundige in strafzaken). Representatives from the various domains were consulted; users (judges, public prosecutors and lawyers) and subject matter experts in the field (professional organisations, representative associations, experts both at home and abroad). The draft of the Standards has also been published on the NRGD website for public consultation.

§ 4. Validity of Standards

The Standards are valid from the date shown on the cover. The validity runs until the moment of publication of a new version. In principle it will be checked annually as being up-to-date. This check can lead to a new version. The aim is to publish the new version no more than once a year.

§ 5. Version management and formal revision history

All changes made to the Standards lead to a new version. Newer versions of (parts of) the Standards are designated with a higher version number.

5.1. Version management

In the case of editorial changes the old version number is increased by 0.1. Editorial changes have no substantive impact. In the case of substantive changes the version number is increased by 1.

5.2. Formal revision history

The revision history starts with version 1.0 as the first formally approved version. Substantive changes made are briefly described in the revision history (Annex C). This makes it possible to trace which Standards are valid at any given moment at all times.

Part II. Demarcation of DNA – Source level

§ 1. Introduction

Within the field of DNA analysis and interpretation – Source level (hereinafter: DNA – Source level), the following questions are relevant:

1. *Are biological traces present on the exhibit and what is the nature of the cellular material in the biological trace?*
   Is it a classical biological trace, such as blood, semen, saliva or hair (source level), or is it cellular

[1] It is possible to make an exception to this general rule, namely in case of an earlier rejection pursuant to Article 12(2), sub-paragraph a, of the Register of Court Experts in Criminal Cases, the so-called training requirement. Reports written before the date of the Board's decision rejecting the earlier application may be included in the List of Case Information, provided that they were drawn up within the generally applicable period preceding the time of submission of the new application.

material (sub source level), the nature of which cannot yet be identified using current techniques, as is the case with biological contact traces (skin cells)?
Answering this question requires knowledge and experience of presumptive testing. It concerns identification and classification.

2. *From whom does the biological trace originate i.e. who is the donor of the cellular material?*
This question concerns individualisation. Answering this question requires knowledge of and experience with DNA profiling and statistical evaluation, including knowledge of the legal status and working procedures concerning national DNA databases for criminal cases, among which, criteria for inclusion and removal of DNA profiles, criteria for matching, and inclusion of and comparison with partial DNA profiles and mixed DNA- profiles.
3. *How was the biological material deposited?*
Is there a relationship between the trace and the criminal activity; and, are there (alternative) explanations as to how the trace came to be at the given location?
This question concerns association and reconstruction. Answering this question requires knowledge of issues of transfer and persistence.

§ 2. Core activities

Stated below is the description of the field of expertise DNA- Source level.

In a criminal law context, experts working in the field of DNA – Source level, primarily seek to answer question 2: *From whom does the biological trace originate? In other words, who is the donor of the cellular material?*

The DNA – Source level expert subjects the biological trace material to (Autosomal and/or Y-chromosomal) DNA analysis, and may subsequently perform DNA profile comparison. To do this, the expert compares DNA profiles from trace material with each other and/or with DNA profiles from reference samples.

In addition, comparisons may be made with DNA profiles in DNA databases.

The DNA – Source level expert is concerned with interpreting and comparing individual and complex and/or mixed DNA profiles obtained from the trace material under standard conditions or with the help of low template/minimal traces DNA techniques. The expert's focus is on the whole scope of biological traces, including contact traces.

The tasks that fall within the field of DNA – Source level are:
– detection and identification of bodily fluids by means of visual examination and presumptive biochemical test methods, followed up by confirmation of the search result by means of microscopy and immunoassay;
– autosomal DNA analysis and interpretation;
– low template/minimal traces DNA analysis and interpretation;
– statistical calculations to determine the evidential value of a match.

Experts within the field of DNA – Source level are capable of applying Autosomal and Low Template/ Minimal Traces DNA analysis techniques and are capable of interpreting, statistically evaluating and reporting on the results of these techniques.

Experts within the field of DNA – Source level are capable of applying DNA techniques used to answer question 1*. 'Are biological materials present on the exhibit and what is the nature of the cellular material in the biological trace?'* even though not all DNA experts perform these analyses (anymore) themselves.

Experts within the field of DNA – Source level do not have to be able to answer question 3*. 'How was the biological material deposited?'.* Being able to answer this question adequately is central to reporting at Activity level and requires specialised knowledge and expertise (See paragraph 2.2).

§ 3. Boundaries of the field of expertise

Within the practice of DNA – Source level, five specific types of questions exist that require additional expertise and experience, and therefore, fall outside the scope of DNA – Source level as registered by the NRGD:
– *Y-chromosomal DNA Testing*
– Specific question: Subject biological trace material to Y chromosomal (Y-STR) DNA Testing and then carry out comparative Y chromosomal DNA analysis including interpretation.
– *Kinship DNA Testing*

– Specific question: Investigate a (presumed) biological relationship based on DNA profiles of individuals and/or traces.
– *Externally Visible Characteristics*
– Specific question: Determine the geographical origin and/or externally visible characteristics of the unknown cell donor (the possible perpetrator of the crime) by means of DNA analysis of the trace evidence.
– Mitochondrial DNA Testing
– Specific question: Subject biological trace material to Mitochondrial DNA Testing and then carry out comparative Mitochondrial DNA Testing.
– *Reporting at Activity level*
– Specific question: How was the biological material deposited? (see above)

When reporting as an expert registered for the field of DNA-Source level, the expert should be aware of the possibilities and limitations of the above mentioned techniques and/or specialisations, and in addition, the expert should be aware of the potential for international searches of intelligence databases and of new developments such as RNA, SNPs and Next Generation Sequencing. The expert should also be aware of the *pros* and *cons* of these techniques, specialisations and/or developments.

§ 4. Registration

The register will record the name of the relevant expert as an expert in the field of DNA- Source level.

Part III. Registration requirements for DNA analysis and interpretation – Source level

The general (repeat) registration requirements are given in the next paragraphs in italics with a reference to Article 12 paragraph 2 in the Register of Court Experts in Criminal Cases Decree (Besluit register deskundige in strafzaken).

An expert will only be registered as an expert in criminal cases upon submission of the application if, in the opinion of the Board, the expert:
a. has sufficient knowledge and experience in the field of expertise to which the application relates;
b. has sufficient knowledge of and experience in the field of law concerned, and is sufficiently familiar with the position and the role of the expert in this field;
c. is able to inform the commissioning party whether, and if so, to what extent the commissioning party's question at issue is sufficiently clear and capable of investigation in order to be able to answer it on the basis of their specific expertise;
d. is able, on the basis of the question at issue, to prepare and carry out an investigation plan in accordance with the applicable standards;
e. is able to collect, document, interpret and assess investigative materials and data in a forensic context in accordance with the applicable standards;
f. is able to apply the current investigative methods in a forensic context in accordance with the applicable standards
g. is able to give a verifiable and well-reasoned case report on the assignment and any other relevant aspects of their expertise in terms which are comprehensible to the commissioning party, both orally and in writing;
h. is able to complete an assignment within the stipulated or agreed period.
i. is able to carry out the activities as an expert independently, impartially, conscientiously, competently, and in a trustworthy manner.

§ 1. Article 12(2) sub-paragraph a

(...) has sufficient knowledge and experience in the field of expertise to which the application relates.

1.1. Initial: independent reporter

Basic requirements:	– work at the level of someone who has completed an academic Master's Degree, and must have a proven level of education, training and expertise; – be familiar with the summary of concepts (see annex A) and keep abreast of state-of-the-art developments; – minimally be able to answer questions about Autosomal DNA Testing and Low Template/ Minimal Traces DNA Testing; – have sufficient knowledge of the *pros* and *cons* of various techniques, specialisations and scientific methods used in the field, be aware and capable of explaining the possibilities and limitations of these techniques, specialisations and methods, and keep abreast of related recent developments; – be currently engaged in interpreting and reporting on cases at the time of the application for registration.

Specific requirements:	– have interpreted and reported on at least 50 complex and/or mixed DNA profiles in the past 2 years that have been subjected to collegial review; *In case the applicant is also acting as a supervisor, at least 10* complex and/or mixed DNA profiles *on the List of Case Information should be independently interpreted and reported on.* – have spent an average of 40 hours a year over the past 5 years on forensically relevant professional development (e.g. publications, attending conferences, running or attending courses).

1.2. Initial: reporter without work of his own

Basic requirements:	– work at the level of someone who has completed an academic Master's Degree, and must have a proven level of education, training and expertise; – be familiar with the summary of concepts (see annex A) and keep abreast of state-of-the-art developments; – should minimally be able to answer questions about Autosomal DNA Testing and Low Template/Minimal Traces DNA Testing; – have sufficient knowledge of the *pros* and *cons* of various techniques, specialisations and scientific methods used in the field, be aware and capable of explaining the possibilities and limitations of these techniques, specialisations and methods, and keep abreast of related recent developments; – be currently engaged in interpreting and reporting on cases at the time of the application for registration.
Specific requirements:	– have interpreted and reported on at least 50 complex and/or mixed DNA profiles in the past 2 years that have been subjected to collegial review and/or supervision, and of which at least one complex and/or mixed DNA profile has been drawn up under supervision; – have spent an average of 40 hours a year over the past 2 years on forensically relevant professional development (e.g. publications, attending conferences, running or attending courses).

1.3. Repeat applicant: after unconditional registration

Basic requirements:	– work at the level of someone who has completed an academic Master's Degree, and must have a proven level of education, training and expertise; – be familiar with the summary of concepts (see annex A) and keep abreast of state-of-the-art developments; – minimally be able to answer questions about Autosomal DNA Testing and Low Template/Minimal Traces DNA Testing; – have sufficient knowledge of the *pros* and *cons* of various techniques, specialisations and scientific methods used in the field, be aware and capable of explaining the possibilities and limitations of these techniques, specialisations and methods, and keep abreast of related recent developments; – be currently engaged in interpreting and reporting on cases at the time of the application for registration.
Specific requirements:	– have interpreted and reported on at least 60 complex and/or mixed DNA profiles in the past 5 years that have been subjected to collegial review; *In case the applicant is also acting as a supervisor, at least 10* complex and/or mixed DNA profiles *on the List of Case Information should be independently interpreted and reported on.* – have spent an average of 40 hours a year over the past 5 years on forensically relevant professional development (e.g. publications, attending conferences, running or attending courses).

1.4. Repeat applicant: after conditional registration

Basic requirements:	– work at the level of someone who has completed an academic Master's Degree, and must have a proven level of education, training and expertise; – be familiar with the summary of concepts (see annex A) and keep abreast of state-of-the-art developments; – minimally be able to answer questions about Autosomal DNA Testing and Low Template/Minimal Traces DNA Testing; – have sufficient knowledge of the *pros* and *cons* of various techniques, specialisations and scientific methods used in the field, be aware and capable of explaining the possibilities and limitations of these techniques, specialisations and methods, and keep abreast of related recent developments; – be currently engaged in interpreting and reporting on cases at the time of the application for registration.

Specific requirements:	– demonstrably have interpreted and reported an average of 25 complex and/or mixed DNA profiles a year during the registration period that have been subjected to collegial review; *In case the applicant is also acting as a supervisor, at least 10* complex and/or mixed DNA profiles *on the List of Case Information should be independently interpreted and reported on.* – have spent an average of 40 hours a year during the registration period on forensically relevant professional development (e.g. publications, attending conferences, running or attending courses).

§ 2. Article 12(2) sub-paragraph b

(...) has sufficient knowledge of and experience in the field of law concerned, and is sufficiently familiar with the position and the role of the expert in this field.

- In general an applicant should have adequate knowledge of Dutch criminal law:
  - context of criminal law:
    - Trias Politica, distinction between civil law, administrative law and criminal law.
  - criminal law procedure:
    - pre-trial investigation;
    - coercive measures;
    - stages of the proceedings;
    - actors in the criminal justice system (tasks/powers/responsibilities);
    - regulations concerning experts laid down in the Dutch Code of Criminal Procedure (position and powers of commissioning party, legal position of expert, position and powers of lawyer, forms of counter-analysis, register of experts in the context of criminal law);
    - legal decision-making framework of the court in criminal cases (decision-making schedule laid down in Section 350 of the Dutch Criminal Code of Procedure), also with a view to the relevance of the commission to the expert and to the question at issue;
    - course of the criminal trial;
    - position of the expert in the court procedure.
- substantive criminal law:
  - sanctions and grounds for exemption from criminal liability (very basic).
- knowledge of the legal context of safeguarding the quality of the expert and the analysis/investigation:
  - position and role of the co-operating organisations in the criminal justice system in safeguarding the quality of the reports;
  - professional codes and relevant regulations in relation to the NRGD Code of Conduct.

- In addition to the above requirements, an applicant for the field of expertise DNA analysis and interpretation – Source level:
  - should be familiar with the specific Dutch DNA legislation, and keep abreast of new legislation.

§ 3. Article 12(2) sub-paragraph c

(...) is able to inform the commissioning party whether, and if so, to what extent the commissioning party's question at issue is sufficiently clear and capable of investigation in order to be able to answer it on the basis of their specific expertise.

§ 4. Article 12(2) sub-paragraph d, e and f

d. *is able, on the basis of the question at issue, to prepare and carry out an investigation plan in accordance with the applicable standards.*
e. *is able to collect, document, interpret and assess investigative materials and data in a forensic context in accordance with the applicable standards.*
f. *is able to apply the current investigative methods in a forensic context in accordance with the applicable standards.*

An applicant is required to:
- have insight and experience regarding (forensic) DNA statistics, including:
  - background information, minimally:
    - knowledge of DNA database search controversy;
    - knowledge of both Prosecution and Defence Fallacies;
    - knowledge of the false positive fallacy (knowledge about how to account for the possibili-

ties of errors when reporting a likelihood ratio or match probability);[2]
    - population genetics;
    - Bayesian and frequentist statistics;
    - knowledge of the terms listed in Annex A;
    - statistical calculations used to estimate the evidential value of a match;
- be able to define which DNA analyses are to be used and how. An applicant must be able to record, assess and interpret the results. An applicant must have a thorough knowledge of all methods and be able to explain them; must have knowledge of state-of-the-art developments in autosomal and low template/minimal traces DNA Testing methods;
- be able to adequately answer question 2: *From whom does the biological trace originate? In other words, who is the donor of the cellular material?* An applicant is also required to possess the know-how to be able to answer question 1;
- be aware of the possibilities and limitations of Y-chromosomal Testing methods, Kinship DNA Testing, Mitochondrial DNA Testing, Externally Visible Characteristics and reporting at Activity level;
- be aware of the *pros* and *cons* of various techniques, specialisations and scientific methods used in the field, be aware of and able to explain the possibilities and limitations of these techniques, specialisations and methods, be aware of the potential for international searches of intelligence databases and follow up on developments thereof.

§ 5. Article 12(2) sub-paragraph g

(...) is able to give a verifiable and well-reasoned case report on the assignment and any other relevant aspects of their expertise in terms which are comprehensible to the commissioning party, both orally and in writing.

An applicant is required to:
- be able, on the basis of the results, to report comprehensively to laymen on an interpretation and conclusion (orally and in writing) and to substantiate the results statistically where relevant

§ 6. Article 12(2) sub-paragraph h

(...) is able to complete an assignment within the stipulated or agreed period.

§ 7. Article 12(2) sub-paragraph i

(...) is able to carry out the activities as an expert independently, impartially, conscientiously, competently, and in a trustworthy manner.

An applicant should:
- comply with the NRGD Code of Conduct determined by the Board of Court Experts and published on the website of the NRGD.

§ 8. Hardship clause

The Board may decide not to apply or deviate from a registration requirement if application of such requirement would produce very unreasonable results. The hardship clause may only offer a solution in certain exceptional situations. It is up to the applicant himself to submit facts and circumstances showing that a certain registration requirement is unreasonable in his specific case.

Part IV. Assessment procedure for DNA – Source level

§ 1. General

In all fields of expertise the assessment will be based on the written information provided, including as a minimum requirement case reports and items of evidence, supplemented in principle with an oral assessment. However, such an oral assessment will not be necessary if the applicant's expertise has already been clearly demonstrated by the written information.

The assessment will in principle be carried out on the basis of the information provided by the applicant:
- general information as part of the application package

[2] Thompson, W.C., Taroni, F. & Aitken, C.G.G. (2003). How the Probability of a False Positive Affects the Value of DNA Evidence. In: *Journal of Forensic Sciences* 48(1), 47-54.

– documentary evidence of competence.

If it is felt necessary in the context of the assessment an additional case report and/or information, for example information about the way collegial review and/or supervision is organized within the organization, can be requested.

§ 2. Assessment procedure per type of applicant

2.1. Initial: independent reporter

Documents to be submitted:	– NRGD application form; – Statement accompanying the application for registration with the NRGD; – Certificate of Good Conduct; – a clearly legible copy of a valid passport or identity card; – a curriculum vitae (CV), preferably in English; – copies of documents relating to the highest level of professional qualification; – documentary evidence of the current academic working level; – Overview Continued Professional Development DNA- Source level; – List of Case Information DNA – Source level; – 3 case reports drawn up in the past 2 years selected by the applicant from the List of Case Information. These case reports should provide a clear and broad picture of the applicant's competencies; – if available: • proof of the forms of professional development referred to in the Overview Continued Professional Development DNA – Source level[1]; • a statement concerning the level of accreditation of the applicant's working environment, where applicable.
Assessment method:	phase a. administrative, by the NRGD Bureau; phase b. substantive, by an Advisory Committee for Assessment (ACA) made up of at least three people on the basis of the available written material, including possible supplementary written information. In principle this ACA consists of a lawyer and two professional assessors; phase c. substantive, by the ACA specified at phase b by means of an oral assessment. This oral assessment will be waived if the applicant's expertise has already been clearly established in phase b; phase d. decision by the Board: registration, conditional registration or no registration.

Explanation:
If the ACA has to assess an application after an earlier rejection, a new ACA will be formed if possible. This ACA will not be allowed to inspect the advice given by the previous ACA.

[1] It is left to the applicant to decide in which form this evidence is provided, e.g. in the form of a logbook or by means of certificates.

2.2. Initial: reporter without work of his own

Documents to be submitted:	– NRGD application form; – Statement accompanying the application for registration with the NRGD; – Certificate of Good Conduct; – a clearly legible copy of a valid passport or identity card; – a curriculum vitae (CV), preferably in English; – copies of documents relating to the highest level of professional qualification; – documentary evidence of the current academic working level; – Overview Continued Professional Development DNA- Source level; – List of Case Information DNA – Source level – 3 case reports drawn up in the past 2 years selected by the applicant from the List of Case Information. These case reports should provide a clear and broad picture of the applicant's competencies; – if available • proof of the forms of professional development referred to in the Overview Continued Professional Development DNA – Source level[1]; • a statement concerning the level of accreditation of the applicant's working environment, where applicable.
Assessment method:	phase a. administrative, by the NRGD Bureau; phase b. substantive, by an Advisory Committee for Assessment (ACA) made up of at least three people on the basis of the available written material, including possible supplementary written information. In principle this ACA consists of a lawyer and two professional assessors; phase c. substantive, by the ACA specified at phase b. by means of an oral assessment. This oral assessment will be waived if the applicant's expertise has already been clearly established in phase b; phase d. decision by the Board: registration for a conditional registration or no registration.

Explanation:
If the ACA has to assess an application after an earlier rejection, a new ACA will be formed if possible. This ACA will not be allowed to inspect the advice given by the previous ACA

[1] It is left to the applicant to decide in which form this evidence is provided, e.g. in the form of a logbook or by means of certificates.

2.3. Repeat applicant: after unconditional registration

Documents to be submitted:	– NRGD application form; – Statement accompanying the application for registration with the NRGD; – Certificate of Good Conduct; – a clearly legible copy of a valid passport or identity card; – an updated curriculum vitae (CV), preferably in English; – Overview Continued Professional Development DNA- Source level; – List of Case Information DNA – Source level; – 2 case reports drawn up in the past 5 years selected by the applicant from the List of Case Information. These case reports should provide a clear and broad picture of the applicant's competencies; – if available • proof of the forms of professional development referred to in the Overview Continued Professional Development DNA – Source level[1]; • a statement concerning the level of accreditation of the applicant's working environment, where applicable.
Assessment method:	phase a. administrative, by the NRGD Bureau; phase b. substantive, by an Advisory Committee for Assessment (ACA) made up of at least two people on the basis of the available written material. This ACA will in principle consist of a lawyer and a professional assessor; phase c. substantive, by the ACA specified at phase b to which one professional assessor is added, drawn from the same field of expertise as the applicant, on the basis of the available written material. This will not be necessary if the ACA unanimously gives a positive recommendation to the Board in phase b; phase d. substantive, by the ACA specified at phase c by means of an oral assessment. This oral assessment will be waived if the applicant's expertise has been clearly established in phase c; phase e. decision by the Board: registration, conditional registration or no registration.

Explanation:
A new ACA will be formed if possible. This ACA will not be allowed to inspect the advice given by the previous ACA.

[1] It is left to the applicant to decide in which form this evidence is provided, e.g. in the form of a logbook or by means of certificates.

2.4. Repeat applicant: after conditional registration

Documents to be submitted	– NRGD application form; – Statement accompanying the application for registration with the NRGD; – a clearly legible copy of a valid passport or identity card; – an updated curriculum vitae (CV), preferably in English; – Overview Continued Professional Development DNA- Source level; – List of Case Information DNA – Source level; – 2 case reports drawn up during the registration period selected by the applicant from the List of Case Information. These case reports should provide a clear and broad picture of the applicant's competencies; – if available • proof of the forms of professional development referred to in the Overview Continued Professional Development DNA – Source level[1]; • a statement concerning the level of accreditation of the applicant's working environment, where applicable.
Assessment method	phase a. administrative, by the NRGD Bureau; phase b. substantive, by an Advisory Committee for Assessment (ACA) made up of at least three people on the basis of the available written material. In principle this ACA consists of a lawyer and two professional assessors; phase c. substantive, by the ACA specified at phase b by means of an oral assessment. This oral assessment will be waived if the applicant's expertise has already been clearly established; phase d. decision by the Board: registration, conditional registration or no registration.

Explanation:
A new ACA will be formed if possible. This ACA will be allowed to inspect the advice given by the previous ACA.

[1] It is left to the applicant to decide in which form this evidence is provided, e.g. in the form of a logbook or by means of certificates.

ANNEX A SUMMARY OF CONCEPTSDNA ANALYSIS AND INTERPRETATION – SOURCE LEVEL

This document contains keywords for concepts of which an expert in the field of *DNA- Source level* should minimally have a basic knowledge.

Keywords

Forensic biology
Sources of DNA evidence
Crime scene investigation and laboratory analysis of biological evidence
Identification and presumptive testing of body fluids (blood, semen, saliva)
Confirmatory assays for body fluid identification (immunoassays)
Uncertainty concerning attribution of DNA (particularly at low levels) to specific body fluids

General
The structure of DNA and the variability of the human DNA genome
Loci, alleles, genotypes and DNA profiles
Polymorphisms commonly used for DNA testing
The molecular biological basis of forensic DNA tests; using the DNA profile to identify a forensic sample
Extraction and quantification of DNA
Polymerase chain reaction
Short tandem repeats and mutation processes
Forensic multiplex STR typing kits
DNA separation by CE and LIF detection
Analysis of results, including the use of ladders for fragment sizing, use of analytical thresholds and identification of artefacts such as stutter, 'pull-up' and identification of mixed samples.

QC/QA
Quality control and quality assurance of forensic DNA analysis
Laboratory accreditation, personnel certification and proficiency testing
Validation studies
Laboratory error rates
Understanding and minimizing the risk of contamination in the forensic process: methods of reducing the occurrence of contamination and detecting when it has occurred
Continuous improvement and quality

DNA statistics
Likelihood Ratio (LR)
Bayes Theorem
Product rule to calculate the probability of independent variables
DNA mixture deconvolution and recommended procedures for analysing mixed samples (LR and RMNE ('Random Man not Excluded')/CPI ('Combined Probability of Inclusion'))
Accounting for relatives, where applicable, in calculating evidential strength

Database issues
Inclusion criteria and search (im)possibilities of the national DNA database including the detection of false negative and false positive matches.
Population Genetics
Hardy-Weinberg equilibrium/Linkage equilibrium
Population Substructure
Allele frequencies, genotype probabilities
Applying the product rule for independent events
Conditional match probabilities
Fst/Theta population substructure correction; correction for possible allele dropout
Sampling variation in construction of DNA population databases

Proper Interpretation of the Evidence
Common Logical Fallacies (Prosecution/Defence Fallacy)
Evidential strength of database match
DNA database search controversy
Avoidance of cognitive bias

Minimal traces (Low Template DNA Analysis)
Evaluation of potential low template DNA typing results.
Allele and/or locus dropout due to degradation, preferential amplification, stochastic effects and stochastic thresholds.
Replication and consensus DNA profiles
Approaches for the statistical evaluation of DNA profiles from low template DNA samples

Y-chromosome Testing
Y-chromosome evolution and its consequences for forensic analyses
Patrilineal inheritance
Laboratory analysis of Y-chromosome STR's
Population genetics of Y-STR haplotypes
Use of Y-STR population databases (YHRD)
Statistical evaluation of Y-chromosome haplotypes
Interpretation of Y-STR mixtures

Kinship DNA Testing
Inheritance of genetic polymorphisms
Technical procedures for determining kinship
Statistical evaluation of kinship (e.g. paternity index, sibling index, Bayesian networks)
Incorporation of the presence of mutations and null-alleles in the statistical evaluation
Principles of disaster/mass identification
Principles of familial searching in databases
Use of Y-STR and mtDNA analysis to narrow candidate lists from familial searching in databases

Externally Visible Characteristics
Evolution and migration of Homo sapiens
Population genetics of externally visible characteristics
Principles of determining the geographic origin of an individual
Principles of determining externally visible characteristics
Knowledge about genes involved in the biosynthesis of melanine (skin and hair pigmentation, iris colour)
Technical procedures for determining geographic origin or externally visible characteristics
Approaches for the interpretation of genotyping results for determining geographic origin or externally visible characteristics
Knowledge of the limitations of determining geographic origins or externally visible characteristics

Mitochondrial DNA Testing
Mitochondrial DNA evolution and its consequences for forensic analysis
Matrilineal inheritance, variable mutation rates, heteroplasmy and principles for evaluating close non-matching mtDNA sequences
Laboratory analysis of mitochondrial DNA (e.g. Sanger sequencing, mini-sequencing)
Population genetics of mitochondrial DNA haplotypes
Use of mitochondrial DNA databases (EMPOP)
Statistical evaluation of mitochondrial DNA matches

Reporting at Activity level
Understanding of the principles of case assessment and interpretation (CAI)[2] and in particular, balance, logic, robustness and transparency
Formulation and evaluation of appropriate hypotheses
Understanding use of data and experience in evaluation of hypotheses:
- Knowledge concerning transfer of cells and DNA (primary, secondary, tertiary)
- Knowledge concerning persistence of DNA and the impact of e.g. environmental conditions
- Extensive experience of forensic DNA analysis and interpretation in forensic casework
- Transparency regarding any limitations of the data used

Understanding of the principles of probabilistic (Bayesian) networks in evidence interpretation

[2] R. Cook, I.W. Evett, G. Jackson, P.J. Jones, J.A. Lambert – *Science and Justice*, 1998 38(3): 151–156.

ANNEX B NRGD GLOSSARY

Advisory Committee for Assessment	A committee appointed by the Board which advises the Board on the (repeat) applicant's (degree of) suitability for (repeat) registration.
Applicant	Natural person submitting an application to the NRGD in order to be (re-) registered in the register.
Assessor	A member of an Advisory Committee for Assessment.
Board	The Board of Court Experts is the body as referred to in Section 51k(2) of the Code of Criminal Procedure and is charged with managing the register.
Brdis	Register of Court Experts in Criminal Cases Decree (Besluit register deskundige in strafzaken).
Bureau	The NRGD Bureau that supports the Board.
Collegial review	The assessment of another person's work for the purpose of continuous quality control of a person's expertise. There is thereby not a hierarchical but a horizontal relationship between colleagues specialised in the same subject area. The reviewer does not sign the report.
Conditional registration	The registration of an expert for a period specified by the Board and possibly under certain conditions which must be met within that period. In principle the period to be specified by the Board is two years.
Continuous professional development	All (training) activities that contribute to the ongoing development of knowledge and skills, which is desirable and necessary in order to be able to continue performing the role of court expert in a professional manner.
Independent reporter	A reporter who has independently prepared and signed the required number of case reports
Initial applicant	An applicant who makes an application to be entered in the register and does not or not yet have an NRGD registration at the time when the application is made.
Intervision	Intervision is a structured (interdisciplinary) meeting between people who are working or training in the same professional area. The subject of discussion is in any case the forensic work carried out and the associated problems. The aim is to enhance the expertise of those involved and improve quality of work. Unlike supervision, there is no hierarchical relationship between the participants.
NRGD	The Netherlands Register of Court Experts of which the Board and the Bureau form part.
Register	The national public register as referred to in Section 51 k(1) of the Code of Criminal Procedure, which lists the court experts which the Board deems suitable.
Registered expert	An expert who is entered in the register.
Registration	Entry in the register.
Repeat applicant	An expert who at the time of submitting a repeat application already has a NRGD registration, possibly for a temporary period.
Reporter	An individual who issues a report for the administration of justice and/or gives testimony in court.
Reporter training	A coherent and structured arrangement of organised training activities in which the necessary knowledge and experience are acquired to report as a court expert in criminal law proceedings and that is completed by an exam.
Reporter with no own work	A reporter who has not independently completed and signed the number of case reports required for registration.
Supervision	The assessment of another person's work, the joint consideration of the work and the supervision of a supervisee as part of a training or additional training process. Supervisor and supervisee are thereby in a hierarchical relationship. The supervisor will observe the subject of the investigation (the investigated person) in such a way that they can check the supervisee's investigation, and can endorse and take responsibility for the conclusions thereof. The supervisor will sign the report in all cases.
User	Someone who uses the register in order to find and potentially engage a registered expert.

ANNEX C REVISION HISTORY

Version	Date	Revisions made
3.0	01.11.2016	Generic adjustments: – addition: generic introduction for all fields of expertise in Part I – adjusted description of types of applicants: independent/work of his own – differentiation per types of applicants to provide an immediate overview of respective requirements (Part III) and assessment procedure (Part IV) – number of hours CPD reduced to 40 hours per year for repeat applicants (instead of 50) – number of case reports adjusted because of extending the registration period; – Continued Professional Development (CPD) mandatory for all types of applicants – possibility to submit profiles that were interpreted and reported on under supervision – possibility to submit profiles that were interpreted and reported on under the supervision of the applicant – integration of several NRGD policy frameworks in Standards – selection of case reports by applicants themselves.
2.1	01.03.2014	– Y-STRS no longer basic requirement – CPD mandatory for repeat applicant – generic adjustment in assessment procedure regarding repeat applicants B(iv) – adjustment definition complex profile
2.0	28.02.2013	Generic adjustments: – Document containing both Demarcation and Requirements and assessment procedure combined – type of applicants
1.4	25.01.2013	Field of DNA limited to Source level
1.3	01.07.2012	Every report should be subjected to collegial review
1.2	01.02.2011	Modification assessment procedure: an oral examination will not take place if the applicant's expertise has already been clearly demonstrated.
1.1	29.06.2010	Modification assessment procedure
1.0	01.02.2010	First edition