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Standard for Reports and Testimony in Forensic Toxicology

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Foreword

Forensic toxicology laboratories, forensic toxicologists, and other experts produce results that include observations, data, calculations, interpretations, and opinions (written or oral). These results are often provided to customers or stakeholders through reports and testimony in criminal and civil matters. A toxicologist may be asked to testify as a fact witness about the analyses conducted, and they may provide interpretations as an opinion witness.

Reports and testimonies must be presented clearly, accurately, unambiguously, and objectively in these legal matters. This document requires that toxicological reports and testimony be transparent, comprehensive, and based on reliable principles and methods.

Although published as a Best Practice Recommendation in 2019, ANSI/ASB Standard 037 is now a standard. ANSI/ASB Standard 053, *Standard for Report Content in Forensic Toxicology, 1st Ed. 2020*, has been merged with this document. This revised document provides the requirements for analytical and opinion reports, including disclosures and additional information that must be made immediately available in these reports. Common limitations of forensic toxicology observations, calculations, and interpretations used as the basis of opinions have been included. The requirements for opinions and testimony in forensic toxicology have been expanded and clarified. The term "expert witness" was removed from this document to align with the views of the National Commission on Forensic Science regarding judicial vouching.

The American Academy of Forensic Sciences established the Academy Standards Board (ASB) in 2015 with a vision of safeguarding Justice, Integrity, and Fairness through Consensus Based American National Standards. To that end, the ASB develops consensus-based forensic standards within a framework accredited by the American National Standards Institute (ANSI) and provides training to support those standards. ASB values integrity, scientific rigor, openness, due process, collaboration, excellence, diversity, and inclusion. ASB is dedicated to developing and making freely accessible the highest quality documentary forensic science consensus Standards, Guidelines, Best Practices, and Technical Reports in a wide range of forensic science disciplines as a service to forensic practitioners and the legal system.

This document was revised, prepared, and finalized as a standard by the Toxicology Consensus Body of the AAFS Standards Board.

Questions, comments, and suggestions for the improvement of this document can be sent to AAFS-ASB Secretariat, asb@aafs.org or 410 N 21st Street, Colorado Springs, CO 80904.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

ASB procedures are publicly available, free of cost, at www.aafs.org/academy-standards-board.

Keywords: *toxicology reports, toxicology testimony, opinions*

Table of Contents *(to be finalized upon completion)*

Standard for Reports and Testimony in Forensic Toxicology

1 Scope

This document establishes the requirements for the content of reports, providing supporting materials, and delivering testimony in forensic toxicology. It is intended for human performance toxicology, postmortem forensic toxicology, non-regulated employment drug testing, court-ordered toxicology, and general forensic toxicology. Reports and supporting materials for breath alcohol subject testing and breath alcohol calibration are excluded from this document; however, they do apply to testimony in these areas.

2 Normative References

The following references are indispensable for the application of the standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASB Standard 036, *Standard for Test Method Selection, Development, Validation, and Verification in Forensic Toxicology.*[a] *(not yet published, current draft can be requested from asb@aafs.org)*

ANSI/ASB Standard 113, *Standard for Identification Criteria in Forensic Toxicology.*[a]

ANSI/ASB Best Practice Recommendation 122, *Best Practice Recommendation for Performing Alcohol Calculations in Forensic Toxicology.*[a]

ANSI/ASB Standard 173, *Standard for Education, Training, Continuing Education, and Certification of Forensic Toxicology Laboratory Personnel.*[a]

ASB Technical Report 208, *Forensic Toxicology: Terms and Definitions (not yet published, current draft can be requested from asb@aafs.org)*

3 Terms and Definitions

For purposes of this document, the following terms and definitions apply. Additional applicable terms are defined in ASB TR 208, *Forensic Toxicology: Terms and Definitions (not yet published, current draft can be requested from asb@aafs.org)*.

3.1
amended report
Used to document any subsequent modifications to a previously issued report, particularly those that affect or correct an original result.

3.2
analytical report (forensic toxicology)
Provides observations (including data), calculations, and interpretations, and is based on results from laboratory analysis.

[a] Available from https://www.aafs.org/academy-standards-board.

3.3
inconclusive results
Findings that are not clear due to analytical interferences or sample condition.

3.4
opinion report (forensic toxicology)
Offers the author's belief, view, or judgment that considers other information beyond observations (including data), calculations, and interpretations expressed in an analytical report.

3.5
supplemental report
Used to document additional work performed.

4 Background

Forensic toxicology testing qualitatively identifies or quantitates drugs, metabolites, or poisons in biological specimens. A toxicology test result in which a drug or drug class is not detected can also be informative. Toxicology results (observations, calculations, interpretations, and opinions are summarized in reports and testimony.

The requirements specified in this document provide a framework for forensic toxicology:

a) analytical and opinion reports are to be accurate, unambiguous, objective, and supported by scientific principles;

b) opinion reports are to be based on the totality of information available at the time the report is prepared (e.g., case history, statements, circumstances, and other relevant information beyond the analytical results); and

c) testimony is to be accurate, clear, and transparent.

5 Requirements for Forensic Toxicology Reports

5.1 General

Individuals authoring analytical reports or providing opinion reports for court or investigative purposes shall meet the requirements of ANSI/ASB Standard 173, *Standard for Education, Training, Continuing Education, and Certification of Forensic Toxicology Laboratory Personnel*.

5.2 Analytical Reports

5.2.1 Analytical reports in forensic toxicology shall include the following (when known), either directly within the report, via attachments to the report, or through hyperlinks to electronic materials that are immediately available to the reader:

a) administrative information:

   1) name, address, and contact information of the laboratory issuing the analytical report;

   2) name and location(s) where testing occurred;

NOTE This includes multi-site laboratories and external providers.

3) requesting individual or agency information;

4) unique case identifier assigned by the requesting agency;

5) unique case identifier assigned by the laboratory;

6) identifying information of the individual(s) from whom specimens were collected (e.g., full name, donor identification number);

7) unambiguous descriptive identification of all specimens received;

NOTE This includes specimens received but not tested.

8) date(s) of receipt of specimens for toxicological testing;

9) date of report issuance;

10) indication when the report contains supplemental information or amends an earlier report (see Section 6);

11) statement clarifying that the report does not contain all documentation associated with the work performed;

EXAMPLE "Supporting documentation is maintained separate from this report and is necessary for independent evaluation of the work or interpretation of the data."

12) statement of the planned evidence disposition at the time of the report;

NOTE Common disposition statements include that additional examinations are pending, the evidence has been transferred to another unit, the evidence was consumed, the evidence will be returned, or the evidence will be retained for a specified retention timeframe.

13) laboratory accreditation information;

14) page numbers and the laboratory's unique case identifier on each page with a clear indication of the total number of pages for the report;

15) printed name and title of the individual(s) authorizing the report;

16) statement affirming that a technical review was performed.

b) test result information:

1) scope of the work being reported;

2) test result to include:

— specimen tested,

— name or class of analyte,

- interpretation of data obtained and units (See Section 7),
- analytical techniques used (e.g., immunoassay, GC-MS, LC/MS-MS, etc.),
- reporting limit or limit of detection for the analyte,
- identification of a result provided by an external provider.

c) disclosures:

1) deviations from laboratory procedures that may impact the validity of a test result;

2) abnormal environmental or sample conditions that may impact the validity of a test result;

3) disagreements occurring during the technical review *that required mediation* to report a test result;

4) rates of false test results for qualitative methods per ANSI/ASB Standard 036, *Standard for Test Method Selection, Development, Validation, and Verification in Forensic Toxicology* or the absence of such information ;

5) expanded uncertainty of measurement and coverage factor for quantitative test results per ANSI/ASB Standard 056, *Standard for Evaluation of Measurement Uncertainty in Forensic Toxicology,* or the absence of such information;

6) explanation for not testing for requested analytes that are within the laboratory's scope of testing;

7) database or analytical limitations (e.g., mass spectral library search with a small number of compounds) that may impact the requested scope of testing;

8) indication when a reported test result is outside the laboratory's scope of accreditation.

5.3 Opinion Reports

5.3.1 Written toxicological opinions regarding the interpretation of the results can be provided within an analytical report(s) or as a separate report.

5.3.2 When provided, opinions shall be clearly identified.

5.3.3 Opinion reports in forensic toxicology shall include the following (when known/applicable) either directly within the report, via attachments to the report, or through hyperlinks to electronic materials that are *immediately available* to the reader:

a) administrative information:

1) name, address, and contact information of the laboratory or individual issuing the opinion report;

2) requesting individual or agency information;

3) unique case identifier assigned by the requesting agency;

4) unique identifier of the opinion report (e.g., case style or report number);

5) date of report issuance;

6) indication when the opinion report pertains to a test performed by an external provider, if known or applicable;

7) indication when the report provides supplemental information or amends an earlier report (see Section 6);

8) page numbers on each page with a clear indication of the total number of pages for the report;

9) name, title, and dated signature of the author of the opinion report;

10) indication whether a technical review was performed on the opinion.

b) opinion information:

1) opinion statement(s);

2) summary of data, observations, calculations, interpretations, investigative activities performed, information reviewed, and list of references relied upon to develop the reported opinion;

3) list of any assumptions made.

c) disclosures:

1) conflicts of interest;

2) known limitations of the opinion;

3) statement indicating that the opinion report may be subject to change based on new information that becomes available.

5.4 Additional Information to be Made Available for Analytical and Opinion Reports

5.4.1 When known, the following items shall be included within forensic toxicology analytical and opinion reports, within the files for the case, or available through other means (e.g., discovery requests, public record requests, public websites):

a) Administrative information:

1) manner of receipt of test items (e.g., courier, hand delivery);

2) specimen container type(s);

3) estimate of the received volume, weight, or amount of specimen(s) and/or minimum specimen volume/weight requirement of the laboratory;

4) date and time of specimen collection;

5) subject's sex;

6) subject's date of birth or age;

7) abnormal conditions of specimens upon receipt, if applicable;

8) names and affiliations of all people responsible for making observations, generating, and reviewing data, performing calculations, and providing interpretations along with corresponding dates;

9) chain-of-custody;

10) standard operating procedures and policies pertinent to the case;

11) log of communications related to the case;

12) name and affiliation of individual(s) performing technical review of the report along with corresponding dates otherwise indicate as "none" and provide an explanation;

13) final disposition of evidence (e.g., evidence consumed; evidence returned; evidence retained).

b) test information:

1) all pertinent data, observations, calculations, and statistics, in sufficient detail for independent expert review

2) documentation of all corrections pursuant to technical and/or administrative review

3) justification for reanalysis, changes to data, or changes to interpretations

4) copy of laboratory reports provided by external providers

c) disclosures:

1) deviations relevant to the case, and any resulting actions or resolutions, from laboratory policies or procedures that do not impact the validity of the test results;

2) relevant internal validation summaries as described in ANSI/ASB Standard 036, *Standard for Test Method Selection, Development, Validation, and Verification in Forensic Toxicology;*

3) other common discipline-specific limitations that are likely to impact the data, observations, results, or opinions (see Section 8).

6 Supplemental and Amended Reports

6.1 Supplemental and amended reports shall meet the requirements listed in Section 5.

6.2 Reports to supplement or amend a prior report shall:

a) be clearly marked as such;

b) reference the original toxicology report(s); and

c) include the reason for the additional report.

6.3 Reports to amend a prior report shall have all changes clearly identified.

7 Interpretations of Forensic Toxicology Observations and Calculations

7.1 When testing provides sufficient criteria to be met for identification of the analyte (e.g., per ANSI/ASB Standard 113, *Standard for Identification Criteria in Forensic Toxicology*, or other standard practices), the toxicological results shall be reported:

a) qualitatively as "identified" or "positive"; or

b) quantitatively to include the amount and units of measurement.

NOTE Reporting quantitative analytical results as “greater than” or “less than” a specific value is acceptable.

7.2 When testing detects a specific drug or drug class, but identification criteria have not been met (e.g., per ANSI/ASB Standard 113, *Standard for Identification Criteria in Forensic Toxicology,* or other standard practices), the result may be reported as “preliminary” or as "presumptively positive.” All such preliminary and presumptive positive results shall include a disclaimer.

EXAMPLE “Cannabinoids were presumptively positive in item 1 but were not specifically identified. This result is provided for informational purposes only. Additional testing is required before use in legal proceedings, as criteria for substance identification has not been made. Based on this presumptive result, any conclusions suggesting that identification has occurred is inappropriate.”

7.3 Observations of specimens unsuitable for testing shall be clearly noted with an explanation.

EXAMPLE Item 1 was unsuitable for testing due to sample clotting.

7.4 Inconclusive analytical results shall be clearly noted with an explanation.

EXAMPLE Results for alkaline drugs in item 1 are inconclusive due to interfering substances.

7.5 All other testing results shall be reported as "not detected" or “none detected.”

7.6 The term “negative” shall not be used except where required by legislation.

7.7 Specific drugs or drug classes tested for but not detected shall be individually listed within the report, an annex, or through a hyperlink to an external website.

8 Common Limitations of Interpretations of Forensic Toxicology Observations, Calculations, and Opinions

8.1 Limitations shall be included in the analytical or opinion reports, within the files for the case, or made available through other means.

8.2 When relevant, limitations shall be acknowledged when discussing the case and during testimony.

8.3 The following common forensic toxicology limitations may impact interpretations of observations and calculations, and the formation of opinions.

a) *Scope of Analysis: The analytes included or excluded from the scope of analysis can affect the interpretation of results.*

b) *Specimen Condition:* The condition of the specimen can affect the interpretation of test results by influencing the detectability of the substances being tested. Factors such as adulteration, clotting, or degradation can lead to inaccurate or misleading results.

c) *Specimen Volume:* An insufficient specimen volume may impact the scope or sensitivity of the testing.

d) *Analyte Stability:* Compound stability may affect the ability to detect and quantitate drugs in biological samples.

e) *Isomer Differentiation:* The inability to distinguish between isomers with identical molecular formulas and masses (e.g., d- and l- methamphetamine, dextro- and levomethorphan, delta-8 and delta-9 tetrahydrocannabinol) may necessitate reporting these substances as mixed isomeric compounds (e.g., methamphetamine, methorphan, tetrahydrocannabinol).

f) *Postmortem Drug Redistribution:* Postmortem blood concentrations can be artificially elevated, especially in central sources, due to redistribution from areas with higher concentrations, such as the liver and gastric contents.

g) *Interpretive Value of Certain Matrices:* Drug concentrations in matrices such as urine, hair, and nails have limited interpretive value. They do not correlate with impairment and may not indicate the time or dose of use.

h) *Pharmacological variability:* Genetic differences can affect drug metabolism and response, causing variations in detection times, efficacy, and effects. Further, classically determined pharmacokinetic parameters (e.g., half-life volume of distribution) may not apply to children, the elderly, individuals in a toxic state, or those in a diseased state.

i) *Drug Tolerance:* Tolerance can affect how an individual processes and responds to a drug pharmacokinetically and pharmacodynamically.

j) *Drug Interactions:* Drug interactions can lead to unanticipated variations in drug concentrations and unexpected physiological responses.

k) *Limited Pharmacological Data:* Some drugs may lack comprehensive pharmacokinetic or pharmacodynamic data from human studies.

l) *Reference Ranges:* Therapeutic, toxic, and lethal concentration ranges for some drugs may be limited.

9 Requirements for Opinions and Testimony in Forensic Toxicology

9.1 The following requirements shall apply when a forensic toxicologist provides opinions through reports or testimony.

a) Applicable limitations shall be addressed when discussing a report and any analytical work.

b) Qualifying a reported concentration in the context of a given case as subtherapeutic, therapeutic, toxic, or lethal shall be supported by appropriate references, databases, and/or other relevant information.

c) Pharmacology/toxicology information, including impairment, shall be contextualized to the average individual and supported by appropriate references, databases, and/or other relevant information.

NOTE This does not preclude a toxicologist from addressing effects within a given population (e.g., chronic users).

d) The toxicological significance of the presence, absence, and/or stability of drugs or other chemicals shall be addressed and supported by appropriate references, databases, and/or other relevant information.

e) Ethanol calculations shall follow the recommendations of ANSI/ASB BPR 122, *Best Practice Recommendation for Performing Alcohol Calculations in Forensic Toxicology*.

f) A toxicologist shall not opine as to an individual's cause and manner of death.

NOTE While a medical examiner or coroner determines the cause of death, this does not preclude a toxicologist from addressing the toxicological impact of any substances found in the analysis of specimens from the case.

g) A toxicologist shall not address an individual's behavioral intent (e.g., suicidal ideation, homicidal rage).

NOTE While a psychiatrist or psychologist evaluates an individual's behavioral intent, this does not preclude a toxicologist from addressing the behavioral effects of any substances relevant to the case.

h) A toxicologist shall not provide an opinion on a specific individual's degree of impairment *based solely on a quantitative result*.

NOTE 1 Unknown factors, such as the individual's tolerance to the drug's effects, prevent a toxicologist from providing an opinion on a specific individual's degree of impairment based only on a quantitative result.

NOTE 2 This does not preclude a toxicologist from addressing the impairing effects of any substances relevant to the case on the average individual.

NOTE 3 *Per se* laws create a legal presumption of impairment.

i) A toxicologist shall not provide an opinion on the effects of a drug or combination of drugs on a specific individual without considering the context of the case.

NOTE 1 This context includes behavioral evidence, the individual's drug history, reports from Drug Recognition Expert officers or Sexual Assault Nurse Examiners, driving behavior, autopsy findings, clinical reports, and subject statements.

NOTE 2 This does not preclude a toxicologist from addressing the general effects of drugs at varying concentrations.

j) A toxicologist shall not infer impairment based on results derived from urine, hair, nails, sweat, gastric contents, bile, or tissues.

NOTE 1 Urine, hair, nails, sweat, gastric contents, bile, and tissues do not reliably correlate with recent substance use.

NOTE 2 This does not preclude a toxicologist from addressing the impairing effects on the average individual based on analytical findings from blood, oral fluid, or breath.

k) A toxicologist shall not opine as to the cause of an accident without specialized training in accident reconstruction.

NOTE This does not preclude a toxicologist from addressing the impairing effects of any substances relevant to the case that may have contributed to the accident.

l) Except for ethanol, a toxicologist shall not perform retrograde extrapolation calculations to estimate drug concentration in an individual at an earlier time.

NOTE ANSI/ASB BPR 122 *Best Practice Recommendation for Performing Alcohol Calculations in Forensic Toxicology* provides guidance on performing these calculations for ethanol.

m) Except for ethanol, a toxicologist shall not calculate the dose of a consumed drug based on its measured concentration(s) in a biological sample.

NOTE 1 Due to unknown factors such as postmortem redistribution, bioavailability, and pharmacokinetic/pharmacogenomic variability, such calculations are not reliable.

NOTE 2 ANSI/ASB BPR 122 *Best Practice Recommendation for Performing Alcohol Calculations in Forensic Toxicology* provides guidance on performing these calculations for ethanol.

n) A toxicologist shall not use words such as "scientific certainty" or "reasonable degree of scientific certainty" unless required by jurisdictional regulations.

NOTE This does not preclude a toxicologist from explaining the scientific principles they applied in forming their opinion or citing any published works they relied upon.

9.2 Upon request, a toxicologist shall provide a listing of cases in which they have testified as an expert at trial or by deposition during the previous four years.

9.3 Upon request, a toxicologist shall provide their qualifications, including a list of all publications authored in the previous 10 years.

Annex A
(informative)

Bibliography

The following bibliography is not intended to be an all-inclusive list, review, or endorsement of literature on this topic. The goal of the bibliography is to provide examples of publications addressed in the standard.

1] ANSI/ASB Standard 055, *Standard for Breath Alcohol Measuring Instrument Calibration*, 1st Ed 2024.[b]

2] *The Federal Rules of Evidence.* Michigan Legal Publishing Ltd.; 2023 edition; Accessed November 15, 2024.[c]

3] *Testimony Using the Term "Reasonable Scientific Certainty", National Commission on Forensic Science, National Institute of Standards and Technology.* Accessed August 20, 2024.[d]

4] *Views of the Commission "Judicial Vouching", National Commission on Forensic Science, National Institute of Standards and Technology.* Accessed March 13, 2025.[e]

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[d] Available from: https://www.justice.gov/ncfs/file/795146/dl
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