



This annex has been developed and reviewed by the A2LA Technical Committees (i.e. Construction Materials Advisory Committee (CMAC), Electromechanical Advisory Committee (EMAC), Life Science Advisory Committee (LSAC), Measurement Advisory Committee (MAC), Materials and Transportation Advisory Committee (MTAC), and Forensics Examination Advisory Committee (FEAC)). This annex provides the proficiency testing sub-discipline breakdown which is suitable to adequately demonstrate the technical competence of the laboratory per field of testing or calibration.

I. Acoustics and Vibration

There are currently no defined sub-disciplines under this scope of accreditation. In lieu of the A2LA General Requirements for Proficiency Testing, laboratories accredited under the Acoustics and Vibration field of testing will be required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1.

II. Biological

Biological - General

Sub-disciplines include:

Sub-disciplines

- Quantitative Bacteriology
- Quantitative Mycology
- Quantitative Virology

- Qualitative Bacteriology
- Qualitative Mycology
- Qualitative Virology

- Molecular Sub-typing
- Serology
- ELISA
- PCR
- Microscopy

Biological - Food Testing Program Requirements

Laboratories accredited to the *A2LA Food Testing Program Requirements* must meet the proficiency testing requirements specified in the *AOAC International Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food and Pharmaceuticals (March 2010)*. This document is available from AOAC International (www.aoac.org).



III. Calibration

Disciplines/Sub-disciplines include:

Disciplines

Acoustical

Sub-Disciplines

- Dosimeters, mastoids, sensors
- Calibrators

Chemical

- pH, conductance measuring devices, gas concentration

Dimensional

- 1D – portable gauging and hand tools (calipers, height gages, indicators, micrometers, rulers, etc)
- 1D – artifacts, standards, and parts (angle blocks, external/internal cylinders, gage blocks, lasers, length bars, line scales, sine plates, sieves or mesh openings, spheres, stage micrometers, step gages, measurement of parts, etc)
- 2D – portable/fixed gauging and hand tools (bevel protractors, clinometers, levels, linear measuring machines, measuring microscopes, optical comparators, squareness testers, theodolites, etc)
- 2D – artifacts, standards, and parts (angle block, autocollimator, cones, cylinder squares, granite squares, index tables, optical polygons, optical squares, retroreflection prisms, sine bars, measurement of parts, etc)
- Form (external/internal cylinders, flatness standards, lenses, magnification, standards, optical flats/parallels/wedges, spheres, surface plates, etc)
- 3D – gauging (CMMs, theodolites, laser trackers, etc)
- 3D – artifacts, standards, and parts (ball plates, grid plates, etc.)
- Other – (gears, groove depth standards, pitch masters, profilometers, roughness, standards, threaded devices, tip condition, etc)

Electrical – DC/Low Frequency - Current

- Voltage
- Power
- Impedance
- Inductance
- Capacitance
- Resistance
- Oscilloscope functions
- Process calibrators



Disciplines

Sub-Disciplines

Electrical – RF/Microwave

- Attenuation, AM/FM/PM modulation, power
- Adapters, antennas, CDNs, ferrite clamps, ESD simulators, signal generators, LISNs, current probes, EMI receivers, spectrum analyzers
- Insertion loss, VSWR
- Noise

Fluid

- Volume, density, specific gravity, mass/volume flow

Ionizing Radiation & Radioactivity

- Dosimetry
- Radiation protection/health physics survey instruments
- Radioactive source calibration

Mechanical

- Hardness (direct verification, indirect verification, geometry)
- Pressure, vacuum
- Torque, force, durometers, extensometers, strain gauges
- Acceleration, speed, vibration
- Scales & balances, mass

Optical

- Lasers, fiber optics
- Power, luminosity, radiance, irradiance, color
- Optical density
- Metallographs, photomicrographs

Thermodynamics

- Thermometers, ovens, furnaces
- Temperature indicating systems/environmental monitoring (RH, RTD's, thermocouples)
- Black body/IR

Time & Frequency

- Period, time, frequency

Initial Accreditation Requirements: Calibration laboratories seeking A2LA accreditation will normally be asked to complete a measurement audit before accreditation is granted. Depending on the availability of measurement artifacts, calibration laboratories may occasionally be granted accreditation before an audit has been completed. In such cases, accreditation is granted with the understanding that continued accreditation is contingent upon the successful completion of measurement audits as artifacts become available.

Evaluation of Results: A laboratory's participation in a given measurement audit is usually evaluated based on the following equation:



$$E_n = \frac{|Lab - Ref|}{\sqrt{(U_{95}Lab)^2 + (U_{95}Ref)^2}} \quad (1)$$

where Lab and Ref indicate the laboratory and reference measurement values respectively for the attribute in question and $U_{95}Lab$ and $U_{95}Ref$ represent the expanded uncertainties expressed at the 95% confidence level for the laboratory and reference laboratory respectively. E_n values greater than 1 indicate that a laboratory's measurement result and associated uncertainty deviate significantly from the reference measurement result and associated reference uncertainty.

Remedial Actions: Laboratories obtaining one or more unsatisfactory results in a measurement audit (i.e., measurements for which $E_n > 1$) will be required to promptly provide evidence of corrective action undertaken to correct the problem in the measurement ensemble evidenced by the unsatisfactory measurement result. In the event that a thorough investigation of the ensemble fails to identify an assignable cause for the unacceptable measurement result, the laboratory will provide to A2LA complete and detailed records of its investigation into the unacceptable measurement. In either case, requested evidence will be provided to A2LA in the time frame specified by A2LA. (In some cases, the measurand may change in the course of a study. This is especially true in international ILCs (interlaboratory comparisons) where artifacts are subjected to the rigors of extensive travel, or due to the nature of the artifact itself (for example, standard capacitors).

In the event that an unacceptable measurement result is obtained in a measurement audit, and upon receipt of the records of corrective action taken or investigation conducted, the laboratory shall be subject, at the discretion of A2LA, to one or more of the following actions:

- The calibration parameter in question, or any other parameter dependent upon the parameter in question, may be removed from the scope of accreditation. The parameter would be reinstated after successful completion of a technical assessment in that area as well as successful completion of a measurement audit.
- The best uncertainty quoted on the scope of accreditation may be enlarged sufficiently to render the E_n value for the measurement(s) in question less than one.
- An on-site surveillance visit by an A2LA assessor to verify continued amenability of the laboratory environment, personnel, and equipment to the measurement in question.
- Recalibration of the same or similar artifact with acceptable results.



IV. Chemical

Chemical - General

Sub-disciplines and material/matrices include:

Sub-disciplines

Chromatography: GC, GC-MS, HPLC, IC, TLC

Combustion: LECO

Spectroscopy: AA, CVAA/GFAA, Fluorescence, ICP, IR/FTIR, MS (MSD, MS/MS, etc.), OE, UV/Vis, XRF

Wet Chemistry

Materials/Matrices/Product Types

Ferrous Metals

Non-Ferrous Metals

Plastics

Rubber

Water

Food

Specific Program Requirements: Laboratories accredited for the Fertilizer, Animal Drug Testing, or Food Testing programs under the Chemical field of testing must meet the proficiency testing requirements outlined below.

Chemical - Fertilizers


Minimum Participation: Applicants under this program are required to participate at least twice per year in a relevant proficiency testing program administered by organizations acceptable to A2LA, but participation must be sufficient to ensure that all testing sub-disciplines listed on a laboratory's scope of accreditation is covered over a four year period. Please see the A2LA web site for information on fertilizer proficiency testing programs.

Chemical - Animal Drug Testing

Minimum Participation: Applicants under this program are required to participate in the proficiency and blind sample testing from any of the relevant programs found on the A2LA web site. Participation must be sufficient to ensure that all testing sub-disciplines listed on a laboratory's scope of accreditation are covered over a four-year period.

Chemical - Food Testing

Laboratories accredited to the *A2LA Food Testing Program Requirements* must meet the proficiency testing requirements specified in the *AOAC International Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food and Pharmaceuticals (September 2010)*. This document is available from AOAC International (www.aoac.org).

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Chemical - Anti-Doping Testing

World Anti-Doping Agency (WADA) accredited laboratories are required to meet the proficiency testing requirements as specified in the current International Standard for Laboratories (ISL)). This document is available from WADA (www.wada-ama.org).

V. Construction Materials

Minimum Participation: Applicants under the Construction Materials field of testing are required to participate at least twice per year in a proficiency-testing program in each of the major areas of construction materials testing related to their Scope of Accreditation (see below). These programs must be administered by organizations acceptable to A2LA. In addition, laboratories must participate in any proficiency testing mentioned in the engineering standards (such as ASTM C1077, D3666, C1093 and D3740) for which they are accredited.

Enrollment in the following programs related to a laboratory's Scope of Accreditation satisfies the above requirement:

Proficiency Sample Programs of the Cement and Concrete Reference Laboratory (CCRL)

- A. Concrete – Applicable Standards: ASTM C39, C138, C143, C173 and C192.
- B. Cement – Applicable Standards: ASTM C109, C114, C115, C151, C185, C1896, C187, C188, C191, C204, C266, C430 and C451.
- C. Masonry – Applicable Standards: ASTM C92, C109, C151, C185, C187, C188 and C266.

Proficiency Sample Programs of the AASHTO Materials Reference Laboratory (AMRL)

(NOTE: AASHTO equivalent standards are in parentheses after each ASTM designation.)

- D. Bituminous – Applicable Standards: ASTM D5 (AASHTO T49), D70 (T228), D92 (T48), D1754 (T179), D2042 (T44), D2170 (T201), D2171 (T202) and D2872 (T240).
- E. Soils – Applicable Standards: ASTM D422 (AASHTO T88), D698 (T99), D854 (T100), D2844 (T190), D4318 (T89 & T90).
- F. Aggregate – Applicable Standards: ASTM C88 (AASHTO T104), C117 (T11), C127 (T85), C128 (T84), C131 (T96) and C136 (T27).
- G. Bituminous Concrete – Applicable Standards: ASTM D5 (AASHTO T49), D1559 (T245), D1560 (T246), D1856 (T170), D2041 (T209), D2170 (T201), D2171 (T202), D2172 (T164), D2726 (T166), D3203 (T260) and D5444 (T30).



Remedial Actions: If a laboratory's results are deemed outliers or unacceptable (ratings of "0", "1", or "2" for the above programs), then the laboratory shall promptly investigate and determine the cause(s) for such unacceptable results, correct any problems identified and promptly report to A2LA the outcome of such investigations. Two successive failures, a pattern of erratic results or failure to participate may be cause for revocation of accreditation for that parameter and/or a required on-site surveillance visit.

VI. Electrical

Electrical - General

There are currently no defined sub-disciplines under this scope of accreditation. In lieu of the A2LA General Requirements for Proficiency Testing, laboratories accredited under the Electrical field of testing will be required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1.

VII. Environmental

Environmental – NELAC

For laboratories pursuing compliance with the requirements of The NELAC Institute (TNI), the applicable requirements of 2011 Environmental Laboratory Sector Volume I, Module I, (EL-V1M1-20011) apply (<http://www.nelac-institute.org/>).

TNI NEFAP Field Sampling and Measurement Organizations (FSMO)

Laboratories seeking and maintaining accreditation under the Field Sampling and Measurement Organizations Program shall receive, analyze, and achieve a passing score on an applicable and available PT sample(s) from an approved PT provider for each scope of accreditation being sought. The minimum amount of proficiency testing and the frequency of participation shall be specified in cooperation with interested parties and shall be appropriate in relation to other surveillance activities. If an appropriate PT program is not applicable or available for the field sampling or analytical method for which the FSMO is seeking accreditation, then the accrediting body shall consider other evidence that demonstrates FSMO proficiency, for example that the FSMO:

- a) maintains a quality manual that meets the requirements of Clause 5 of this Standard to demonstrate sampling and measurement procedure competency;
- b) employs the use of other types of internal quality control check samples or programs to demonstrate sampling/measurement procedure competency;
- c) has conducted method detection limit studies, precision and accuracy studies and demonstrations of analyst capability.
- d) employs an internal self-monitoring and audit system (e.g., of processes, procedures, field observations) to demonstrate sampling/measurement competency;



- e) participates in applicable inter-organization comparison studies such as round robins; and
- f) employs various combinations of the aforementioned examples or other techniques to demonstrate competence in the requested scope of accreditation.

Submittal of proficiency test sample results generated by another FSMO as its own, failure to successfully complete applicable proficiency testing studies within any interim accreditation period (twelve months), failure to complete at least one applicable PT sampling program during the accreditation period (typically two years) and failure to maintain a two out of three passing record on applicable PT studies, or failure to demonstrate the required degree of competency in the absence of applicable and available PT programs may result in suspension of accreditation in total or in part. Accreditation shall be retained by the FSMO for those areas where it continues to meet the PT requirements

Environmental - Lead (Pb)

Minimum Participation: To be accredited under the A2LA Environmental Lead (Pb) program, enrollment and proficient performance in the Environmental Lead Proficiency Analytical Testing (ELPAT) program (administered by AIHA and NIOSH/EPA) is required. Sample sets for one or more of three matrices (paint chips, soil and dust wipes) are supplied on a quarterly basis. Four concentration levels are required for each of the three matrices. NIOSH supplies the results of participating laboratories directly to A2LA each quarter.

Any laboratory performing field testing and/or sampling shall be required to participate in suitable proficiency testing programs as they become available.

Initial Accreditation Requirements: Before initial Lead accreditation can be granted, applicant laboratories shall attain a rating of “proficient” under ELPAT for each matrix for which it seeks accreditation.

Ongoing Participation: Accredited laboratories must continue to participate in all rounds of ELPAT for all matrices for which they are accredited. To maintain full accreditation, each accredited laboratory must be at least 75% (12 out of 16 test samples) “proficient” over the 4 most recent rounds for each matrix.

Remedial Actions: If a laboratory obtains less than 75% proficiency for the previous four rounds in any matrix for which it is accredited, the laboratory’s Scope of Accreditation shall be revised to delete that particular matrix. A2LA shall issue a revised Scope of Accreditation to the laboratory with a copy to USEPA NLLAP officials within 5 working days of receipt of the NIOSH ELPAT report.

Accreditation for a specific matrix may be restored if the laboratory’s performance on the next ELPAT round is 100% (no outliers) and there are no more than 25% (4 of 16 test samples) cumulative outliers over the 4 most recent rounds. Accreditation may also be restored if the laboratory performs at a level of zero outliers on the next two ELPAT rounds.



Environmental (Kentucky UST Program)

Laboratories seeking and maintaining accreditation under the Kentucky Underground Storage Tank Program must meet the proficiency testing program requirements noted in the above Section of this requirements document for non-NELAC laboratories for the parameters for which accreditation is sought and maintained.

Environmental (Wyoming LAUST Program)

Laboratories seeking and maintaining accreditation under the Wyoming Leaking Aboveground and Underground Storage Tank (LAUST) Program must meet the proficiency testing requirements noted in the above Section of this requirements document for non-NELAC laboratories for the parameters for which accreditation is sought and maintained.

Environmental (Texas Department of Health Indoor Air Quality Laboratory Accreditation Program (TXDOH IAQ))

Laboratories seeking and maintaining accreditation under the Texas Department of Health Indoor Air Quality Laboratory Accreditation Program shall successfully participate in and meet the requirements of the American Industrial Hygiene Association Environmental Microbiological Proficiency Analytical Testing (EMPAT) program.

VIII. Forensic

Minimum Participation: Laboratories accredited under the forensic field of testing are required to participate in relevant and available commercial proficiency testing or interlaboratory comparisons at a frequency of twice a year. In addition, forensic personnel actively engaged in forensic inspection or testing shall participate in commercial PT, intralaboratory or interlaboratory or round robin testing annually for each discipline in which they are considered competent.

Sub-disciplines include:

Failure Analysis: Electrical Safety, See sections IV – Chemical, XI – Mechanical, XII – Nondestructive and others as applicable

Forensic Biology: Extraction from substrates, Extraction from commercial collection cards (i.e. FTA@GeneCards), Body fluid identification, Serology, Human DNA (i.e. Mixtures, Semen, Blood, Buccal Swab, Lineage (YSTR and Mito)), See also section II - Biological

Controlled Substances: Chemical Unknown (Solid), See also sections IV – Chemical and VII – Environmental

Latent Prints & Impressions: Fingerprint, Palm Print



Firearms & Toolmarks*: Serial number restoration, Firearms examination / identification, Toolmark examination, See also section XI - Mechanical

Trace Evidence*: Fiber / Hair analysis, Paint analysis, Glass, Tape Examination, Bulb Examination, Gun Shot Residue Analysis, Low Order Explosives (i.e. Flammability, Flashpoint, Ignition Temperature, Fire-promoting characteristics, Corrosion behavior), See also sections IV – Chemical and XI - Mechanical

Questioned Documents*: Document examination, Handwriting examination

Forensic Toxicology: Blood Alcohol analysis, Breath alcohol simulator solution analysis, Urine testing, See also sections II – Biology and IV – Chemical

Digital Forensics: Digital media examination (i.e. Write protection, Media imaging, Establishing a hash value of the original media, Creating a directory listing, Recovery of all active files, Deleted file recovery, Metadata recovery from documents, Text file recovery), Analog video examination, Digital video examination

Crime Scene Inspection: Blood pattern analysis, Body fluid identification, Computer simulated crime scene

*The listing of testing techniques under the above headings does not require that they be listed this way on a Scope of Accreditation. It is recognized that forensic disciplines perform similar analyses and the allocation of these job duties will vary.

IX. Geotechnical

Geotechnical - General

Minimum Participation: Laboratories accredited under the Geotechnical field of testing are required to participate in at least one relevant and available proficiency-testing program administered by organizations acceptable to A2LA. One such acceptable program is the Soils Proficiency Sample Program (SPSP) of the AASHTO Reference Materials Program. In order for a laboratory to maintain accreditation for the following test method standards [ASTM D422 (AASHTO T88), ASTM D427, ASTM D698 (AASHTO T99), ASTM D854 (AASHTO T100), ASTM D2844 (AASHTO T190) and ASTM D4318 (AASHTO T89 & T90)], it must participate in all rounds offered by SPSP per year for each test.

Remedial Actions: If a laboratory's results are deemed to be outliers or unacceptable (ratings of "0", "1", or "2" for the above program), the laboratory shall promptly investigate and determine the cause(s) for such unacceptable results, correct any problems identified and report to A2LA the outcome of such investigations. Two successive failures, failure to participate or patterns of erratic results may result in revocation of accreditation or a required on-site surveillance visit.



Specific Program Requirements: Laboratories accredited for the Putting Green Materials program under the Geotechnical field of testing must comply with the specific proficiency testing requirements outlined below.

Geotechnical - Putting Green Materials

Minimum Participation: Applicants under this program are required to participate in the quarterly USGA Green Section Proficiency Testing Program geared toward the putting green materials testing industry. Participation is required for each accredited test method, if proficiency testing for that test method is offered by the USGA Green Section Proficiency Testing Program. For testing on the scope that is not covered by the USGA Green Section Proficiency Testing Program, the laboratory must ensure that appropriate round robin programs or quality checks (see clause 5.9 of ISO/IEC 17025) are completed in order to ensure that the entire scope is covered over a four-year period.

X. Information Technology

There are currently no defined sub-disciplines under this scope of accreditation. In lieu of the A2LA General Requirements for Proficiency Testing, laboratories accredited under the Information Technology field of testing will be required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1.

XI. Mechanical

Sub-disciplines and material/matrices include:

Sub-disciplines

- Mechanical Tests: Tensile, Flexural, Compression
- Impact Tests: Izod, Charpy
- Thermal Tests: HDT, Vicat, DSC, Melt Flow, TGA, Ash Content
- Hardness: Rockwell, Brinell
- Microhardness: Knoop, Vickers
- Hardness: Other - (e.g. Shore A)
- Optical: Color, Gloss, Haze
- Corrosion/Environmental Simulation¹
- Metallographic Evaluation: Grain Size
- Material Properties: Specific Gravity, Viscosity
- Dimensional (please refer to the Dimensional section under III. Calibration)
- Others: Coefficient of Friction, Volume and Surface Resistivity

Materials/Matrices/Product Types

- Plastic
- Rubber

¹ Participation in available ASTM B117 salt spray testing programs is not mandatory.



Metals
Textiles

XII. Nondestructive

There are currently no defined sub-disciplines under this scope of accreditation. In lieu of the A2LA General Requirements for Proficiency Testing, laboratories accredited under the Nondestructive field of testing will be required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1.

XIII. Sustainable Energy

Sustainable Energy – General

Minimum Participation: Laboratories accredited under the Sustainable Energy field of testing are required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1, except where noted by special program requirements.

Specific Program Requirements:

EPA ENERGY STAR – Solid State Lighting

Minimum Participation: Applicant laboratories testing to IESNA LM-79 (2008) are required to demonstrate a successful round of PT for LM-79 prior to applying for accreditation to this test method. The PT program for LM-79 is currently offered by NIST Metrology Services by Mr. Cameron Miller (c.miller@nist.gov, 301-975-4713). For all other testing on the scope, the laboratory must ensure that appropriate round robin programs or quality checks (see clause 5.9 of ISO/IEC 17025) are completed in order to ensure that the entire scope is covered in accordance with the applicant's risk assessment process.

XIV. Thermal

There are currently no defined sub-disciplines under this scope of accreditation. In lieu of the A2LA General Requirements for Proficiency Testing, laboratories accredited under the Thermal field of testing will be required to perform internal performance-based checks meeting the requirements of ISO/IEC 17025, clause 5.9.1.



Document Revision History

Date	Description
7/09/2010	Added Forensic testing sub-disciplines
9/15/2011	<ul style="list-style-type: none"> ➤ Part II: Updated title and date of AOAC document; ➤ Part IV: Updated title and date of AOAC document; ➤ Part V: Removed “twice per year” requirement in second paragraph; ➤ Part V, Remedial Actions: Changed “...failure to participate shall be cause...” to “...failure to participate may be cause...”; ➤ Part VI: Removed the specific AEMCLRP Proficiency Testing Requirements; ➤ Part VII: Added TNI NEFAP Field Sampling and Measurement Organizations requirements as an Environmental sub-field. Updated the NELAC requirements to the current version of the standard; ➤ Part XI: Added Ash Content, Metallographic Evaluation (Grain Size) and footnote #1; ➤ Part XIII added as new section.

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