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Standard Guide for ~~Certification~~ Requirements for Analytical Laboratory ~~Professional Vocations~~Related Professions Within the Cannabis ~~Industry~~and Hemp Industries[1]

This standard is issued under the fixed designation D8347; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide ~~provides recommendations to certificate issuers to administer certifications and develop associated training programs for laboratory vocations within the cannabis/hemp industries. All references to cannabis within this guide are also inclusive of the hemp cannabis varieties.~~can provide certification bodies, training providers, employers, and certificate issuers, with best-practice guidance for administering their respective programs for supporting analytical laboratory-related professions within the cannabis and hemp industries.

1.2 This guide ~~provides the general requirements and recommendations~~ recommends requirements for experience, training, education, and the body of knowledge (BoK) necessary for analytical ~~laboratory-related vocations~~ laboratory related professions within the ~~cannabis/hemp industry~~ cannabis and hemp industries listed in Table 1.

~~1.3 The vocational requirements recommended in this standard provide a guide for entities that issue certificates, offer training programs, and for individuals that seek careers in the respective vocation.~~

1.3 This guide provides recommendations for articulating ~~vocational~~professional requirements for ~~certifications.~~ training and education or earning certificates. Its content does not supersede ~~requirements, vocational training, and certification conditions~~ requirements for training or earning a certificate defined by jurisdictional entities such as government or other regional regulatory bodies.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

[1] This guide is under the jurisdiction of ASTM Committee D37 on Cannabis and is the direct responsibility of Subcommittee D37.06 on Personnel Training, Assessment, Credentialing.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

~~TABLE 1 General Requirements, Experience, Education, and Body of Knowledge (BoK) by Vocation~~

	Section
~~Cannabis/Hemp Laboratory Professionals~~	~~7~~
~~Certified Cannabis Sampling Technician (CCST)~~	~~7.1~~
~~Certified Cannabis Laboratory Technician (CCLT)~~	~~7.2~~
~~Certified Cannabis Laboratory Analytical Chemist (CCLAC)~~	~~7.3~~
~~Certified Cannabis Laboratory Manager (CCLM)~~	~~7.4~~

TABLE 1 Cannabis and Hemp Supporting Analytical Laboratory Professions

	Section
Cannabis and Hemp Laboratory Professionals	7
Cannabis and Hemp Sampling Technician	7.1
Cannabis and Hemp Laboratory Technician	7.2
Cannabis and Hemp Laboratory Analytical Chemist	7.3
Cannabis and Hemp Microbiologist	7.4
Cannabis and Hemp Laboratory Manager	7.5

E2659 Practice for Certificate Programs
E2708 Terminology for Accreditation and Certification

2.2 *Other Standards:*
21CFR 111 Dietary Supplements[3]
21CFR 117 FSMA and Food Safety[3]
21CFR 210 Pharmaceutical Packaging and Holding[3]
21CFR 211 Pharmaceuticals[3]
ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *biosafety level 2, n*—a biosafety level classification pertaining to laboratories that work with agents associated with human diseases (that is, pathogenic or infections organisms) that pose a moderate health hazard.

3.1.2 *certificate, n*—a document (letter, card, or other medium) awarded to certificate holders that designates the successful completion of a credentialing program's requisites. **E2659, E2708**

3.1.3 *certification agency, n*—the organizational or administrative unit that offers or operates, or both, a certification program. **E2659, E2708**

3.1.4 *certificate program, n*—a non-degree-granting education of training program consisting of (*1*) a learning event or series of events designed to educate or train individuals to achieve specified learning outcomes within a defined scope, and (*2*) a system designed to ensure individuals receive a certificate only after verification of successful completion of all program requisites, including but not limited to an evaluation of learner attainment of intended learning outcomes. **E2659, E2708**

3.1.5 *certification, n*—procedure and action by a duly authorized body of determining, certifying, and attesting in writing to the qualifications of individuals, processes, procedures, or items in accordance with application requirements.

[3] Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.access.gpo.gov.
[4] Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.

3.1.5.1 *personnel certification, n*—procedure and action by a duly authorized body of determining, verifying, and attesting in writing to the qualifications of individuals in a profession, in accordance with application requirements associated with that profession. **E2659, E2708**

3.1.6 *standard guide, n*—a compendium of information or series of options that does not recommend a specific course of action. Guides are intended to increase the awareness of information and approaches in a given subject area.

3.1.6.1 *Discussion—*
Guides may propose a series of options or instructions that offer direction without recommending a definite course of action. The purpose of this type of standard is to offer guidance based on a consensus of viewpoints but not to establish a standard practice to follow in all cases (ASTM Form and Style, C15.2).

3.2 *Acronyms:*

3.2.1 *BoK, n*—body of knowledge.

3.2.2 *cGMP, n*—current good manufacturing practices.

3.2.3 *FSMA, n*—food safety modernization act.

3.2.4 *PPE, n*—personal protective equipment.

3.2.5 *QC, n*—quality control.

3.2.6 *QMS, n*—quality management system.

3.2.7 *R&D, n*—research and development.

4. Summary of Guide

4.1 The BoK criteria is itemized in their associated tables and represent the general competency subject matter expertise that practitioners within each ~~vocation~~profession should demonstrate to meet ~~certification requirements.~~certificate requirements as guided by Practice E2659.

~~4.2 For brevity purposes, the acronyms denoting the vocational titles, such as Certified Cannabis Laboratory Technician (CCLT), include the hemp varieties of cannabis.~~

4.2 Mastery of said criteria can be demonstrated by many alternative means, including but not limited to passing proctored examinations, attaining educational degrees or training certificates, and the documented completion of apprenticeships or other on-the-job ~~training,~~ training covering all elements of the specific BoK for that position as determined by the relevant jurisdiction.

4.3 Section 6 identifies the ~~vocations~~professions covered in this guide.

4.4 Section 7 includes a subsection for each ~~vocation.~~profession. Each subsection is divided into the following four sections:

4.4.1 ~~Vocational~~Professions roles,

4.4.2 Experience,

4.4.3 Education, and

4.4.4 BoK.

4.5 The sourcing of personnel meeting these qualifications may be difficult in an emerging sector. In situations where post-secondary degreed personnel or post-secondary institutions are not available or applicable, the phasing-in of staff is acceptable in the first three years of employment along with sector training or apprenticeship programs reflecting the content of the ~~vocational~~professional BoK. The validation process can occur through proctored exams.

5. Significance and Use

5.1 As the ~~cannabis/hemp~~ cannabis and hemp industries expand and their products become more available as consumable products, the following requirements and expectations within the industry become increasingly ~~significant,~~ significant (Practice E2659, Terminology E2708), requiring:

5.1.1 The safety, reliability, and quality of its products;

5.1.2 Worker safety;

5.1.3 Environmental sustainability;

5.1.4 Regulatory compliance;

5.1.5 The need for different levels of qualified professionals; and

5.1.6 Development of qualified training and ~~certification~~certificate programs.

5.2 The primary objectives of this ~~standard~~guide are as follows:

5.2.1 ~~To provide~~ Provide a general overview of the BoK required for the ~~professional vocations~~ professions listed in Section 6 (Table 1); and

5.2.2 ~~This guide provides recommendations for vocations~~ Provide recommendations to form the foundation for training and subsequent ~~recognition/certification or accreditation systems, or both,~~ recognition/certificate systems that enable consumers, employers, organizational management, government agencies, and others who rely upon a skilled workforce to distinguish between qualified and non-qualified workers.

5.2.3 Recommend requirements that agencies can use to develop and document the specific criteria used for training or certificate programs.

5.3 Users of this guide shall document deviations from the recommended requirements to inform their clients of the criteria applied in either the training or the certificate programs offered. As the cannabis and hemp industries mature, this guide will be updated to reflect current thinking and requirements.

5.4 The Bok elements are applicable to certificate Programs, while the BoK, experiential and educational elements are applicable to certification process requirements.

6. Vocational Requirements for Analytical Laboratory Professionals within the ~~Cannabis/Hemp~~ cannabis and hemp Industries

6.1 The ~~vocations relative to analytical laboratory professionals within the cannabis/hemp industries~~ cannabis and hemp analytical laboratory-related professions are listed in Table 1. The general requirements, experience, education, and BoK for each ~~vocation~~profession are provided in the section ~~specified in~~ specified.~~Table 1.~~

6.2 The ~~vocation~~profession titles used in this ~~standard represent titles of the certifications. The certification~~ guide represent potential titles. The titles used are not intended to replace existing job ~~titles that~~titles, which fall under the ~~employing organization's purview.~~purview of the employing organization. The titles for the certificate and certification programs are determined by the administrating bodies.

7. Cannabis and Hemp Analytical Laboratory Professionals

7.1 ~~*Vocational Roles*~~*Professional Role* — ~~*Certified*~~ *Cannabis* ~~*Sampling Technician (CCST):*~~ *and Hemp Sampling Technician:*

7.1.1 The ~~CCST~~ Cannabis and Hemp Sampling Technician should:

7.1.1.1 Be a professional responsible for conducting routine pickups adhering to regulatory compliance guidelines for laboratory analysis of ~~cannabis/hemp~~ cannabis and hemp samples.

7.1.1.2 Record accurate sample and chain of custody documentation.

7.1.1.3 A ~~CCST~~ Cannabis and Hemp Sampling Technician should have current government-issued identification and be approved to drive motor vehicles as defined by qualifications imposed by local regional or governmental jurisdiction.

7.1.2 *Experience:*

7.1.2.1 A ~~CCST~~ Cannabis and Hemp Sampling Technician should have had at least one (1) year of experience working in the ~~cannabis/hemp~~ cannabis and hemp industries.

7.1.3 *Education:*

7.1.3.1 Candidates should have a minimum of a high school diploma or regional or governmental equivalent and demonstrated mathematical proficiency.

7.1.3.2 A diploma, record of apprenticeship, an associate's, or bachelor's degree in chemistry, biology, life sciences, environmental, horticulture, or a similar discipline is preferred but not required.

7.1.4 *Body of Knowledge (BoK):*

7.1.4.1 A ~~CCST~~ Cannabis and Hemp Sampling Technician should fulfill the minimum requirements for experience and education as articulated by this guide, or the governmental or regional jurisdictional entities, and demonstrate proficiency for the topics listed in the BoK as summarized in Table 2.

7.2 *~~Vocational Roles~~Professional Role — ~~Certified~~ Cannabis ~~Laboratory Technician (CCLT):~~ and Hemp Laboratory Technician:*

7.2.1 The ~~CCLT~~ Cannabis and Hemp Laboratory Technician is a professional who:

7.2.1.1 Performs routine and non-routine sample preparations, tests, and analyses using the appropriate equipment and instruments;

7.2.1.2 ~~Is able~~ Ability to receive samples and document data in laboratory electronic or paper-based sample tracking systems, if available;

7.2.1.3 ~~Is able~~ Ability to prepare samples for analyses;

7.2.1.4 ~~Is able~~ Ability to log data and results using a computer or paper tracking system;

7.2.1.5 ~~Is able~~ Ability to maintain laboratory equipment in proper working order,

TABLE 2 ~~Certified~~ Cannabis and Hemp Sampling Technician ~~(CCST) Body of Knowledge (BoK)~~(BoK)

~~1 Knowledge of cannabis business (processes and materials)~~	~~10 Time management~~
1 Cannabis and hemp business (processes and materials)	10 Time management
2 Assuring that appropriate lot numbers are recorded	11 Client relationship management
3 Representative random sampling and chain of custody	12 Seed-to-sale systems, if applicable
4 Sampling statistics and basic math	13 Conduct pickups as scheduled
~~5 Understand customer service relative to clients to be sampled~~	~~14 Secure transport protocol of all samples~~
5 Laboratory inventory and supplies control	14 Secure transport protocol of all samples
~~6 Best practices for collection of field data~~	~~15 Oral and written communication~~
6 Understand customer service relative to clients to be sampled	15 Oral and written communication
~~7 Good documentation practices~~	~~16 Maintenance of client confidentiality~~
7 Best practices for collection of field data	16 Maintenance of client confidentiality
~~8 Knowledge of effective cleaning and sanitation practices~~	~~17 Avoiding cross-contamination~~
8 Good documentation practices	17 Avoiding cross-contamination
~~9 Implementing sampling plans~~	~~18 Maintenance of sample integrity~~
9 Effective cleaning and sanitation practices	18 Maintenance of sample integrity
10 Familiarity with GACP	20 Food Safety Guidelines (SQF/GFSI/ICH/FDA, etc.)

7.2.1.6 ~~Is able~~ Ability to maintain a work environment that is kept clean, sanitized, and organized;

7.2.1.7 ~~Is able~~ Ability to practice safe work habits, including complying with all safety, health, and environmental rules and regulations.

7.2.1.8 ~~Is able~~ Ability to practice safe work habits, including complying with all safety, health, and environmental rules and regulations.

7.2.2 *Experience:*

7.2.2.1 The ~~CCLT~~ Cannabis and Hemp Laboratory Technician should have had at least one (1) year of experience working in the ~~cannabis/hemp~~ cannabis and hemp industries.

7.2.2.2 The ~~CCLT~~ Cannabis and Hemp Laboratory Technician should have at least one (1) year of analytical laboratory support experience in an environment ~~subjected~~subject to regulatory authorities and their associate procedures (as a full-time employee, apprentice, or intern).

7.2.3 *Education:*

7.2.3.1 Candidates should have ~~a minimum of a high school diploma or regional or governmental equivalent.~~an Associates Degree, a Bachelors degree in chemistry, microbiology, life sciences, environmental sciences, or equivalent certification from a completed apprenticeship or training program, or as dictated by the governing jurisdictional requirements.

7.2.3.2 A diploma, record of apprenticeship, or an associate's, or bachelor's degree, in chemistry, biology, life sciences, environmental, or a similar discipline is preferred but not required.

7.2.4 *Body of Knowledge (BoK):*

7.2.4.1 The ~~CCLT~~ Cannabis and Hemp Laboratory Technician should demonstrate the minimum requirements as related to experience, education, and noted proficiency in the BoK as summarized in Table 3.

7.3 ~~*Vocational Roles*~~ *ProfessionalRole* — ~~*Certified*~~ *Cannabis and Hemp Laboratory Analytical* ~~*Chemist (CCLAC):*~~ *Chemist:*

7.3.1 The ~~CCLAC is a professional~~Cannabis and Hemp Laboratory Analytical Chemist is an individual who, in addition to understanding the BoK of a certified laboratory ~~technician,~~ analytical chemist, is able to:

7.3.1.1 Be responsible for performing, documenting, record checking, and troubleshooting qualitative or quantitative assays on samples using techniques that vary from standard laboratory equipment to highly modern and automated instrumentation.

7.3.1.2 Participate in analytical laboratory quality control (QC) support such as cleaning verification, environmental monitoring, and providing process control related analyses; and

7.3.1.3 Demonstrate a general knowledge of the cannabis and hemp industry or other agriculturally based processes.

7.3.2 *Experience:*

TABLE 3 ~~Certified~~ Cannabis and Hemp Laboratory Technician ~~(CCLT)~~ Body of Knowledge (BoK)

~~1 Knowledge of cannabis business (processes and materials)~~	~~10 Quality management system (QMS) procedures and protocols~~
1 Cannabis and hemp business (processes and materials)	10 Quality management system (QMS) procedures and protocols
2 Sample preparation protocol	11 Sample storage and analyses recordkeeping
3 Sample logging into the existing tracking system	12 Oral and written communication
4 Equipment maintenance and calibration	13 Seed-to-sale system trackers
5 Laboratory inventory and supplies control	14 Occupational and sanitation protocols
6 Document control	15 Clerical laboratory protocols
7 Teamwork and collaboration	16 Cannabis and hemp laboratory analyses techniques
8 Laboratory safety best practices	17 Appropriate use of personal protective equipment (PPE)
9 Necessary data and data processing skills	18 Following established test methods

7.3.2.1 A ~~CCLAC~~ Cannabis and Hemp Laboratory Analytical Chemist should have had at least one (1) year of experience working in the ~~cannabis/hemp~~ cannabis and hemp industries.

7.3.2.2 Candidates should have (3) three years of on-the-job experience in one or more of the areas of the ~~CCLAC~~ Cannabis and Hemp Laboratory Analytical Chemist BoK.

7.3.2.3 The candidate should demonstrate proficiency in operating analytical instrumentation and practicing laboratory techniques (HPLC, GC, MS, advanced spectroscopy, LC, ICP, titrations, wet chemistry/physical testing, water testing, etc.) as required by the business.

7.3.2.4 The ~~Certified Cannabis~~ Cannabis and Hemp Laboratory Analytical Chemist should have a minimum of (1) one-year related experience in a quality control support function in a laboratory (as part of the experience set).

7.3.3 *Education:*

7.3.3.1 Candidates should have a Bachelor's degree in chemistry, microbiology, life sciences, environmental sciences, or other relevant science or an equivalent from a completed apprenticeship or training program, or as dictated by the governing jurisdictional requirements.

7.3.3.2 Applicants who have completed a higher education degree (in the fields of chemistry, biology, chemical engineering, mechanical engineering, horticulture, agronomy, and other scientific, manufacturing, or industrial disciplines from an accredited college, university or technical school, or apprentice program should have part of the experience requirements waived, as follows (only one of these waivers may be claimed):

(1) Diploma, associate degree, trade school, or apprenticeship program — one (1) year may be waived.

(2) Bachelor's degree or higher — two (2) years waived.

7.3.4 *Body of Knowledge (BoK):*

7.3.4.1 The ~~CCLACshould~~ Cannabis and Hemp Laboratory Analytical Chemist should demonstrate the minimum requirements as related to experience, education, and noted proficiency in the BoK as summarized in Table 4.

7.4 *Professional Role — Cannabis and Hemp Microbiologist:*

7.4.1 The Cannabis and Hemp Microbiologist is an individual who, in addition to understanding the BoK of a certified cannabis and hemp microbiologist, has the ability to:

7.4.1.1 Isolate and identify microbial organisms of interest by selective culture, biochemical testing, PCR, or other standard techniques.

7.4.1.2 Maintain important culture stocks of ATCC organisms and to properly store them for both short and long-term storage.

TABLE 4 ~~Certified~~ Cannabis and Hemp Laboratory Analytical Chemist ~~(CCLAC)~~ Body of Knowledge (BoK)

~~1 Knowledge of cannabis business (processes and materials)~~	~~15 Equipment and instrument setup~~
1 Cannabis and hemp business (processes and materials)	15 Equipment and instrument setup
2 Data evaluation and analysis	16 Data reporting protocol
3 Analytical techniques and instrumentation	17 Cannabis and hemp phytochemistry
4 Supporting quality control (QC) procedures	18 Sanitation verification/validation
5 Environmental monitoring (where applicable to roles)	19 Time management
6 Analytical assays	20 Troubleshooting laboratory instruments
7 Sanitation validation (as applicable to laboratory analytics)	21 Microbiological analyses
8 Written/verbal communication	22 Manage inventory supplies
9 Test method validation	23 Calibration management
~~10 Gauge R&R~~	~~24 Equipment qualification~~
10 Statistics and uncertainty	24 Equipment qualification
11 HPLC/GC/LC/MS/ICP	25 Inventory management
12 Preventative maintenance	26 Deviations
13 Hazardous chemical/waste handling	27 cGMP and ISO/IEC 17025:2017
14 Lab safety best practices	28 Use of personal protective equipment (PPE)
	29 Design of experiment (DOE)