



Quality Control/Quality Assurance Manual

ALPHA ENERGY LABORATORIES
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07/25/2018

Date

Owen Reese, Supervisor/Technical Director

07/25/2018

Date

Christina Henderson, QA Director

07/25/2018

Date

TABLE OF CONTENTS

Incorporation Statement	3
Support Documents Reference	4
Confidentiality & Business Termination	5
Quality Policy Statement	6
Introduction to QA/QC	7
Laboratory Layout & Facilities	8
Organization & Responsibilities	9
Approved Signatories	10
Organization Chart	11
Primary/Key Personnel Listing	12
Signature List	13
Laboratory & Data Audits	14
Data Integrity & Ethics	15
Integrity & Ethics Training	16
Ethics & Data Integrity Commitment	17
Corrective & Preventative Actions	18
Complaint Handling	19
Laboratory Training	20
Contracting Analytical/Other Services	21
New Projects	22
Deviations from SOP	23
Document Handling & Record Keeping	24
Data Handling	25
Data Review	26
Proficiency Testing & DOC	27
Radon Measurement Device	28
Radon Device Field Placement	29
Personal Monitoring	31
Sample Integrity/Acceptance	32
Backgrounds & Sources	33
Efficiencies	34
Duplicates & Blanks	35
Control Charts	36
Analytical Analysis of Radon	37
Radon Testing in Schools – General	40
Radon Testing in NJ Schools	44
Sample Disposal	46
Measurement Traceability	47
General Equipment Requirements	48
Balances	49
System Calibration	50
Appendix A – Calculations	
Appendix B – Info Card/COC, Report	
Appendix C – QAM Forms	

Incorporation Statement

Secretary of State 5/18/08 3:51 PAGE 2/3 RightFAX

Corporations Section
P.O.Box 13697
Austin, Texas 78711-3697



Roger Williams
Secretary of State

Office of the Secretary of State

The undersigned, as Secretary of State of Texas, does hereby certify that the document, Articles of Incorporation for ALPHA ENERGY LABORATORIES, INC (filing number: 67590200), a Domestic For-Profit Corporation, was filed in this office on October 17, 1983.

It is further certified that the entity status in Texas is in existence.

In testimony whereof, I have hereunto signed my name officially and caused to be impressed hereon the Seal of State at my office in Austin, Texas on May 16, 2006.



A handwritten signature in black ink that reads "Roger Williams".

Roger Williams
Secretary of State

Phone: (512) 463-5555
Prepared by: Sandy Henderson

Come visit us on the internet at <http://www.sos.state.tx.us/>
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Document: 129630110001

Supporting Documents for Alpha Energy's Standard Operating Procedures and Quality System

1. EPA Methods & Reference Documents:
 - a. EPA 402-R-92-003: *Protocols for Radon and Radon Decay Product Measurements in Homes*
 - b. EPA 402-R-92-004: *Indoor Radon and Radon Decay Product Measurement Device Protocols*
 - c. EPA 402-R-92-014: *Radon Measurement in Schools*
 - d. EPA 402-K-09-002: *Home Buyer's and Seller's Guide to Radon*
 - e. EPA 402-K-10-005: *Consumer's Guide to Radon Reduction*
 - f. EPA 402-K-12-002: *A Citizen's Guide to Radon*
 - g. EPA 520-1-86-014: *Interim Protocols for Screening and Follow-Up Radon and Radon Decay Product Measurements*
2. Current NELAC Quality Systems
3. EPA QA/G-5, or most recent release thereof.
4. EPA QA/G-7, or most recent release thereof.
5. HUD Multi-Family Development Radon Policies, most recent release.
6. AARST/ANSI *Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings* (MAMF-2012), or most recent release.
7. *Radon Mitigation Standards for Schools and Large Buildings* (RMS-LB 2014), or most recent release.
8. *Protocols for Measuring Radon and Radon Decay Products in School and Large Buildings* (MALB 2014), or most recent release.
9. *Testing for Radon in Child Care Centers* (NJ DEP Guidance Document), or most recent release.
10. *Mandatory Radon Testing Protocols* (FDOH DH\PI 150-334), or most recent release.
11. *Control of Radiation – Hazard Regulations: Radon* (Florida Administrative Code, Chapter 64E-5 Parts X, XI, and XII, 2015), or most recent release.

Statement of Confidentiality

Alpha Energy and its entire staff commit themselves to providing environmental services that meet the needs of our clients, comply with and satisfy EPA protocols and requirements, and keep pace with modern technologies and practices.

We use client data for many purposes including the determination of the presence, concentration, and movement of toxic materials in homes and in the environment. Results are used to determine the potential effects upon or protection required for human beings. We may use data to support broader based projects involved with site characterization and/or remediation for the health, safety, and protection of personnel and the public.

It is in our client's best interests that we maintain confidentiality between the laboratory and the client, except when an identified problem may adversely affect the health and safety of our personnel and the public at large.

In the Event of Company Termination

Should Alpha Energy cease business operations, management will send a written notice to all current and former clients with whom we have done business within the previous five years, and whose records we hold on file. The notice will specify that Alpha Energy will no longer accept test samples after a specified date. Customers that buy in bulk and distribute through their own channels will be responsible for finding alternative suppliers and analysis.

All information cards and test data is stored in an electronic format. All hard copies of client records will be destroyed, but the electronic versions will be stored according to the data storage time frame required by certifying authorities. The president of the company will be in charge of securing the data for storage.

In the Event of the Sale of the Company to another Party

Unless the new owner decides to conclude the radon analysis aspect of the laboratory, all records and information will pass to the new owner, and their staff will be responsible for complying with the requirements for continued certification and business operations.

If the new owner decides to conclude radon monitoring, the previous owner and management will make recommendations for the distribution and storage of data and insure that clients are fully entitled to their information.

Quality Policy Statement

Alpha Energy is committed to insuring the integrity of our data and meeting the quality needs of all of our clients. Alpha Energy Laboratories and its employees pledge to manage our business according to the following principals:

- 1) Alpha Energy will endeavor to create an environment that provides consistent high-quality data through integrity, honesty, and accountability at all levels of our operation, achieving this through dependable, well-trained, and courteous personnel.
- 2) We will strive to foster an atmosphere of personal responsibility and mutual respect, to ensure that our employees have an equitable environment of efficient communication between management and all employees.
- 3) We are dedicated to providing accurate and legally defensible data, while maintaining the confidentiality of our employees' and clients' information.
- 4) Alpha Energy Laboratories will only take on projects that we feel we have adequate equipment and staff to successfully complete.
- 5) Our lab will comply with all pertinent federal, state, and local regulations. We will also meet all the client's requirements for any work charged to our competency, and will do no less than deal openly, honestly, and fairly with all of our clients.
- 6) We will conduct our business on the principle that we will treat others as they would prefer to be treated.
- 7) We will maintain leadership, technical innovation, and proficiency that enhance the quality and value of our work.
- 8) We will endeavor to provide employees with guidelines and an understanding of the ethical and quality standards that they must uphold to maintain the integrity of our reputation and business.

All employees are required to read and sign that they understand the above statements and will strive to work in such a manner that they are achieved. The "Ethics and Data Integrity Commitment" is a document that will be maintained as a record of each employee's agreement to abide by the above values. The document also further outlines many of the specific responsibilities that our employees will maintain.

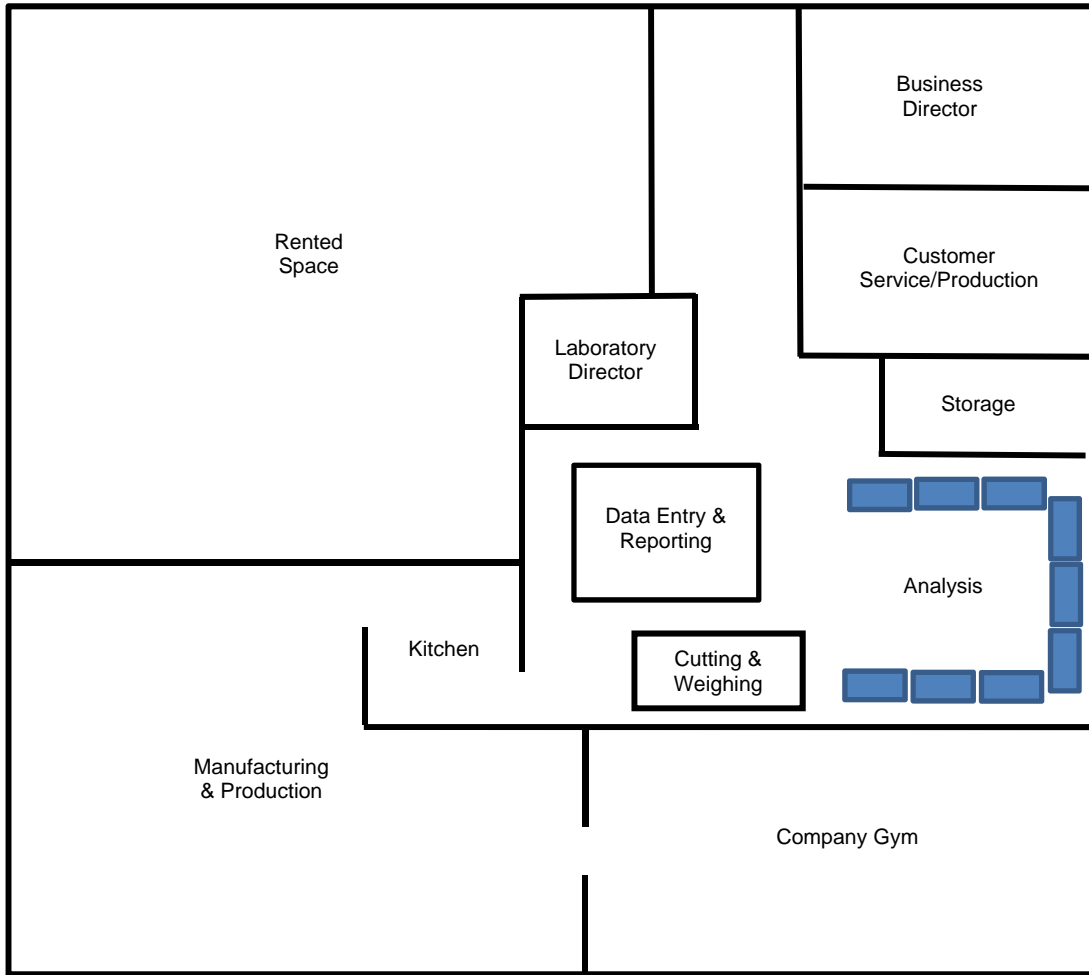
Introduction to Quality Assurance and Quality Control

This manual is a support document aimed at keeping the amount of variation from standard operating procedures during laboratory testing to a minimum, to meet specific requirements and guidelines. Although, it is impossible to measure a true value for every test performed, our goal is to reduce the random variation by setting quality control standards and monitoring them with quality assurance practices.

In order to deliver high quality data continually, we analyze each sample the same way using the same method, follow the same techniques learned throughout the extensive and continual training program, and strive to consistently produce accurate and precise data.

Each technician is responsible for performing QC procedures daily, unless otherwise necessary or noted in the SOPs. The QA Office periodically reviews technician actions and inspects all QC logs according to the schedule designated throughout the SOPs and QAM for missing data or discrepancies.

Laboratory Layout and Facilities



Organization and Responsibilities

The following are the personnel titles and general duties of all the positions at Alpha Energy Laboratories. Since Alpha Energy is a relatively small company, many personnel are cross-trained in various aspects of the lab. Many employees may be responsible for the duties of more than one position listed below, or can be designated for one or more of these positions. This is one reason we list many employees simply as “lab techs” on our organizational chart. This excludes the offices of Laboratory Director and QA Director, although both offices may assign deputy officers to assist in their duties in the event of an absence or heavy workload.

Management Objectives and Commitment

The Management of Alpha Energy has a goal to create an environment that stresses using correct laboratory practices and procedures to achieve the best accuracy and precision for the various tests that we perform. The Management commitment is to provide its employees with the tools and resources to achieve the above-mentioned goal.

Laboratory Personnel Identification and Minimum Education Requirements

Individuals involved with implementing procedures outlined in this QA/QC manual have the following duties and responsibilities:

Laboratory Specialist/Technical Director

The Laboratory Specialist is responsible for overseeing all aspects of the laboratory, manufacturing, and final review of all reports. He or she is also responsible for mediating complaints from clients and communicating problems that arise.

Education Requirements: Bachelor’s degree in a related science field with at least 2 years of experience in environmental analysis. A Master’s degree may substitute for 1 year of experience. (Exception: those designated as Technical Directors that qualify under the “grandfather” clause)

Radiation Safety Officer (RSO)

The RSO is responsible for monitoring the safe handling of radioactive sources and samples. He or she will assure that the sources are locked away daily in the proper location.

Education Requirements: Bachelor’s degree, technical degree plus 2 years of experience, or high school degree or GED equivalent plus 4 years of experience, or relevant certification in safety management and training.

QA Director, Manager, or Officer

The QA Manager is responsible for overseeing the quality system and its implementation as well as all QC procedures undertaken by the technicians; insures the proper training and technique of all lab personnel; is responsible for overseeing corrective actions, and for periodic lab and employee audits; reviews all logbooks and QC records to make sure they are correct and/or current, and he or she maintains and updates the quality manual and standard operating procedures.

Education Requirements: Bachelor’s degree, preferably in a related science field with at least 2 years of experience in environmental analysis. He or she must have exceptional organizational skills and attention to detail.

Laboratory Director

The Laboratory Director is responsible for logging in samples and creating the test specific identification numbers that correspond to each sample. He or she obtains lab supplies, including those for equipment and maintenance along with documentation for traceability. The Lab Director oversees technicians in the laboratory, raw data transcription to the database, and the processing, printing and compiling of all reports. He or she also monitors internal QC checks, proficiency testing, and general SOP adherence of lab staff.

Education Requirements: Bachelor's degree, technical degree plus 2 years of experience, or high school degree or GED equivalent plus 4 years of experience.

Laboratory Technicians

The Laboratory Technician is primarily responsible for aiding the Laboratory Director with their duties, which may include any or all of the above responsibilities.

Education Requirements: Enrolled in high school, high school graduate, or GED equivalent. College degree candidate preferred.

Customer Service & Shipping Manager

This position is responsible for answering and coordinating customer phone calls, orders, or complaints. He or she oversees final kit preparation steps, taking and fulfilling customer orders, and also oversees temporary or seasonal technicians that assist in the duties mentioned above.

Education Requirements: Bachelor's degree, technical degree, high school degree, or GED equivalent. Customer service and some personnel management experience preferred.

Office Manager (Accounting)

The Office Manager is responsible for binding, copying, filing, and mailing completed reports to the clients; handles all payroll, accounts payable, and accounts receivable.

Education Requirements: Bachelor's degree, technical degree, high school degree, or GED equivalent. Accounting experience and customer service experience preferred.

Approved Signatories

Carla Earley – Laboratory Director

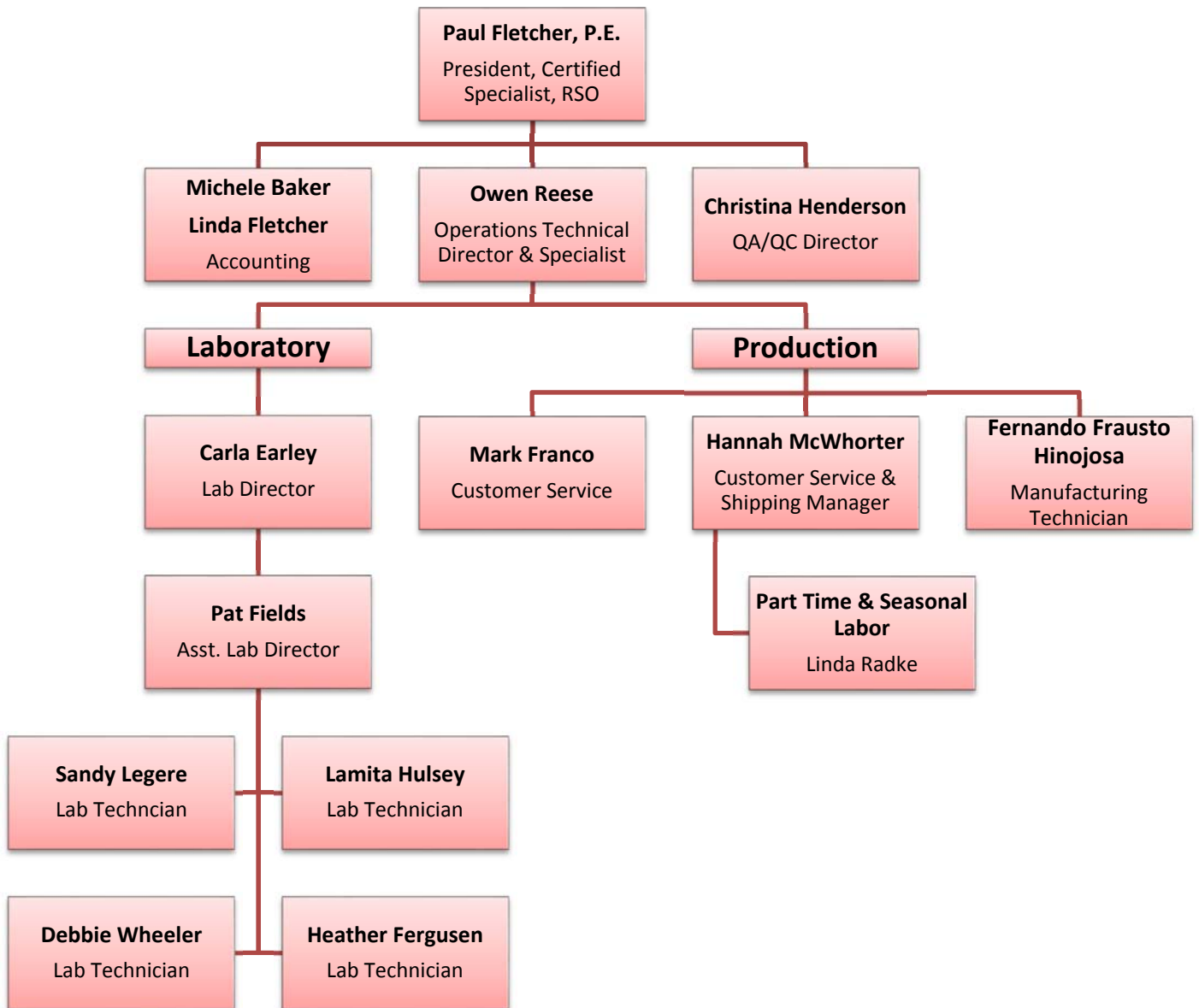
Paul Fletcher – Specialist/RSO/President

Christina Henderson – QA Director

Owen Reese – Operations Technical Director/Specialist

Organization Chart

All analyses are conducted by Alpha Energy Laboratories, a division of Enviro Sciences, Inc., which is located at 2501 Mayes Rd, Suite 100, Carrollton, Texas 75006.



Primary/Key Personnel Listing

Paul Fletcher, President (Owner), Certified Radon Specialist, & RSO

Education: B.S. Degree in Petroleum Engineering, Texas A&M University

Experience: Over 20 years of experience in engineering and research, over 10 years radon and laboratory operations experience

Owen Reese, Operations Technical Director & Specialist

Education: B.S. Texas A&M University

Experience: Over 5 years of radiochemistry laboratory and management experience

Carla Earley, Laboratory Director

Experience: Over 10 years of radon laboratory experience

Christina Henderson, Quality Assurance & Quality Control Director

Education: M.S. University of North Texas

Experience: Over 15 years of experience in laboratory quality assurance & control

Signature List

Objectives

Provide a current and historical listing of employee signatures and initials.

Attaining Objectives (Refer to SOP 3.7)

The following objectives are the duties of the QA Officer or Laboratory Director

1. The QA Office will maintain an alphabetically organized employee signature and initial list.
2. New employees must sign the signature list within the first week of employment.
3. The QA Office will update the signature list every three years for all employees.
4. The list will also include electronically applied signatures or signature stamps (if applicable) for reference.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Laboratory Director will review the QA Office on an annual basis for discrepancies.
- ✚ If the Laboratory Director finds discrepancies, the QA Office will be reviewed and possibly replaced.

Laboratory Audits and Data Audits of Quality Control Logs

Objectives

- ✚ To reflect the procedures followed and the documentation requirements for routine laboratory audits and data audits of the quality control logs by the Quality Assurance personnel (QA).

Procedures (Refer to SOP 3.6)

1. Quality Control Logs – audited quarterly by QA and monitored by the QA Office
 - a. To make sure that the technicians are filling out and filing QC data logs, the following QC records will be reviewed approximately once a quarter (or may be reviewed during random checks):
 - ✚ Backgrounds & Sources
 - ✚ Efficiencies
 - ✚ Mail Log
 - ✚ Balances
 - ✚ Proficiency Testing
 - ✚ Blanks
 - ✚ Duplicates
 - ✚ Moisture QC
 - ✚ Manufacturing
2. Laboratory Inspections
 - a. At any time during a scheduled workday, the QA Office may perform in-lab inspections of the technicians and/or procedures to compare the approved standard operating procedure and required regulations with the actual procedure performed in the lab.
 - b. The QA Office will attempt to perform at least one lab inspection per quarter.
3. Personnel Audits
 - a. The QA Office will audit the laboratory on an annual basis and document the results. The audit could include verbal, written, observational, or other forms of testing over standard procedures.
 - b. New employees will be monitored/inspected quarterly for the first year of employment, and annually thereafter. A training log will be kept on their progress.
 - c. The QA Office will maintain an internal file for each employee that will contain the employee's audits, reviews, and training records.
 - d. The QA Office will also keep documentation of any corrective actions taken pertaining to the QA/QC in this manual; any CA involving an employee will also be documented by the QA Office in the employee's file.
4. Reports to Management
 - a. The findings from the above audits and inspections will be reported to management. If the QA Office deems the finding critical and needs immediate action, they may immediately verbally inform management prior to giving management the regular report.
5. Managerial audits will occur on an annual basis.

Data Integrity and Ethics

Objectives

- ✚ Assure valid data of known and documented quality.
- ✚ Include signed and dated integrity training documentation for all laboratory employees.
- ✚ Insure periodic monitoring of actual data integrity and documented data integrity procedures.
- ✚ Insure that monitoring tools are used to prevent and discourage unethical practices.
- ✚ Provide tools to employees for reporting unethical behavior.

Attaining Objectives

1. Managers uphold standards by supporting and enforcing data integrity procedures and by signing and dating the data integrity procedure training forms.
2. Management annually reviews and updates data integrity procedures and evidence of inappropriate actions through regularly scheduled internal audits. Management also monitors the procedures periodically through in-depth data review, records review, or other thorough check processes.
3. The mechanism for confidential reporting of ethics and data integrity issues includes unrestricted access to senior management, an assurance that personnel will not be treated unfairly for reporting instances of ethics and data integrity breaches, and anonymous reporting
4. Through training and review of quality system documents, employees understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to serious consequences such as immediate termination or civil/criminal prosecution.
5. Any potential data integrity issue is handled confidentially until a follow-up evaluation, full investigation, or other appropriate actions have been completed and the issues clarified. Inappropriate activities are documented, including disciplinary actions, corrective actions, and notifications to clients, if applicable.
6. Any determination for a detailed investigation of data integrity issues must be communicated to senior management. Allegations are investigated and remain confidential to the extent necessary.
7. All employees must attend data integrity training upon hire and annually thereafter.
8. All staff must attend the initial data integrity training and the annual refresher course and sign the attendance sheet (if held as a general lab meeting) and ethics agreement. This demonstrates that all staff members have participated and understand their data integrity obligations.
9. Senior management signs and dates data integrity training records.
10. Management insures that contracted technical or support personnel, when used, are trained to the laboratory's quality system and data integrity procedures, competent to perform the assigned tasks, and appropriately supervised.
11. Ongoing monitoring of data integrity will include random periodic review of test data from receipt to reporting, throughout the testing system. Additional periodic blind samples may also be used to verify data integrity within the laboratory.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ If a discrepancy is discovered, but not documented, the corresponding technician will be reprimanded and asked to document any deviations pending final approval.
- ✚ Without sufficient documentation and reasoning, a test may be determined invalid, and re-testing at the lab's expense will occur.

Integrity/Ethics Training

Objectives

- ✚ Insure that all employees are trained in their ethical responsibilities

Attaining Objectives

These objectives are the duties of Lab Management.

Employee integrity and ethics training will include:

- ✚ The organizational need for truthfulness and full disclosure in all analytical reporting
- ✚ How and when to report data integrity issues
- ✚ Record keeping
- ✚ Discussion regarding all data integrity procedures
- ✚ Data integrity training documentation
- ✚ In-depth data monitoring
- ✚ Data integrity procedure documentation
- ✚ Improper data manipulations
- ✚ Adjustments of instrument time clocks
- ✚ Inappropriate changes in concentrations of standards
- ✚ The importance of proper written narration on the part of the analyst with respect to those cases where analytical data may be useful, but are in one sense or another partially deficient
- ✚ Written ethics agreements
- ✚ Examples of improper practices

Quality Assurance and Countermeasures for Non-Attainment

- ✚ If a discrepancy is discovered, but not documented, the corresponding technician will be reprimanded or face other potential consequences including termination or criminal prosecution.
- ✚ Follow-up with any reported activity through audit or investigation.
- ✚ Report any activities to the client that would affect the outcome of their work.

Ethics Policy and Data Integrity Commitment

I _____ (print name), state that I have read and understand the high ethical standards that I must uphold as an employee of Alpha Energy Laboratories. I am committed to performing my duties to the best of my ability while at the same time maintaining the level of integrity and quality of data for which our company is known. I further consent to hold all information pertaining to our clients' data completely confidential.

I agree that in the performance of my duties for Alpha Energy Laboratories and its clients, I shall strive to always conform to the following ethical standards and will report immediately to the Quality Assurance Office or an appropriate supervisor any information regarding the misrepresentation of data, or other inappropriate lab behavior that includes, but is not limited to:

1. Altering an instrument, computer, or clock for an inappropriate purpose.
2. Altering the contents of logbooks and/or datasheets to misrepresent data.
3. Forging or misrepresenting a technician's identity.
4. Changing raw data or reporting false or fake data.
5. Altering calibration procedures or standards to produce a certain result.
6. Failing to comply with standard operating procedures without proper documentation and approval.
7. Disposing of or deleting electronic data files or hard copies of raw data.
8. Engaging in any practice that ultimately misrepresents data or narratives in any way.
9. Failing to maintain client confidentiality.
10. Failing to report any observed violation of the above standards by fellow employees.

I will not knowingly participate in any of the above activities and will not tolerate such unethical practices by others. I also understand that confidentiality will be strictly enforced by Alpha Energy Laboratories in such matters. I am responsible for seeking approval to report data that may deviate from standard operating procedures or methods.

If I am unsure of how to handle data generated by me, I am responsible for seeking the advice and approval of the Quality Assurance Officer or supervisor. I agree to seek such information within 24 hours of the discovery.

I understand that if I knowingly participate in any unethical or prohibited activity that I am subject to disciplinary action that may include termination of my employment with Alpha Energy Laboratories, and that I may face individual prosecution from the appropriate authorities and possibly imprisonment.

My signature affirms my understanding of the consequences of violating this agreement as well as my commitment to its intent.

Employee Signature

Date

QA or TD Signature

Date

Corrective and Preventative Actions

Objectives

- ✚ Effectively link any deviation requiring corrective/preventative action to its origin.
- ✚ Thoroughly document corrective/preventative actions.
- ✚ Quickly communicate to the client all corrective actions that cast doubts on the accuracy of data.
- ✚ Effectively implement corrective/preventative actions and follow-up and evaluate these actions using the audit process.

Attaining Objectives (Refer to SOP 3.8)

The following objectives are the duties of all laboratory staff:

1. Identify problems, non-conformances, or incidents and document them as soon as possible along with the method of discovery and any associated dates or record numbers. Sources of discovery may include audits, staff observation, inspections, data trends, managerial review, etc.
2. Describe documented actions in detail so that it can be easily followed by an outside observer. Include relevant evidence, such as effects noticed or observations made, the data in question, etc., where applicable. The Lab Director or QA Office is then responsible for evaluating if the documentation is sufficient and will provide immediate response or initiate further root cause investigations.
3. Document and assign steps to be taken to collect additional data if further investigation is warranted to identify the root cause.
4. Analyze the resultant data from the investigation and develop an action plan and implementation scheme. Assign and record the action steps to take.
5. Review corrective actions at least annually during the internal audit process.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ Review actions periodically for completeness and traceability, at a minimum during internal audits and managerial review. If a discrepancy is discovered, the corresponding party will be reprimanded for non-conformance.
- ✚ Notify clients and appropriate authorities where required when test data may be called into question without sufficient documentation and reasoning.

Complaint Handling

Objectives

- ✚ Insure complaints are received and handled in a courteous and professional manner to the client's satisfaction.

Attaining Objectives (Refer to SOP 3.9)

The following objectives are the duties of all laboratory staff:

1. Complaints, when they occur, typically go through the employee who takes the call or receives the mail. Most complaints are received verbally and are handled over the phone.
2. Technicians are encouraged and empowered to courteously listen to grievances and determine if he or she can rectify the situation by him or herself. The problem could be a simple reporting error in a document or a missing test time.
3. Complaints that will require investigation time or other measures should be documented as completely as possible in the customer service database.
4. If the technician is unsure about a solution or feels they cannot adequately handle the problem themselves, they will record as much information that the client is willing to disclose then report it to the Lab Director or QA Officer. If the Lab Director or QA Officer cannot handle the complaint right away, then the information will be added to the record and referred to the Technical Director or Specialist.
5. Alpha Energy takes the following actions to minimize complaints:
 - a. Log and run mail daily whenever feasible.
 - b. Provide free replacement kits for postal errors or in some cases, client handling errors.
 - c. Provide multiple means for obtaining sample results.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ Management will reprimand the employee(s) responsible if complaints are not being addressed or recorded correctly.

Training

Objectives

- ✚ Insure that employees are adequately trained for their respective lab tasks.
- ✚ Monitor employees continuously to keep skills current and identify any area(s) that require retraining.

Attaining Objectives (Refer to SOP 3.7)

These objectives are the duties of the QAO, Lab Director, or assigned training mentors:

1. The QA Office trains or assigns new employees a training mentor. Mentors must be classified as veteran employees and must be already certified to perform the task to be trained. The QA Office maintains training records. The QAO will confer with the mentor/trainer during the training process to ascertain proficiency. The Technical Director must certify that the employee is allowed to perform the assigned task and has final authority.
2. The QA Office audits new employees once a quarter for at least the first year of employment.
3. In addition to annual DOC for test methods, new employees must demonstrate capability upon hire.
4. Veteran employees are individually audited annually, through DOC, or through inspection.
5. Audit records are maintained for each employee and the unit as a whole. Non-conformances and required corrective actions are documented separately unless the QAO or Lab Director determines immediate corrective action is applicable.
6. Veteran employees must review applicable procedures and SOP documents for any areas identified for retraining.
7. Lab and training meetings will cover new SOPs and procedure revisions.
8. If corrective action is required, reference the handling of corrective actions above.
9. Records of worker radiation safety training and annual refresher courses shall be maintained by the business during and at least one year after the employee terminates his or her employment. These records shall include date of training, instructor, length of session, and topics covered

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The QAO will monitor the employee using previous audits to insure continued compliance.

Contracting Analytical and Other Services

Objectives

- ✚ Insure that any contracted laboratory used by Alpha Energy has adequate facilities, methodology, standards, and traceability to perform the analysis required.
- ✚ Insure that any other contracted service, such as shipping companies, couriers, or sub-contracting, can make certain that delivery times, handling, and adequate services are rendered.

Attaining Objectives

The following objectives are the duties of the Technical or Lab Director:

1. The Lab Director or Business Director will contract with other laboratories and request proper disclosure of their certifications, methodology, services, and traceability and will determine if Alpha Energy's needs and standards are met before conducting any business with proposed laboratories.
2. The Lab Director or Business Director will contract with shipping companies such as FedEx, UPS, and intermediate couriers where necessary, provided sample delivery times are met and samples are handled with care and precaution.
3. The same care and consideration will be taken with any other sub-contracted work.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Technical Director will determine the best course of action when considering a contracted service.
- ✚ The Technical Director may file complaints and seek a new service if standards are not met.

New Projects

Objectives

- ✚ Review all new work so that requirements are clearly defined to ensure that the laboratory has adequate resources (time, equipment, supplies, and personnel), accreditations, and capabilities applicable to the customer's needs.
- ✚ Insure that all work receives adequate attention without shortcuts that may compromise data quality.

Attaining Objectives

The following objectives are the duties of all lab staff:

1. Contracts for new work may be in the form of formal bids, signed documents, verbal, or electronic communication.
2. Any employee can accept new work for routine radon test kits that fall under our current methods (Short term, Long term, Radon in Water).
3. The QA Office, Lab Director, or Technical Director reviews the project specifications and confirms if the laboratory has the required certifications, that it can meet the client's data quality and reporting requirements, and that the lab has the capacity to meet the client's turnaround time needs.
4. The Lab Director, QA Office, or Technical Director must review projects that fall under our scope of capabilities but have a new protocol before accepting the project. Once the laboratory accepts the project, the client receives a quote for the cost of services.
5. For new, complex, or large projects, the Lab Director or Technical Director must gather the necessary staff to evaluate the following:
 - a. Contractual obligations, bonding issues, and payment terms
 - b. Method capabilities, reporting limits, and quality control limits
 - c. Turnaround time feasibility
 - d. QA/QC issues, including certification and accreditation
 - e. Formal laboratory quote
 - f. Final report formatting and electronically deliverable documents
 - g. Time required to keep the sample in-house
 - h. Final sample disposal requirements

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director or Technical Director has final say on a project's feasibility. The lab maintains pertinent records for every contract or work request (for projects other than routine radon tests) including pertinent discussions with a client relating to the client's requirements or the results of the work during the period of the contract's execution.
- ✚ The Lab Director maintains copies of all signed contracts.

Deviation from Standard Operating Procedures

Objectives

- ✚ Insure that any deviation is well documented.
- ✚ Insure that deviations only occur where absolutely necessary or for valid, defensible reasons.
- ✚ Insure that all explanations for deviations are communicated to the appropriate authority and to the client.

Attaining Objectives

The following objectives are the duties of all laboratory staff:

1. Technicians must document any deviation in testing procedures on the information card or mailer, or in the designated space in the test database. Approval will be sought from a supervisor before any course of action is taken.
2. All documented deviations must be reported to the QA Office or Lab Director before a report issued.
3. The Lab Director or QA Office will determine if the documentation is sufficient to properly explain the necessity of the deviation.
4. If uncertainty remains as to the validity of the data consultation with appropriate state representatives will be sought, if applicable, or the test will be invalidated and the customer contacted and possibly offered a replacement test kit.
5. If not required before hand, issued reports will have a disclaimer notifying customer of the deviation in the report and be made aware of any other changes in reporting that must result.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ If a discrepancy is discovered, but not documented, the corresponding technician will be reprimanded and asked to document any deviations pending final approval.
- ✚ Without sufficient documentation and reasoning, a test may be determined invalid and re-testing at the lab's expense will occur.
- ✚ If sufficient reasoning is documented, the final reporting authority may still rule data invalid and demand re-testing.
- ✚ Data that is reported with undocumented deviations may be ruled as falsifying records and could result in an employee's termination in violation of our ethical policy and/or other legal repercussions.

Document Handling & Record Keeping

Objectives

- ✚ Insure that logbooks, SOPs, the QA/QC manual, reports, and other pertinent internal documentation are maintained and secure.

Attaining Objectives

The following objectives are the duties of the QA Officer and Lab Director:

1. The QA Office maintains all logbooks not kept near the designated workstation and maintains a record of the location of each logbook. The QA Officer audits all logbooks according to the frequency established in the QA/QC plan.
2. The QA Office maintains individual employee audit and training information in employee files.
3. Annual training records for refresher courses and safety records are kept in a training binder in the QA Office.
4. In order to insure all copies are current, individual copies of SOP's are made only with the approval of the QA Office. Old copies must be returned or discarded before new, updated copies are released.
5. Individual report document handling is discussed in the relevant Quality Control section of this manual. Refer to this section for procedures on the handling of report documents.
6. The Lab Director maintains and tracks proficiency testing documentation.
7. QC Data that is not current but not stored electronically, and is also less than 5 years old, is clearly separated, filed, and placed into storage on the premises and labeled by year for easy access.
8. Data that is outdated is discarded. Hard data is shredded and discarded and electronic data is purged, though electronic data may be kept for longer than five years, if space allows.
9. Computer stored data is backed up daily on the premises and weekly offsite.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ Computer login names and passwords are used for security purposes to prevent entry into our systems.
- ✚ The main server system, which holds all of our files, is kept in a secured room to which only management has access. This room remains locked during business hours unless maintenance is required. The main server is also protected by a firewall and daily back up.
- ✚ The Laboratory Specialist or Technical Director is responsible for maintaining records and insuring that back-ups occur as scheduled.
- ✚ The QA Office is responsible for keeping copies of documentation current for SOP and QA.

Data Handling

Objectives

- ✚ Make sure information sheets and other pertinent test information is filed into the storage location for awaiting data entry as well as disposal.
- ✚ Insure data transcription from information cards/sheets or data sheets to the computer database is accurate and that all data is analyzed following the recommended EPA protocol.

Attaining Objectives (Refer to SOP 2.5)

The following objectives are the duties of all laboratory staff:

1. Upon completion of analysis, technicians review information cards or data sheets for possible errors. If an error or question concerning word clarity arises, a second technician will be sought. If the error has no precedence, the Lab Director will be told and will help resolve the matter.
2. Following data entry, the Lab Director will examine a percentage of the reports for accuracy and completeness.
3. If errors are discovered, the necessary corrections are made prior to distribution to the client.
4. If an error is discovered after the report has been sent to the client, the appropriate revision procedures will be followed.
5. Analytical software and calculations used to generate test results are based on EPA approved methods.
6. If a hard copy is required, the report will be sent via domestic courier or postal service.
7. Electronic reports are sent to a client-specified email address or fax number in a file format to deter data tampering. The emails and faxes are sent through an encrypted contract service. A computer disk copy is also saved, and all data is backed up daily and offsite weekly.
8. The Lab Director or designated technician checks for undeliverable emails and reports not sent at least weekly. If an email address or fax cannot be used, a hard copy will be mailed.
9. Clients may also obtain their results via the internet, using our secure website. Each customer has instructions for using unique login information to access their specific test kit data.
10. When requesting results, the client MUST have their Kit ID number for a technician to release or change any test information.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Specialist or Technical Director is responsible for overseeing the general security of the test data, laboratory email services, and website features.
- ✚ The Lab Director or QA Office is responsible for insuring that technicians are properly trained on reporting procedures.
- ✚ If excessive mistakes are found, or similar mistakes continually occur, the QA Office will review the procedures of the data entry personnel and retrain if necessary.
- ✚ If security and confidentiality of reports cannot be achieved, the electronic submittal of documents must be reviewed and possibly terminated.

Data Review

Objectives

- ✚ Insure raw data contains no discrepancies or inconsistencies when analysis is completed.
- ✚ Insure that data entry technicians enter all data correctly so that it matches the raw data sheets.

Attaining Objectives

The following objectives are the duties of the Lab Director and data entry technicians:

1. After analysis is completed, insure that the radon measurement (counts) data makes sense.
2. When performing data entry, examine the information cards for completeness and accuracy.
3. Prior to submission to the client, a percentage of standard report documents are reviewed for accuracy.
4. All completed reports for New Jersey are given to the Lab Specialist for review before information is released to the client.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ Should the Lab Director or QA Office consistently find the same types of errors, the error will be reviewed with the technician and recorded on the employee audit record.
- ✚ If the problems continue, the technician will be re-trained or face dismissal.

Proficiency Testing and Demonstration of Capability

Objectives

- ✚ Insure that blind proficiency test results are submitted on time and performed at least annually.
- ✚ Insure that monthly spike samples are performed in a timely manner.
- ✚ Insure all proficiency testing is carried out within the confines of the quality control system and in accordance with all current SOPs and EPA methodology.
- ✚ Make sure accurate records are retained for review by accrediting authorities, clients, and the EPA.
- ✚ Insure that standards for proficiency testing are only ordered from certified providers.

Attaining Objectives

The following objectives are the duties of all laboratory staff:

1. At the start of each monthly spike study, the Lab Director assigns the analysis to a lab technician, insuring that each technician handles the task at least annually for demonstration of capability. Annual blind studies are handled by whichever technician is running analysis at the time of receipt.
2. All spike and blind PT test kits are logged and processed as any other test, with the exception of running the samples on different shields and detectors to span the analysis system.
3. The Lab Director oversees all proficiency testing in the lab. The QA Office observes that accurate testing procedures and quality control measures are followed.
4. Once the lab analyzes the test kits, a report is generated and given to the Lab Specialist for review.
5. The Lab Specialist is also responsible for transferring blind PT data to the Provider's data reporting forms for evaluation.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director oversees the general progression of the study while the QA Office insures that personnel are properly trained on all aspects of the study that pertain to their work.
- ✚ If any of the testing endpoints do not match the criteria for the study, a corrective action response may be necessary and re-testing may be required.

Radon Measurement Device Production

Objectives

- ✚ Insure that the charcoal adsorption test kit is designed so that it will effectively collect representative samples of radon in air.
- ✚ Provide systems for insuring results are related to a single measurement device.
- ✚ Adequately provide instructions that limit improper use and sample tampering and provide adequate information for reporting results.

Attaining Objectives (Refer to SOP 1.1)

The following objectives are the duties of all laboratory staff:

1. Summary: Plastic sampler trays uniquely stickered and are filled with a preset amount of charcoal. A radon permeable paper backing is then applied and the kit is pre-weighed and sealed into an airtight plastic bag.
2. Description of Measurement Device

Alpha Designation	EPA Designation
Radon Sampler Tray	AC--AD004--Alpha Energy Labs Tray RD 1

3. The Radon Sampler Tray consists of a rectangular plastic tray with a cavity that is approximately 4.25 inches long, 3.5 inches wide, and 0.625 inches deep. The tray is filled with approximately 40 grams of activated charcoal and the open side of the tray is then closed with a heat-sealable paper lid stock, which is permeable to radon.
4. Only fill the test kit with high quality, low moisture, activated charcoal. Measure the moisture content of at least one percent of the kits as they are produced.
5. Insure that the charcoal provider can deliver a certificate of analysis for monitoring quality or an alternate means of insuring quality, if a COA is not available.
6. The charcoal-filled tray is referred to as a Radon Sampler Tray.
7. The Radon Sampler Tray has a printed, stickered, unique and unduplicated identification number and is inserted into a plastic bag, which is then heat-sealed. The purpose of the plastic bag is to prevent exposure of the charcoal to radon or water prior to deployment.
8. Include an information card and adequate instructions with each kit to serve as the chain of custody (See Appendix A).
9. A special foil-lined Return Mailer envelope is also provided along with a test kit information card to help prevent additional environmental exposure during shipment prior to analysis.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Technical Director or Laboratory Specialist oversees the production of our measurement devices, vets suppliers of activated charcoal and other test kit materials.
- ✚ The Technical Director with input from the Lab Specialist, periodically reviews and updates the information card and instructions to provide clarification or a new design that produces better transcription results.

Field Deployment of Short Term Measurement Devices

Objectives

- ✚ Properly deploy short term radon measurement devices to insure good results in accordance with EPA, ANSI/AARST/HUD, and/or state specific protocols (ie. FDOH requirements in DH/PI 150-334, or the most current release).

Attaining Objectives (Refer to SOP 1.6)

The following objectives are the duties of any designated field personnel or customer:

1. Summary: If required, technicians place charcoal kits into test locations according to proper placement guidelines. They are run for the specified time, retrieved, and returned to the lab for analysis.
2. Always measure the lowest livable area of a dwelling or the designated useable space required by the client.
3. Only measure under “closed house conditions,” where all windows and doors should be closed for at least 12 hours prior to the start of the test (except for normal entry and exit) and should be kept closed as much as possible throughout the test duration. Fans and ventilation systems that use outside air should be turned off during the testing period and any forced air heating and cooling fan systems should not have the fan running continuously unless there is no way to turn them off.
4. Sampling should be done during periods of calm weather, avoiding high winds (>30mph), rain, heavy snow, and thunderstorms.
5. If performing a follow-up test, perform the test in the same test location as the previous test and follow the conditions above.
6. Places that should not be used as test locations:
 - a. Any place subject to constantly moving air, such as near a fan or a heating or air conditioner register.
 - b. Anywhere the kit may get wet.
 - c. In direct sunlight or near a heat source or gas appliance.
 - d. Avoid kitchens, laundry rooms, bathrooms, root cellars, a garage, crawl space, or sump, or other high humidity areas.
7. When placing the test kit, do not place the kit on the floor, near windows or doors.
8. Start the Test as Follows:
 - a. Remove the Radon Sampler from the plastic bag. Be careful not to tear, puncture or remove the paper backing from the Radon Sampler.
 - b. Lay the Radon Sampler on a flat horizontal surface in the test location at least 20 inches above the floor (30 inches where practical) and at least 4 inches from other objects. Do not disturb the sampler during the measurement period. **Radon Sampler Trays must be placed such that the side marked THIS SIDE MUST FACE UP DURING TESTING is facing upward.**
 - c. The Radon Sampler should be placed a minimum of 3 feet from windows, doors, or other potential openings in any exterior wall. If an exterior wall contains no windows, doors, or other potential openings, then the Radon Sampler should be placed between 2 feet and 6 feet about the floor, at least 1 foot away from walls and away from corners.
 - d. If a Radon Sampler is suspended from a ceiling or other overhead object, it should be at an appropriate distance from the floor to measure the radon concentration in the general breathing zone. The optimal height for placement is 6 to 8 feet from the floor according to the EPA.
 - e. Record the start time and date and the test location on the Test Information Card.

Field Deployment of Short Term Measurement Devices (Cont.)

- f. In addition, record the serial number from the Radon Sampler and the test location on the inset received with the Radon Sampler. Save this insert until you receive your test results.
9. Stop the Test After 2 Days (48 hours, and no longer than 96 hours) as follows:
 - a. Record the stop time and date, and all other requested information on the Test Information Card.
 - b. Immediately place the Radon Sampler and Test Information Card in the Return Mailer envelope and seal the envelope using the self-adhesive strip as explained on the back of the return envelope. As an additional precaution, tape the Return Mailer envelope shut.
 - c. Place the correct amount of postage on the Return Mailer envelope and mail within 24 hours for evaluation. The results are reported within approximately three weeks, unless expedited services are purchased.
 - d. Please Note: Although valid test results can be obtained with this Radon Sampler when it has been exposed in dry, low-humidity environments for either 2 or 4 days (48 or 96 hours) an exposure period of 2 days (48 hours) is recommended.
 - i. Charcoal adsorbs water from the air along with radon. If it adsorbs too much water, the test results will be invalid. The longer the exposure period, the more water is adsorbed. By limiting the test period to 2 days, the effect of water adsorption is usually acceptable, even in high humidity environments such as basement areas.
10. Results are interpreted according to the most recent edition of the EPA Protocols for Radon and Radon Decay Product Measurements in Homes.
11. If you are testing in a real estate transaction and require results quickly, the EPA recommends the following short-term testing options.
 - a. Option 1: Sequential Testing: Conduct an initial test for at least 48 hours. After the first test has been completed, conduct a follow-up test for at least 48 hours.
 - b. Option 2: Simultaneous Testing: Conduct two tests at the same time in the same location for at least 48 hours. Results of both individual kits are reported along with the average of the two test kits.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ Prior to dispatching assigned field personnel, the Lab Director or Lab Specialist thoroughly discusses sampling requirements with personnel responsible for sampling.
- ✚ The QA Office/Lab Director or Specialist reviews the test documentation and procedures. If objectives are not met, the sample is certified as invalid, and new sample must be collected.
- ✚ If field personnel continuously fail to follow correct procedures, retraining may be required or he or she may face dismissal.

Personal Radon Exposure Monitoring

Objectives

- ✚ Track radiological exposure for workers deploying test kits in the field.
- ✚ Insure that exposure does not exceed one working level per year, or take adequate protective measures to reduce or prevent overexposure.
- ✚ Wear long term passive device monitors during the entire exposure period and track the exposure quarterly.
- ✚ Maintain accurate records of time on and off testing sites and retain these for review by accrediting authorities, clients, and the EPA.

Attaining Objectives

The following objectives are the duties of all laboratory staff:

1. Laboratory management will assign a unique long-term passive monitor to any employee that must risk exposure by deploying test kits in the field.
2. Field deployment personnel must wear their assigned device and log their time in and out of sites where they are deploying field test kits.
3. Employees must insure that their passive monitor is sealed to prevent ambient exposure between deployments.
4. Laboratory management will collect and send the passive monitor in for analysis on a quarterly basis (provided any field deployments were done during the monitoring period).
5. Device results will be analyzed per employee to determine their level of exposure and calculated according to the formula below:
 - $WLM \text{ per year} = (\text{Exposure (WL)} * \text{Hours Exposed Per Year}) / (\text{Hours Per Month})$

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The RSO or Specialist must notify any employee found with elevated rates of exposure and efforts will be taken immediately to reduce their exposure to acceptable levels by limiting time spent in risk associated locations. Reassignment of tasks may be required.

Sample Integrity/Sample Acceptance

Objectives



To insure that sample integrity is maintained from the time of sample collection through analysis.

Attaining Objectives

The following objectives are the duties of the all lab technicians:

1. Every kit sent to or purchased by clients contains a copy of the testing instructions (See Appendix A).
2. Upon receipt, any signs of tampering or improper sampling procedures, expired transit time, or other various sampling discrepancies are recorded. The client is notified of errors, proper procedures are reiterated.
3. A test kit will be considered invalid and the client notified if any of the following occur:
 - a. The Radon Sampler Tray has been intentionally damaged by the customer, resulting in the loss of charcoal. If the damage seems to have been done in transit, the final weight of the kit and the initial weight of the kit at manufacture are compared for significant loss and determined case by case.
 - b. The Radon Sampler Tray was received by the laboratory more than 30 days after the termination of exposure. Note: After 12 days from the termination of exposure date (10-11 days of transit time), an estimated radon result is provided to clients. All other transit time results up to 30 days will be handled on a case by case basis for determining test validity. Most tests will likely be invalidated after 15-20 days of decay time.
 - c. The amount of moisture adsorbed during exposure exceeds 25% moisture by weight (about 11.7 grams). At 20% moisture by weight (approximately 10 grams), a warning will be issued with the result.
 - d. If the Lower Limit of Detection (LLD) is higher than the measured result for tests that are greater than 4.0 pCi/L.
 - e. The test was either over or under exposed, meaning the customer did not follow the test exposure time requirements per the provided testing instructions.
4. Replacement kits are offered to customers for all invalid tests except those that are considered intentionally damaged or invalid due to the exposure time.

Quality Assurance and Countermeasures for Non-Attainment

-  Any signs of tampering, expired transit times or sampling discrepancies are documented and invalidated if necessary. The client is notified if the test is invalidated and that another sample must be collected.
-  If SOP procedures are not followed by lab personnel, the QA Officer and Lab Director review proper procedures with technicians as necessary. This is in addition to annual review of lab personnel's adherence to SOP procedures by the QA department.

Backgrounds and Sources

Objectives

- ✚ Perform baseline calibrations on the radon shields daily or prior to any analysis
- ✚ Maintain current control charts to insure detector performance and response is within acceptable limits

Attaining Objectives (Refer to SOP Section 3.1)

The following objectives are the duties of all laboratory technicians:

1. Every day that kits are to be analyzed, designated background radon kits are put in their appropriate detector and counted. For example, the bag of one radon kit will be labeled Shield 2, Detector 3. It will be used strictly for Shield 2, Detector 3.
2. Place each background kit in the corresponding shield and detector. Run the backgrounds computer program on each bank of shields.
3. Record these background counts in the appropriate logbook. These values are compared to control charts that are generated and maintained on each detector. If a detector's background reading is not acceptable it will be marked as unusable until it can be verified as acceptable again. In addition to the logbook, the database for backgrounds will also issue a color coded message on the screen for detectors that have readings outside the control limits. Yellow is a warning and Red means the detector should be rechecked or marked out of service until the unit is demonstrated to be back in control.
4. Following backgrounds, known sources are run. There are four disc sources used. Only one shield can be tested with the sources at a time, leaving the backgrounds in all other detectors.
5. Place the sources in the shield to be run and initiate the sources computer program. Record these readings in the appropriate logbook. Continue until all banks of shields have sources run and recorded.
6. Compare the source readings to their corresponding control charts and use this second method of verification to determine if a detector can be used. If a detector is not to be used, it is clearly marked and the background kit physically left inside as further visual deterrence. In addition to the logbook, the database for sources will also issue a color coded message on the screen for detectors that have readings outside the control limits. Yellow is a warning and Red means the detector should be rechecked or marked out of service until the unit is demonstrated to be back in control. Excluded detectors are also electronically hidden to add a prevention measure for accidentally running or scanning a test kit inside.
7. This data is maintained electronically.
8. Backgrounds must also be rerun any time a detector reaches 20 samples analyzed. These reruns will also be recorded in the logbook.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director reviews the backgrounds and sources logbook at least weekly.
- ✚ If a detector is found to have been out of control during measurement, the Laboratory Specialist will be consulted to determine the extent of the deviation and any effect on test results.
- ✚ If test results are determined to have been adversely affected, the results will be invalidated, the client will be notified and retesting at the laboratory's expense will occur.

Efficiencies

Objectives

- ✚ Perform baseline calibrations on the radon shields monthly using a certified known radon source.
- ✚ Maintain current control charts to insure detector performance is within acceptable limits

Attaining Objectives (Refer to SOP Section 3.4)

The following objectives are the duties of all laboratory technicians:

1. Each month, after backgrounds have been run at least once, each detector is tested using a certified known source of radon.
2. Each background kit will be placed in the corresponding shield and detector.
3. Record these background counts in the efficiencies logbook.
4. Following backgrounds, the known source is run. Only one detector can be tested with the source at a time, leaving the backgrounds in all other detectors.
5. Place the source in the shield and detector to be run and initiate the Efficiencies computer program. The run time is 60 seconds. After the run, the computer displays the efficiency and the source count. See Appendix B for data calculations.
6. These readings are recorded in the appropriate logbook. Continue until all detectors have had the source run and recorded.
7. Compare the source readings to the previous month's readings and the control charts. They must be within 1-2 percent of previous readings.
8. This data is maintained electronically, and the control chart limits allow up to a 5% deviation, but internally we prefer the efficiencies to remain within 1-2% variation from the previous month.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director reviews the efficiencies logbook monthly.
- ✚ If a detector is found inefficient, the Laboratory Specialist will be consulted to determine the extent of the deviation and any effect on test results and if any service is required.

Duplicates and Blanks

Objectives

- ✚ Perform analysis of blank radon measurements to insure proper low level detection capabilities.
- ✚ 5% of all test kits measured will be blanks and must be tested monthly (maximum of 25 required)
- ✚ Perform duplicate analysis of radon measurements to insure a suitable level of reproducibility
- ✚ 10% of all test kits measured will have duplicates and must be done monthly (maximum of 50 required)

Attaining Objectives (Refer to SOP Section 3.3)

The following objectives are the duties of all laboratory technicians:

1. Blank kits are pulled from production stock and run monthly. These kits are treated in the same manner as all regular samples from analysis to reporting.
2. Blanks should not have a measurable radon reading.
3. Duplicates are pulled from side by side customer transactions performed each month. These are reported and examined for their Relative Percent Difference (RPD).

The RPD is calculated by: $\left[\frac{(A-B)}{(A+B)} / 2 \right] \times 100$ (where A is the higher of the two readings)

- a. If both radon results are above 4.0 pCi/L the RPD:
 - i. The RPD is considered “in control” if it is $\leq 14\%$.
 - ii. If the RPD is $\leq 28\%$, but more that 14%, the level should be treated as a “warning level.”
 - iii. An RPD of $\leq 36\%$ is considered the “control limit” and should not exceed this level more than 1% of the time without corrective action.
 - b. If both radon results are below 4.0 pCi/L the RPD:
 - i. The RPD is considered “in control” if it is $\leq 25\%$.
 - ii. If the RPD is $\leq 50\%$, but more that 25%, the level should be treated as a “warning level.”
 - iii. An RPD of $\leq 67\%$ is considered the “control limit” and should not exceed this level more than 1% of the time without corrective action.
 - c. If one result is greater than 4.0 pCi/L and one is less than 4.0 pCi/L, the higher result must be less than two times the lower result, and the average of the two will be used for determining RPD compliance.
4. If there are not enough side by side results to satisfy the duplicate requirements, results will be obtained by deploying side by side measurements using employee participation.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director reviews the blank and duplicate data monthly.
- ✚ If more than 5% of the blanks are false positives (>0.5 pCi/L), the Lab Specialist will be consulted to determine if service is required.
- ✚ If a duplicate test does not have acceptable RPD calculations, the Lab Specialist must be consulted to investigate and determine if service is required, result are qualified (not invalidated out of hand), and the client must be notified that a retest must be performed. Evaluate the duplicate data according to the following chart:

# of Duplicates Outside Warning Level	Total Number of Duplicates	
	Investigate, Continue Operations	Stop Operations Until Corrected
2	8-19	2-7
3	17-34	8-16
4	29-51	17-28
5	41-67	29-40
6	54-84	41-53
7	67-100	54-66

Control Charts

Objectives

- Plot laboratory control data for use in determining validity of measurements and functionality of equipment.

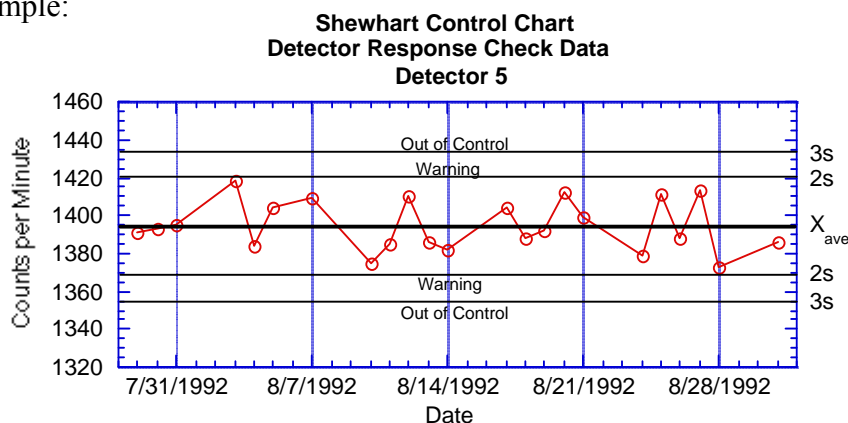
Attaining Objectives

The following objectives are the duties of the Lab Director or QA with oversight by the Lab Specialist:

- Quality Control charts will be maintained for backgrounds, sources, blanks, and duplicates according to the following chart:

Data	Chart Type	In Control	Warning	Control Limit
Laboratory Controls (Blanks)	Std. Dev.		2s	3s
Detector Response Checks	Std. Dev.		2s	3s
Duplicates <4 pCi/L	RPD	25%	50%	67%
Duplicates ≥ 4 pCi/L	RPD	14%	28%	36%

- Data values are plotted on Shewhart Control Charts using two standard deviations and three standard deviations as control limits. In applying this control chart, either of the following two conditions would indicate an "out-of-control" situation:
 - Any points outside ± 3 standard deviations
 - Any three successive points outside of 2 standard deviations
- When an out-of-control situation occurs, analysis must be stopped until the problem has been identified and resolved, after which the frequency should increase for the next few checks.
- The problem and its solution must be documented in the Background Source Logbook and all analyses since the last "in-control" point must be repeated on a detector that meets specifications or invalidated.
- Control Chart Example:



Quality Assurance and Countermeasures for Non-Attainment

- Exclusive of daily comparisons, the Lab Specialist will review control charts to insure that data is in control.

Standard Analytical Radon Analysis Procedures

Objectives

- Analyze test kits according to test methodology in ELAP 7036 and standard operating procedures.

Attaining Objectives (Refer to SOPs in Section 2.0)

The following objectives are the duties of all laboratory technicians:

- Summary:** Radon test kits are received by the laboratory, logged into a daily logbook, assigned a Lab ID number, and placed into a radon counting chamber for analysis. Once analyzed, test kits are cut open, weighed, and the data is transcribed into the database for reporting.
- The radon counting system consists of several, thallium-activated sodium iodide detectors housed in, 3500-pound lead shields coupled to a proprietary computer-based system. Each shield has four cylindrical cavities, each of which contains a sodium iodide detector. The shields are arranged in banks of three shields, and one computer is used to control the detectors housed in each set of three shields. One custom scale and one preamp/amp/discriminator are used for each set of detectors.
- Each shield has four detectors. The far left is detector one on down to the far right which is detector four. Backgrounds and sources are run prior to any analysis for the day.
- Receiving and Logging Mail
 - Mail must be processed the day it is received, unless not feasible, in which case it is given first priority the following day. When mail is received, each test kit receives a sample lab identification number (Lab ID) that will be scanned into the computer using a bar code reader immediately before processing. Lab IDs are assigned sequentially for tracking purposes.
 - The sample Lab ID identifies the sample to the computer and is stored with the sample count, time and date of count, and the detector number.
 - All mail is logged into a daily logbook for receipt tracking. The form includes the following information.
 - The column labeled “Source” refers to the mail carrier. Examples include UPS, FedEx, Priority, Express, Mail, and Dropoff. Due to large volumes each type of kit logged is grouped in one category and labels are grouped together in each sub-categories, such as Rush, Inspectors, Canada, etc. Retest is an option once all the mail has been processed if necessary.
 - “Special Instructions” designates the sub-category for prioritizing analysis.
 - “Begin” and “End” are the beginning and ending Lab IDs placed on the kits. Labels are found in the back of the binder. When you run out, more can be found on the shelf above the shields. It is imperative that Lab IDs be used in numerical order.
 - “Company/Names” is for you to place the customer’s last name or company name or any special notation of that kit series or project.

Standard Analytical Radon Analysis Procedures (Cont.)

5. Analyzing Test Kits (Running Mail or Taking Counts)

- a. After each kit receives a Lab ID, they are placed in buckets by priority. Take kits from the bucket, one per usable detector, scan them into the computer and place them one per detector. (Maximum of 4 kits per shield)
- b. Once a test kit is in each detector of every shield in a shield bank, the counts computer program is initiated.
- c. Counts run for 10 minutes. At the end of the run, the average of the counts across the total run time is recorded using the Lab ID and displayed on the screen.
- d. If a single result has a gross count above 18,000 for shield 1-6 or 21,000 for shields 7-9, the kit will be issued an additional Lab ID number and set aside for retesting on a different detector.
- e. All test kits are processed in this manner until all are run.
- f. Count data can be merged into the reporting database whenever shields are not running, allowing up-to-date import of data.

6. Processing analyzed test kits (cutting and weighing)

- a. Once counting is completed, the Radon Sampler Trays are processed (cut and weighed) as follows:
 - ii. The return mailer is opened and the information card (COC) and sample kit are removed.
 - iii. All test kits should be returned to the lab with a corresponding information card completely filled in with appropriate information.
 - iv. The lab technician processing the test kit verifies completeness and legibility of the information card (COC) in preparation for data entry of the following:
 1. Full name, mailing address, (including city, state, and zip), and telephone number.
 2. Fax number or Email address if client is requesting reporting in such a manner.
 3. Test kit identification number to match that of the number on the actual test device.
 4. Test kit start and stop time and date
 5. Reason for performing the test, test floor, structure type, and location of the test if different from mailing address
 6. Signature of the person performing the test and completing the sample information to verify that closed house conditions during the test were met.
- b. The last three digits of the Lab ID are written on the top of the return mailer.




Standard Analytical Radon Analysis Procedures (Cont.)

- c. The Kit ID number is verified from the information card.
- d. The Radon Sampler is weighed, entered into the computer, a Lab ID sticker is printed and affixed to the top of the information card in the designated space. The weight is recorded on the information card next to the Lab ID sticker.
- e. The information card is then prepared for data entry in accordance with SOP.
- f. Continue in this fashion through the Radon Sampler Trays in numerical order per bucket.
- g. When completed, deliver the Information Cards to the data entry holding station.
- h. The Radon Sampler Tray is then placed in a properly labeled mail bucket for discarding. No test kits are removed from the facility until data entry is completed.

7. Data Entry

- a. After all the samples are counted, the data is copied to data files, which are merged into the computer radon database.
- b. The remainder of the data from each Information Card is then entered as follows:
 - i. The Kit ID and Lab ID are entered by manual entry. This calls up the time and date of count, number of counts, detector efficiency, detector background, detector identification, and manufacturing information for that particular sample.
 - ii. All previously verified customer information from the Information Card is entered into the database. The exposed kit weight documented during cut and weigh is verified.
 - iii. Once information is completely entered, the database automatically performs necessary calculations to provide a detected radon level in pCi/L. This value is written on the corresponding information card and filed for electronic storage and disposal.

Quality Assurance and Countermeasures for Non-Attainment

-  The Lab Director periodically reviews Lab IDs to determine if any are missing. This can be used to verify if a kit has been lost in processing.
-  The Lab Director reviews data as explained in Data Review.
-  If any discrepancies arise during analysis, the Lab Director will be informed and attempt to troubleshoot the problem. The Lab Specialist may be consulted if basic troubleshooting is inconclusive and contracted maintenance may be necessary.

Procedures for General School Testing

Objectives

- ✚ Analyze test kits according to test methodology in FDOH DH/PI150-334, ELAP 7036, EPA 402-R-92-014 and standard operating procedures.
- ✚ Follow AARST/ANSI and EPA requirements and recommendations for testing radon in schools, unless state specific protocols are required (ie. FDOH DH/PI150-334, or most current release).

Attaining Objectives (Refer to SOP 1.6)

The following objectives are the duties of certified placement technicians and all laboratory technicians for analysis:

1. Summary: Radon test kits are placed into school classrooms by certified technicians or designated personnel to measure the ambient radon level. They are placed using the same guidelines as other radon test kit placement procedures. Tests are run for the specified time, retrieved, and sent back to the laboratory for analysis. Special instructions or handling procedures should be negotiated with the designated school representative. Refer to the most recent ANSI/AARST publications for more details.
2. If you are testing a public or private school and require results quickly, the EPA recommends the following short-term testing criteria:
 - a. Project Coordination:
 - i. Before starting the project, appropriate meetings with school administration, staff, support staff, and the public should be performed. The testing protocol should be explained and questions should be answered to a reasonable level of understanding. Up to date drawings of the school should be obtained to plan for the number of test kits and a placement schedule. Emphasis will be placed on the importance of keeping all exterior doors and windows closed during the closed building time period and during the duration of the test period itself.
 - b. Number of Test Kits Needed:
 - i. Obtain a sufficient number of short-term, passive test devices to conduct initial radon testing in at least 25% of frequently occupied rooms that come in contact with the ground within the school and at least 10% of rooms above ground level. Frequently occupied rooms are usually classrooms, offices, laboratories, cafeterias, libraries, and gymnasiums.
3. Duplicates and blanks shall accompany all testing activities in schools to provide assurance of the quality of the measurements.
 - a. Duplicates are pairs of detectors deployed in the same location, side-by-side, and 4 inches apart for the same measurement period. They shall be placed in 10% of all measurement locations in a school building.
 - b. Blanks are used to determine whether the manufacturing, shipping, storage or processing of the detector has affected the accuracy of the measurements. Blanks are unwrapped but not opened and immediately rewrapped at the end of the exposure period. The number of blanks shall be 5% of the detectors deployed or a maximum of 25.
 - c. Duplicate and blank testing devices must be shipped and labeled in the same manner as the other testing devices so that the analytical laboratory cannot distinguish them.

Procedures for General School Testing (Cont.)

For example, a test device is placed in Room 233 accompanied by a duplicate test device. The location name marked on the tracking sheet for the first device is “Room 233” while the location name marked on the tracking sheet for the duplicate device is “Room 233D”. In other words, a duplicate location name of “Duplicate of Room 233” is not acceptable. Blanks should be named in a similar way, such as “Room 233B” as opposed to “Blank of Room 233”.

4. Spikes shall be included in one testing activity per month to measure the accuracy of the normal analytical process of radon measurement. Count the total number of test devices placed in all of the schools where testing has occurred or is planned for the designated month. The number of spikes shall be 3% of the detectors deployed during that month with a maximum of 6 spikes per month.
 - a. Alpha Energy performs this function monthly and uses a private radon chamber, Bowser-Morner, Inc. of Ohio, to provide this service. Spikes are test devices sent to a spike service laboratory for spiking in a radon chamber. The test devices will be exposed in the chamber at a certain level that will be provided by the spike service laboratory. The test devices should be exposed in the chamber for the same amount of time you plan on conducting testing in your designated school.
5. Test Conditions Needed:
 - a. Testing shall be preceded by 12 hours of closed building conditions.
 - b. Testing should remain under closed conditions for a minimum of 48 hours
 - c. Testing should occur during the colder months of the year (October-March), or as required by state creditors.
 - d. Testing should also occur during weekdays while school is in session with HVAC systems operating normally.
6. Testing shall not be conducted:
 - a. During abnormal weather conditions such as major storms or high winds
 - b. During structural changes to a school building and/or the renovation or replacement of the HVAC system.
7. Test Placement Instructions:
 - a. All school rooms must be tested on the same start date. Canister identification numbers, locations, and start date/time will be recorded on a device tracking sheet (example shown below).
 - b. Test devices must be placed:
 - i. away from any drafts, vents, appliances (e.g. computers, projectors, etc),
 - ii. 20 inches above the floor,
 - iii. 3 feet away from any exterior doors or windows,
 - iv. 3 feet away from any exterior or interior wall,
 - v. 4 inches away from other objects,
 - vi. away from heat, areas of high humidity, out of direct sunlight, and
 - vii. where they are least likely to be disturbed.

Procedures for General School Testing (Cont.)

8. The devices should be left in place for two to four days to ensure optimum results. Place the detectors every 2,000 square feet for larger spaces.
9. Place signs on doors and exits to instruct teachers and staff to keep all exterior doors, interior doors (when applicable) and windows closed during the testing period.
10. Retrieval of Testing Devices
 - a. Retrieve all testing devices from each location in the school building on the same day and complete the device tracking sheets (Shown at the end of this section) by marking down the end date/time.
 - b. Make comments if the devices appear to have been tampered with or if windows are found to be open instead of closed.
 - c. Make photocopies of the tracking sheets to keep as a record of the testing event.
 - d. Package all testing devices neatly and securely so as to ensure proper shipment. Mail devices to the analytical laboratory immediately after retrieval or the next morning at the latest. Be sure each shipment parcel contains a copy of the tracking sheets.
 - e. Overnight or two-day delivery is preferred
 - f. Communicate with the analytical laboratory to inquire about preferences for shipping methods and to provide the lab with a schedule of your planned testing activities
11. When school projects arrive in the laboratory, they are logged in and processed according to SOP for large projects and are also keyed into the database as such.

12. Interpretation of Initial Results

- a. Review the results of the initial testing and highlight any results that are at or above 4.0 pCi/L.
- b. Compare the duplicate results by calculating the Relative Percent Difference (RPD).

$$RPD = \left| \frac{\text{Initial Result} - \text{Duplicate Result}}{\text{Average of Both Results}} \right| \times 100$$

If results over 4.0 pCi/L differ by 37% or more (more than 14% for NY), the data quality should be questioned. In this case, the laboratory should investigate the situation further and notify the school that a few results are in question; therefore, the room associated with the questionable duplicate may need to be retested.

- c. Check to be sure that the blank results are at or near the laboratory's LLD. If they are higher than 0.8 pic/L, the analytical laboratory should investigate further and notify the school that the problem is being investigated.
- d. Check to be sure that the spike results are accurate by calculating how close the measured value is to the target value.

$$\text{Spike Diff\%} = \left| \frac{\text{Target Value} - \text{Measured Value}}{\text{Target Value}} \right| \times 100$$

Procedures for General School Testing (Cont.)

The calculation should be + or – 15%. If the measured value is way off from the target value, investigate further and notify the school that the problem is being investigated.

- e. Obtain additional short-term test devices for follow-up testing in rooms with radon results at or above 4.0 pCi/L. Don't forget to include additional QA/QC measurements (duplicates and blanks).
- f. Provide a summary of initial test results to the school administration.
- g. If initial test results are over 20 pCi/L, the school administration shall notify parents and staff as soon as possible, but no later than one week after results have been received.





13. Follow-Up Measurements

- a. Follow-up testing (when needed) shall start within a reasonable time after receiving the initial test results. Follow-up testing must be made in the same location and under the same conditions as the initial measurement.

14. Interpretation of Follow-Up Test Results for School Testing

- a. Recommend that school administration take action to reduce the radon level if the average of the initial and follow-up measurement is 4.0 pCi/L or more.
- b. Provide the school administration with a complete report that includes all results and interpretations.
- c. Recommend that school administration hire a radon mitigation professional certified by NEHA and/or NRSB to reduce elevated radon levels identified through testing.

Quality Assurance and Countermeasures for Non-Attainment

-  The Lab Director typically keys large projects and schools to insure consistency and to review internal QC checks referred to above.
-  The Lab Director or Lab Specialist will contact the client (if Alpha Energy did not do the kit placement) or school district if results are questionable and to inform them of retests.
-  If any discrepancies arise during analysis, the Lab Director will be informed and attempt to troubleshoot the problem. The Lab Specialist may be consulted if basic troubleshooting is inconclusive and contracted maintenance may be necessary.
-  Kit Placement Tracking Sheet Example:

PROJECT/SCHOOL NAME: _____

Signature: _____ Start Date: _____ Stop Date: _____

-	<u>KIT ID</u>	<u>Test Room</u>	<u>Test Location</u>	<u>Start Time</u>	<u>Stop Time</u>	<u>Retrieval Comments</u>
1						
2						
3						

Procedures for NJ School Testing

Objectives

- ✚ Analyze test kits according to test methodology in ELAP 7036, EPA 402-R-92-014, and standard operating procedures.
- ✚ Follow EPA and NJ state guidelines when testing schools in NJ.

Attaining Objectives (Refer to SOP 1.6)

The following objectives are the duties of certified placement technicians and all laboratory technicians for analysis:

1. Summary: Radon test kits are placed into school classrooms by certified technicians to measure the ambient radon level. The NJ regulatory authority must be notified when testing occurs. They are placed using the same guidelines as other radon test kit placement procedures. Tests are run for the specified time, retrieved, and sent back to the laboratory for analysis. Special instructions or handling procedures should be negotiated with the designated school representative.
2. In addition to the general school testing requirements and recommendations above, the following are specific to NJ.
3. When conducting school testing, or selling devices to a school in NJ, Charles Renaud with the NJDEP Radon Section must be notified at (609) 984-5425, within 48 hours when the test results reveal that one or more rooms tested have a radon concentration of 4.0 pCi/L or higher.
4. To ensure proper testing conditions and handling procedures are used, our laboratory is fully responsible for all aspects of the testing procedure when our certified specialist is conducting school testing: including but not limited to, which rooms are tested, time of testing, placements of devices,. Standard Protocol will come from Appendix F of EPA's Radon Measurement in Schools (Revised Edition).
5. A record of test device placement is listed on the chain of custody/information card under test location and will be provided to NJDEP in the required monthly reports.
 - a. Report records are maintained for a period of five years.
6. School testing will not be conducted by our certified specialist in the summer months without valid reasons. The same will be requested of all certified specialists wishing to purchase our test devices to perform radon testing in NJDEP schools.
7. It is required that all schools use 10% of the total amount of test kits used for duplicate testing and 5% for blanks as a quality control check. These requirements will be addressed prior to distribution of test kits to any certified individual.
8. Prior to selling devices to State of New Jersey schools:
 - a. Alpha Energy Laboratory's certified specialist will discuss the testing requirements with necessary school personnel. However, our laboratory is responsible only for ensuring that the school has the appropriate number of test kits to ensure that QAQC requirements are met.

Procedures for NJ School Testing (Cont.)

- b. The principal will be strongly encouraged by our certified specialist to meet personally with teachers and custodial staff to emphasize the importance of keeping windows and exterior doors closed and the heating, ventilation and air conditioning system operating normally for the duration of the radon test. During this discussion the Alpha Energy certified individual will offer to assist in creating handout information regarding proper protocol to distribute to teachers and staff before placing test devices and to inform staff what conditions to maintain while tests are running. Alpha staff will also offer to assist in the creation of signs to be posted in testing locations.
 - c. It is required that New Jersey school officials provide his/her certification number to our laboratory prior to distribution of test devices. The certification number is given by NJDEP upon completion of placement training.
9. Any improper test environment upon retrieval of each test is to be noted as a comment. All deviations noted will be documented with test results. Tests found not observing closed building conditions will be considered invalid and specified areas are required to be retested immediately observing protocol.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Director typically keys large projects and schools to insure consistency and to review internal QC checks referred to above.
- ✚ The Lab Director or Lab Specialist will contact the client (if Alpha Energy did not do the kit placement) or school district if results are questionable and to inform them of retests.
- ✚ If any discrepancies arise during analysis, the Lab Director will be informed and attempt to troubleshoot the problem. The Lab Specialist may be consulted if basic troubleshooting is inconclusive and contracted maintenance may be necessary.

Sample Disposal

Objectives

- ✚ Insure that all analysis and data entry has been verified prior to disposal of test kits and information cards

Attaining Objectives (Refer to SOP 2.8)

The following objectives are the duties of the Lab Director or designated technician:

1. Each day test kits are stored indoors in normal room temperatures until analysis and report distribution is completed.
2. Information cards are stored with their respective test kit bucket after they have been scanned unless they had payment information on the card. These are shredded for security purposes.
3. The Lab Director or designated lab technician makes the decision on whether or not test kits are ready for disposal.
4. The Lab Director or designated technician checks the database to verify that a range of Lab ID's is accounted for in the computer database. If all the Lab IDs have an associated value, the kit has been processed and the data entered. The computer also verifies that a report has been generated and the information card has been scanned for electronic storage.
5. Kits and information cards are marked electronically if available for disposal.
6. Once the kit buckets are deemed ready for disposal they are transported to the outdoor dumpster area and discarded.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ If there is any question regarding a test kit and data entry, the Lab Director will investigate and physically locate the kit and information card and enter or have a technician enter the data before the kits or information cards are thrown out.

Quality Control for Measurement Traceability

Objectives

- ✚ All equipment used that affects the quality of test results are calibrated prior to being put into service and on a continuing basis. These calibrations are traceable to national standards of measurement where available.
- ✚ Reference standards are standards of the highest quality available.
- ✚ Reference materials are substances that have concentrations that are sufficiently well established to use for calibration or as a frame of reference.
- ✚ The laboratory handles and transports reference standards and materials in a way that protects their integrity.

Attaining Objectives (Refer to SOP 3.5)

The following objectives are the duties of the Lab Director or QA Officer:

1. All equipment that affects the quality of test results are calibrated according to the minimum frequency suggested by the manufacturer, by regulation, by method, or as needed.
2. Reference standards, such as ASTM Class 1 weights, are used for calibration only and for no other purpose unless it is shown that their performance as reference standards will not be invalidated.
3. Reference standards, such as ASTM Class 1 weights, are calibrated by an entity that can provide traceability to national or international standards.
4. Reference materials, where commercially available, are traceable to national standards of measurement, or to Certified Reference Materials, usually by a Certificate of Analysis.
5. Internal reference materials are checked as far as technically and economically possible.
6. Reference standard and material integrity is protected by separation from incompatible materials and/or minimizing exposure to degrading environments or materials.
7. Reference standards and materials are stored according to manufacturer's recommendations and separately from working standards or samples.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The QA Office will insure handling and calibration of reference standards and materials through internal audits.

General Equipment Requirements

Objectives

- ✚ Provide all the necessary equipment required for the correct performance of the scope of environmental testing presented in this Quality Manual.
- ✚ All equipment and software used for testing and sampling is capable of achieving the accuracy required and complies with the specifications of the environmental test method as specified in the laboratory SOP.
- ✚ Insure procedures are available for safe handling, transport, storage, use and planned maintenance of measuring equipment to ensure proper functioning and in order to prevent contamination or deterioration. Request traceability documentation whenever possible.

Attaining Objectives (Refer to SOP 3.5)

The following objectives are the duties of the QA Officer or Lab Director:

1. Equipment should be operated by authorized technicians only. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) are readily available for use by laboratory personnel.
3. All equipment is calibrated or checked before being placed into use to ensure that it meets laboratory specifications and the relevant standard specifications. If calibration factors are required, they will be recorded and posted on the instrument.
4. Equipment that has been subject to overloading, mishandling, giving suspect results, or been shown to be defective or outside specifications is taken out of service, isolated to prevent its use, or clearly labeled as being out of service until it has been shown to function properly. If it is shown that previous tests are affected, then procedures for non-conforming work are followed.
5. When equipment is needed for a test that is outside of permanent control of the laboratory, the lab ensures the equipment meets the requirements of this manual prior to its use by inspecting or otherwise testing it.
6. Each item of equipment and the software used for testing and significant to the results is uniquely identified and records of equipment and software are maintained. This information includes the following:
 - a. identity of the equipment and its software; manufacturer's name, type identification, serial number or other unique identifier;
 - b. checks that equipment complies with specifications of applicable tests;
 - c. current location;
 - d. manufacturer's instructions, if available, or a reference to their location;
 - e. dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration;
 - f. maintenance plan where appropriate, and maintenance carried out to date; documentation on all routine and non-routine maintenance activities and reference material verifications;
 - g. any damage, malfunction, modification or repair to the equipment;
 - h. date received and date placed into service (if available); and
 - i. condition when received, if available (new, used, reconditioned).

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The QA Office will periodically keep track of and monitor the equipment log for accuracy and completion and will periodically examine laboratory equipment to insure objectives are met.

Equipment - Balances

Objectives

- ✚ Insure all balances are maintained in proper working order and records are kept of all repair and maintenance activities, including service calls.

Attaining Objectives (Refer to SOP 2.11)

The following objectives are the duties of the designated lab technician:

1. Each day prior to use, check balances with a Class 1 NIST traceable reference if available, to ensure they are operating within the expected range for the application for which the equipment is to be used.
2. Verify instrument performance according to manufacturer recommendations prior to first use.
3. Use a certified standard or reference material to calibrate instruments as specified in the instrument SOP. If calibration factors are required, they will be recorded and posted on the instrument.
4. Calibration references should be determined based on the range of test material, and should bracket above and below. Alpha Energy uses a 10g and a 20g or 50g weight to check balances.
5. Where an instrument calibration is found unacceptable, the calibration must be performed a second time. If acceptable calibration cannot be achieved, the instrument should be taken out of service until achieved, or replaced.
6. Document all calibrations and any associated maintenance or repair in the instrument logbook.
7. Annual calibration and periodic maintenance (when required) is performed by Aldinger Company, 1440 Prudential Drive, Dallas, Texas, 75235.
8. Reference Weights are calibrated annually by Troemner, 201 Wolf Drive, Thorofare, NJ, 08086.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The QA Office will insure that proper procedures and methods are followed and will retrain technicians as necessary.

System Calibration

Objectives

- ✚ Calibrate the shield detectors to various levels of radon at known relative humidity values

Attaining Objectives

The following objectives are the duties of the technicians with oversight by the Lab Specialist:

1. Initial Calibration:
 - a. Unexposed radon kits from our internal inventory will be sent to an independent radon chamber for exposure to a known set of radon values at relative humidity values of approximately 25% to 75%. We will send 10 kits for each set of exposure conditions.
 - b. Calibration Chamber:

Bowser Morner
4518 Taylorsville Road
PO BOX 51
Dayton, Ohio 45401-0051
 - c. A set of kits at various radon concentrations and relative humidity levels will be removed anywhere between 48 and 96 hours of exposure.
 - d. Analyze the test kits according to SOP 2.2.
 - e. Once analyzed, prepare a calibration curve by plotting water content versus net decay-corrected dpm per Picocurie per liter.
 - f. Fit the resulting curve with an appropriate mathematical equation and enter the equation into the results calculation program.
2. Ongoing calibration procedures will be carried out by comparing the calculation plot against monthly spike data and adjusting where necessary.
3. The Lab Specialist maintains more detailed calibration procedures on file and they are available for inspection.
4. All detectors are also peaked annually using a NIST traceable calibrated digital pulser unit. Records are maintained for each detector's response and peak data, and repair/replacement also logged if required.

Quality Assurance and Countermeasures for Non-Attainment

- ✚ The Lab Specialist will determine when calibrations are necessary and implement them as needed if system results indicate the calibration curve is no longer appropriate for analysis. They are done at least annually.