



Licensing Of Radon Detection And Mitigation Services

32 Illinois Administrative Code, Part 422



TITLE 32: ENERGY
CHAPTER II: ILLINOIS EMERGENCY MANAGEMENT AGENCY
SUBCHAPTER b: RADIATION PROTECTION

PART 422
LICENSING OF RADON DETECTION AND MITIGATION SERVICES

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AUTHORITY: Implementing and authorized by the Radon Industry Licensing Act [420 ILCS 44].

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Section 422.15 Incorporations by Reference

- a) All rules, standards and guidelines of agencies of the United States or nationally recognized organizations or associations that are incorporated by reference in this Part are incorporated as of the date specified in the reference and do not include any later amendments or editions. Copies of these rules, standards and guidelines that have been incorporated by reference are available for public inspection and copying at the Illinois Emergency Management Agency, 1035 Outer Park Drive, Springfield, Illinois.
- b) In addition, copies of ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories Compliance may be obtained through the American National Standards Institute (ANSI), 1430 Broadway, New York, New York 10018 and directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Copies of ISO/IEC 17025 can also be obtained from the Illinois Emergency Management Agency, 1035 Outer Park Drive, Springfield, Illinois 62704.

(Source: Added at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.20 Definitions

As used in this Part:

“Act” means the Radon Industry Licensing Act [420 ILCS 44].

“Active Soil Depressurization” or “ASD” means a family of radon mitigation systems involving mechanically driven soil depressurization, including sub-slab depressurization (SSD), drain tile depressurization (DTD), block wall depressurization (BWD), and sub-membrane depressurization (SMD).

“Agency” means the Illinois Emergency Management Agency (IEMA).

“Altering” means to change or modify a building or building design, or to revise, rather than repair, a mitigation system or mitigation system design.

“As Low As Is Reasonably Achievable” or “ALARA” means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 32 Ill. Adm. Code: Chapter II, Subchapters b and d as is practical consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

“Backdrafting” means a condition where the normal movement of combustion products up a flue, resulting from the buoyant forces on the hot gases, is reversed, so that the combustion products can enter the house. Backdrafting of combustion appliances (such as fireplaces and furnaces) can occur when depressurization in the house overwhelms the buoyant force on the hot gases. Backdrafting can also be caused by high air pressures or blockage at the chimney or flue termination.

“Backer Rod” means a semi-rigid foam material resembling a rope of various diameters used to fill around pipes, etc., and to assist in making a sealed penetration. For example, where a pipe is inserted through a concrete slab, a length of backer rod is jammed into the opening around the pipe. Caulking is then applied to the space above the backer rod and between the outside of the pipe and the slab opening. The purpose of the backer rod is to hold the semi-fluid caulk in place until it sets or hardens. It is most important that a sealant only adhere to the 2 sides of the joint and not the base of the joint (third side). Adhesion to all 3 sides will prevent the sealant from elongating properly and will cause sealant failure.

“Block Wall Depressurization” means a radon mitigation technique that depressurizes the void network within a block wall foundation by drawing air from inside the wall and venting it to the outside.

“Category I CE Credits” means those continuing education credits received for documented successful completion of Agency-approved CE courses or for instructing an approved CE course.

“Category II CE Credits” means those continuing education credits received for documented participation in approved professional meetings, seminars and conferences.

“Client” means any person who contracts for measurement or mitigation services.

“Combination Foundations” means buildings constructed with more than one foundation type, e.g., basement/crawlspace or basement/slab-on-grade.

“Communication Test” means a diagnostic test designed to qualitatively measure the ability of a suction field and air flow to extend through the material beneath a concrete slab floor and thus evaluate the potential effectiveness of a sub-slab depressurization system. This qualitative test is commonly conducted by applying suction on a centrally located hole drilled through the concrete slab and simultaneously observing the movement of smoke downward into small holes drilled in the slab at locations separated from the central suction hole. (See also Pressure Field Extension.)

“Crawlspace Depressurization” means a radon control technique designed to achieve lower air pressure in the crawlspace relative to indoor air pressure by use of a fan-

powered vent drawing air from within the crawlspace. (See also Mechanically Ventilated Crawlspace System.)

“Diagnostic Tests” means procedures used to identify or characterize conditions within buildings that may contribute to radon entry or elevated radon levels or may provide information regarding the performance of a mitigation system.

“Drain Tile Depressurization” or “DTD” means a type of active soil depressurization system where the suction point piping attaches to a drain tile or is located in the gas-permeable material near the drain tile. The drain tile may be inside or outside the footings of the building.

“Drain Tile Loop” means a continuous length of drain tile or perforated pipe extending around all or part of the internal or external perimeter of a basement or crawlspace footing.

“Dwelling” means a single family home or a single unit within a multiple family complex.

“Eave” means the border of a roof that overhangs any wall.

“Electret Ion Chamber” or “Electret” means an electrostatically charged piece-- usually a disk-- of Teflon, called an electret, located inside an electrically conducting plastic chamber of a known air volume. The electret serves as a source of high voltage needed for the chamber to operate as an ion chamber. It also serves as a sensor for the measurement of ionization in air. The ions produced inside the sensitive volume of the chamber are collected by the electret causing a depleted charge. The measurement of the depleted charge during the exposure period is a measure of integrated ionization during the measurement period. The electret charge is read before and after the exposure using a specially built non-contact electret voltage reader.

“Footprint” means each foundation type in direct contact with soil or other material.

“Foundation Type” means basement, crawlspace, slab-on-grade or any other construction technique approved by local building code.

“Government Entity” means the State, a State agency, a political subdivision, or any entity of local government.

“HVAC” means heating, ventilation and air conditioning.

“Individual” means any human being.

“Interfere” means *to adversely or potentially adversely impact the successful completion of an indoor radon measurement by changing the radon or radon progeny concentrations or altering the performance of measurement equipment or an indoor radon mitigation system installation or operation.* [420 ILCS 44/15]

“Laboratory” means any organization that analyzes or calibrates radon or radon progeny measurement devices or detectors.

“Laboratory Analysis” means *the act of determining radon or radon progeny concentrations in air, water, soil, or passive radon testing devices, or the act of exposing radon or radon progeny devices to known concentrations of radon or radon progeny as a compensated service.* [420 ILCS 44/15]

“Living Area” means any area in a building that is, or could be, adapted for human habitation whether the area is located in a basement, over a crawlspace, or situated on a slab-on-grade.

“Measurement” means any radon or radon progeny tests, laboratory analysis, or exposure in a known radon or radon progeny environment, as in a radon chamber.

“Mechanically Ventilated Crawlspace System” means a radon control technique designed to increase ventilation within a crawlspace, achieve higher air pressure in the crawlspace relative to air pressure in the soil beneath the crawlspace, or achieve lower air pressure in the crawlspace relative to air pressure in the living spaces, by use of a fan. (See also Crawlspace Depressurization.)

“Mitigation” means *the act of repairing or altering a building or building design for the purpose in whole or in part of reducing the concentration of radon in the indoor atmosphere.* [420 ILCS 44/15]

“Mitigation System” means any system or steps designed to reduce radon concentrations in the indoor air of a building.

“NIST” means the United States Department of Commerce, Technology Administration, National Institute of Standards and Technology (formerly National Bureau of Standards).

“Passive New Construction System” means a system installed in new construction that relies solely on the convective flow of air upward in the vent pipe for sub-slab depressurization and consists of a vertical vent pipe routed through conditioned space from the suction pit to at least 12 inches above the roof.

“Passive Monitor” means a measurement tool that does not require external power or batteries to operate, such as charcoal detectors or alpha track detectors.

“Perimeter Channel Drain” means a system for collecting water in a basement by means of a large gap or channel between the concrete floor and the wall. Collected water may flow to aggregate beneath the slot ("French Drain") or to a sump where it can be drained or pumped away.

“Person” means an entity including, but not limited to, an individual, company, corporation, *firm, group, association, partnership, joint venture, trust, or government agency or subdivision*. [420 ILCS 44/15]

“Pecocurie Per Liter” or “pCi/L” means 2.2 disintegrations per minute of radioactive material per liter of air.

“Pressure Field Extension” means the distance that a pressure change is induced in the sub-slab area, measured from a single or multiple suction points. (See also Communication Test.)

“QAP” means Quality Assurance Program.

“Radon” means a *gaseous radioactive decay product of uranium or thorium*. [420 ILCS 44/15]

“Radon Chamber” means a facility in which radon measurement devices or detectors are exposed to known radon concentrations.

“Radon Contractor” or “Contractor” means *a person licensed to perform radon or radon progeny mitigation or to perform measurements of radon or radon progeny in an indoor atmosphere*. [420 ILCS 44/15]

“Radon Progeny” means any *combination of the radioactive decay products of radon*. [420 ILCS 44/15]

“Real Estate Testing” means short-term measurements that may be requested by a party not residing in the dwelling and that are performed in, or as a result of, or in expectation of, a real estate transaction and are time-limited due to this transaction.

“Re-Entrainment” means the unintended re-entry into a building of radon that is being exhausted from the vent of a radon mitigation system.

“Research” means Agency-approved scientific investigation by testing and/or mitigating for radon or radon progeny.

“Sealing and Caulking” means to plug and make tight to reduce the passage of gas. Sealing and caulking enhances radon reduction techniques; however, sealing and caulking alone has not been shown to lower radon levels significantly or consistently.

“Skeletal New Construction System” means a system installed in new construction that is designed for the installation of a vent fan and may consist of multiple vent pipes, including vertical and angled runs not necessarily routed through conditioned space, that may be joined to a single termination above the roof or may terminate separately above the roof.

“Soil Gas” means the gas mixture present in soil which may contain radon.

“Soil Gas Retarder” means a continuous membrane or other comparable material used to retard the flow of soil gases into a building.

“Stack Effect” means the overall upward movement of air inside a building that results from heated air rising and escaping through openings in the building envelope, thus causing indoor air pressure in the lower portions of a building to be lower than the pressure in the soil beneath or surrounding the building foundation.

“Sub-Membrane Depressurization” or “SMD” means a radon control technique designed to achieve lower air pressure in the space under a soil gas retarder membrane laid on the crawlspace floor and sealed, relative to air pressure in the crawlspace, by use of a fan-powered vent drawing air from beneath the membrane.

“Sub-Slab Depressurization (Active)” or “SSD (Active)” means a radon control technique designed to achieve lower sub-slab pressure relative to indoor air pressure by use of a fan-powered vent drawing air from beneath the concrete slab.

“Sub-Slab Depressurization (Passive)” or “SSD (Passive)” means a radon control technique designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a vent pipe (without a fan) routed through the conditioned space of a building and connecting the sub-slab area to the outdoor air. This system relies primarily on the convective flow of warmed air upward in the vent to draw air from beneath the concrete slab.

“Suitable for Occupancy” means a structural area in a home currently lived in or an area not currently used for occupancy, such as a basement, that an occupant or homeowner could use for living space without renovations. This includes an unfinished basement that could be used regularly as, for example, a recreation room, playroom, exercise room or workshop.

“USEPA” means the United States Environmental Protection Agency.

“Working Level” or “WL” means any combination of short-lived radon progeny in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha particle energy. The short-lived radon progeny for radon-222 are: polonium-218, lead-214, bismuth-214 and polonium-214.

“Working Level Month” or “WLM” means a unit of exposure used to express the accumulated human exposure to radon decay products. It is calculated by multiplying the average working level to which a person has been exposed by the number of hours exposed and dividing the product by 170.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.30 Exemptions from Requirements for a License

The Agency shall, upon application therefore, grant such exemptions or exceptions from the requirements of this Part as it determines are authorized by law and will not result in a hazard to public health and safety. The following persons are exempt from the licensing requirements of this Part.

- a) A person performing radon measurements or mitigation on a dwelling in which the person resides.
- b) A person temporarily practicing in Illinois who possesses a license granted by another state’s regulatory authority which is recognized by this State under principles of mutual reciprocity.
- c) Retail stores that only sell or distribute radon sampling devices but are not engaged in a relationship with the client for other services such as home inspection or representation as in a real estate transaction and that do not perform laboratory analysis, measurement or mitigation services.
- d) Persons who do not perform radon measurements or mitigation, but who are employed for the purpose of disseminating beneficial information to the public for agencies that the USEPA considers to be partners in providing accurate radon information to the public, such as educational institutions, the American Lung Association, the National Safety Council, and the National Association of City and County Governments and State and local public health officials who disseminate radon measurement devices to the public.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.40 Categories of Licenses

- a) The following types of licenses are issued by the Agency to individuals:
 - 1) Radon Measurement Professional license;
 - 2) Radon Measurement Technician license;
 - 3) Radon Mitigation Professional license; and

- 4) Radon Mitigation Technician license.
- b) The Agency also issues licenses to persons performing radon-related laboratory analysis.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.45 Form, Location and Retention of Records

- a) Each record required by this Part and other applicable Parts of Title 32 shall be legible throughout the specific retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of reproducing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate and complete records during the required retention period. Records such as letters, drawings and specifications, shall include all pertinent information, stamps, initials and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.
- b) Each licensee shall maintain copies of records required by this Part and other applicable Parts of Title 32 at the locations specified in Section 422.50(i) of this Part.
- c) Records required by this Part or other Parts of Title 32, including but not limited to records of radon measurements, mitigations, Quality Assurance Programs, calibration measurements, equipment repairs and worker protection plans, shall be retained by the licensee for at least 5 years or the length of time of any warranty or guarantees, whichever is longer.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.50 Application for Licenses

- a) Any person applying to the Agency for a new license or a renewal of a license to perform radon-related measurement, mitigation or laboratory analysis services shall:
 - 1) Submit a complete and legible application form;
 - 2) Pay the appropriate non-refundable fee prescribed in Section 422.100 of this Part; and
 - 3) Meet the licensing requirements, as applicable, and as set forth in Section 422.60 of this Part.

- b) Any person who anticipates conducting radon-related measurement, mitigation, or laboratory analysis services shall receive the license prior to providing such services in Illinois.
- c) The Agency may at any time after the filing of the original application, and before the expiration or termination of the license, require further statements in order to enable the Agency to determine whether the application should be granted or denied or whether an existing license should be modified or revoked.
- d) An application for renewal of a license shall be submitted at least 30 days prior to the expiration date of the license. An application shall be deemed filed on the date that it is received by the Agency.
- e) The application for renewal shall demonstrate successful completion of continuing education requirements as specified in Section 422.80 of this Part, as applicable, satisfactory inspection or audit results, submittal of a complete and accurate application form for renewal and the payment of the appropriate fee as specified in Section 422.100 of this Part.
- f) The Agency shall deny a license to any person if the Agency has evidence that the applicant has engaged in any of the acts listed in Section 422.120 of this Part unless the condition listed in Section 422.120 of this Part no longer exists and the applicant submits documentation that the applicant satisfies the requirements of Section 422.120 of this Part.
- g) *The Agency shall deny an original or renewal license to a person who has defaulted on an educational loan guaranteed by the Illinois Student Assistance Commission. However, the Agency may issue an original or renewal license if the person in default has established a satisfactory repayment record as determined by the Illinois Student Assistant Commission.* [420 ILCS 44/45]
- h) The Agency shall refuse to issue or renew a license to any individual if the Agency has received evidence from the Department of Public Aid that the applicant is delinquent in the payment of child support orders, pursuant to the provisions and procedures set forth in 5 ILCS 100/10-65(c).
- i) The person applying for a license or renewal of a license shall specify, for Agency approval, a location where records required by this Part and other applicable Parts of Title 32 Ill. Adm. Code shall be maintained for inspection by the Agency. This location shall be in Illinois or within 50 miles of the Illinois border and at the location where the licensed professional who ensures the Quality Assurance Program is implemented is located.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.60 Requirements for Issuance or Renewal of Licenses

- a) The Agency shall issue a Radon Measurement Professional license to any individual who fulfills the following requirements:
- 1) Is at least 18 years of age.
 - 2) Provides evidence of relevant work experience and education that meets any one of the following criteria:
 - A) Documented work history approved by the Agency demonstrating completion of 50 radon measurements; or
 - B) No experience. A new license performance audit will be performed by the Agency.
 - 3) Provides proof of successful completion of the USEPA Radon Measurement Operators Course, or an equivalent indoor radon and radon progeny measurement course approved by the Agency.
 - 4) Has successfully completed a USEPA Radon Measurement Examination, or an equivalent examination approved by the Agency.
 - 5) Submits a complete and accurate application form prescribed by the Agency that includes:
 - A) A description of all types of indoor radon measurements performed and any other related services offered;
 - B) A description of all measurement devices the applicant or licensee plans to use;
 - C) A worker protection program description acceptable to the Agency that includes, but is not limited to, methods to reduce or minimize the radon or radon progeny exposures in the work area; and
 - D) A Quality Assurance Program description acceptable to the Agency that includes, but is not limited to:
 - i) A policy statement committing to provide quality work;
 - ii) A description of management and structure of the organization;
 - iii) A listing of personnel, their qualifications and training;
 - iv) Procedures for procurement of items and services;

- v) Procedures for maintaining documents and records;
- vi) A description of relevant computer hardware and software;
- vii) A planning process for radon and radon progeny services;
- viii) Procedures for calibration and testing of instruments;
- ix) A corrective action program; and
- x) Standard operating procedures.

AGENCY NOTE: Professional licensees shall submit standard operating procedures for the performance of School and Commercial Measurements unless the business will be limited to homes.

- 6) An individual requesting renewal shall submit evidence of meeting the continuing education requirements in Section 422.80 of this Part.
- b) The Agency shall issue a Radon Measurement Technician license to any individual authorizing work under the general supervision of a Radon Measurement Professional licensee, if the applicant meets the following requirements:
- 1) Is at least 18 years of age.
 - 2) Provides proof of successful completion of the USEPA Radon Measurement Operators Course, or an equivalent indoor radon and radon progeny measurement course approved by the Agency.
 - 3) Has successfully completed a USEPA Radon Measurement Examination, or an equivalent examination approved by the Agency.
 - 4) An individual requesting renewal shall submit evidence of meeting the continuing education requirements in Section 422.80 of this Part.
- c) The Agency shall issue a Radon Mitigation Professional license to any individual who fulfills the following requirements:
- 1) Is at least 18 years of age.
 - 2) Provides evidence of relevant work experience and education that meets any of the following criteria:

- A) At least 4 years of design and construction of buildings, or associated heating, ventilation and air conditioning (HVAC), or closely related activities approved by the Agency;
 - B) Documented work history approved by the Agency demonstrating completion of 50 radon mitigation installations; or
 - C) No experience. A new license performance audit will be performed by the Agency.
- 3) Provides proof of successful completion of the USEPA Radon Mitigation Course, or an equivalent indoor radon and radon progeny mitigation course approved by the Agency.
 - 4) Has successfully completed a USEPA Radon Mitigation Examination, or an equivalent mitigation examination approved by the Agency.
 - 5) Submits a complete and accurate application form prescribed by the Agency that includes:
 - A) A description of all diagnostic tests that may be performed to determine the mitigation strategy and any other radon related services offered;
 - B) A description of all mitigation system designs or strategies offered. Materials and design controls shall be included in the professional licensees' Quality Assurance Program description;
 - C) A worker protection program description acceptable to the Agency, to be followed when performing mitigation installations, that includes, but is not limited to methods to reduce or minimize the radon or radon progeny concentrations in the work area.
 - D) A Quality Assurance Program description acceptable to the Agency that includes, but is not limited to:
 - i) A policy statement committing to provide quality work;
 - ii) A description of management and structure of the organization;
 - iii) A listing of personnel, their qualifications and training;
 - iv) Procedures for procurement of items and services;
 - v) Procedures for maintaining documents and records;

- vi) A description of relevant computer hardware and software;
- vii) A planning process for radon and radon progeny services;
- viii) Procedures for calibration and testing of instruments;
- ix) A corrective action program; and
- x) Standard operating procedures.

AGENCY NOTE: Professional licensees shall submit standard operating procedures for the performance of School and Commercial Mitigations unless the business will be limited to homes.

- 6) An individual requesting renewal shall submit evidence of meeting the continuing education requirements in Section 422.80 of this Part.
- d) The Agency shall issue a Radon Mitigation Technician license to any individual authorizing work under the general supervision of a Radon Mitigation Professional licensee, if the applicant meets the following requirements:
 - 1) Is at least 18 years of age.
 - 2) Provides proof of successful completion of the USEPA Radon Mitigation Operators Course, or an equivalent indoor radon and radon progeny mitigation course approved by the Agency.
 - 3) Has successfully completed a USEPA Radon Mitigation Examination, or an equivalent examination approved by the Agency.
 - 4) An individual requesting renewal shall submit evidence of meeting the continuing education requirements in Section 422.80 of this Part.
- e) The Agency shall issue a Laboratory Analysis license to any person who submits a complete and accurate application form prescribed by the Agency that includes:
 - 1) The name of one individual who is responsible for the laboratory radon analytical activities;
 - 2) A description of all measurement devices used and services offered; and
 - 3) Documentation of a Quality Assurance Program that meets one of the following:

- A) A quality assurance program description consistent with ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories Compliance published December 15, 1999, exclusive of subsequent amendments or editions; or
- B) Is successfully enrolled in an independent third party accreditation/certification program consistent with national laboratory accreditation and certification standards, or an equivalent program approved by the Agency, for the devices listed in subsection (e)(2) of this Section.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.70 Conditions of Licenses

- a) Any person licensed by the Agency to perform radon measurement shall perform in accordance with the measurement protocol provided in Section 422.130 of this Part as applicable to the measurement type performed and the device(s) used.
- b) Any person licensed by the Agency to perform radon measurements shall use devices approved by USEPA or the Agency to measure radon and radon progeny.
- c) No unlicensed individual shall perform radon measurement or mitigation activities without the direct on-site supervision of a licensed individual.
- d) Within 45 days after providing radon measurements, the individual providing the service shall report the results in picocuries per liter (pCi/L) to the occupant, the owner of the building, his/her representatives or the client.
- e) Licensees shall comply with 32 Ill. Adm. Code 340. This means that the radiation exposure shall not exceed 30 pCi/L or 0.3 WL, based on continuous workplace exposure for 40 hr/week, 52 weeks per year and shall not exceed 4 working level months (WLM) over a 12 month period, using an equilibrium ratio of 50 percent to convert radon exposure to WLM.
- f) Records of radon measurements, mitigations, Quality Assurance Programs, calibration measurements, equipment repairs and worker protection plans shall be retained by the licensee for a least 5 years or the length of time of any warranty or guarantees, whichever is longer.
- g) No person shall interfere with, or cause another to interfere with, the successful completion of a radon measurement or the installation or operation of a radon mitigation.

- h) The radon laboratory licensee shall notify the Agency in writing within 5 working days when it loses or replaces the individual named pursuant to Section 422.60(e) (1) of this Part.
- i) Mitigators who are also licensed to perform measurements shall not perform radon measurements before or after the installation of a mitigation system at the same address as the mitigation installation, unless a measurement has been made by another independent person in accordance with this Part.
- j) Licensees shall inform the Agency of changes in biographical information, such as addresses and telephone numbers within 10 days after the change is effective.
- k) Substantive changes to license application representations require an amendment to the license and Agency approval. Licensees shall request amendments to documents at least 30 days prior to the effective date of the desired revision.
- l) The licensee shall comply with the Agency-approved Quality Assurance Program.
- m) Professional licensees shall be located in Illinois or within 50 miles of the Illinois border. Professional licensees shall provide general supervision of technician licensees working under their Quality Assurance Program.
- n) Contractors installing research or innovative radon techniques or otherwise deviating from the standards in this Part shall notify the Agency in writing 7 working days prior to the commencement of work. When such research is conducted, a performance standard shall be applied, for example, post-mitigation radon levels shall be below USEPA's action level (4.0 pCi/L). Written notification to the Agency shall include:
 - 1) Written acknowledgement signed by the client stating that the client understands the reasons the contractor plans to deviate from the standards of this Part;
 - 2) The technical bases for the measurement or mitigation technique and description of the functional accomplishments that will be achieved; and
 - 3) The identity of the client and the address of the building, including the zip code.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.80 Continuing Education Requirements

All applicants for renewal of individual licenses shall provide evidence of having participated in an Agency-approved program of continuing education as indicated in this Section:

a) Effective July 1, 2005, the required continuing education per year for categories of licenses issued pursuant to this Part is as follows:

- | | | |
|----|--------------------------------|-----------|
| 1) | Radon Measurement Professional | 6 credits |
| 2) | Radon Measurement Technician | 6 credits |
| 3) | Radon Mitigation Professional | 6 credits |
| 4) | Radon Mitigation Technician | 6 credits |

AGENCY NOTE: Effective July 1, 2005, the individual who is licensed for both Measurement and Mitigation needs 6 credits per year for each license (i.e., 12 credits per year).

b) Until July 1, 2005, the individual may choose to meet the continuing education criteria that becomes effective July 1, 2005, or the required continuing education per year period for the category of license issued pursuant to the following:

- | | | |
|----|--------------------------------|----------------------------|
| 1) | Radon Measurement Professional | 16 credits (8 Category II) |
| 2) | Radon Measurement Technician | 8 credits |
| 3) | Radon Mitigation Professional | 16 credits (8 Category II) |
| 4) | Radon Mitigation Technician | 8 credits |

AGENCY NOTE: All applicants for individual licenses shall provide evidence of participating in an approved program of continuing education as indicated in subsections (a) and (b) of this Section. All credits are Category I, unless otherwise noted. Category I can be substituted for Category II.

c) Effective July 1, 2005, continuing education credits may be obtained via participation in courses or teaching approved courses. Until July 1, 2005, the individual may choose to meet the criteria that becomes effective July 1, 2005, or continuing education credits may be obtained via participation in courses, teaching approved courses, and by documented attendance at seminars or meetings of professional organizations. To obtain credit for attendance at seminars and meetings, licensees shall submit a copy of the agenda and the sign-in sheet or other similar proof of attendance.

d) Effective July 1, 2005, licensed individuals shall receive continuing education credits (CECs) for an approved radon course only once during a 5 year interval. Until July 1, 2005, the individual may choose to meet the criteria that becomes effective July 1, 2005, or for Radon Measurement Professionals and Radon

Mitigation Professionals, at least 8 of the required 16 continuing education credits (CECs) shall be in approved radon courses.

- e) The basis for a unit of continuing education credit shall be the contact hour (50 minutes) of lecture. Activity other than lecture shall be submitted to the Agency for evaluation in accordance with Section 422.85 of this Part.
- f) Licensees shall submit required documentation for CECs as part of the application for renewal.
- g) Continuing education credit for courses shall be given for courses approved by the Agency in accordance with the procedures specified in Section 422.85 of this Part.
- h) For courses not approved by the Agency, a licensee may submit the information required by Section 422.85 of this Part to the Agency for approval. The documentation shall be submitted at least 180 days prior to license expiration.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.85 Agency Approval of Radon Courses

- a) Persons offering continuing education for a licensed individual may apply for approval by submitting to the Agency, 90 days prior to the start of the course, the following:
 - 1) A completed application on a form prescribed by the Agency that shall include, but not be limited to, the following information:
 - A) Name, business address, telephone number, fax number and e-mail address of the person providing the training;
 - B) Type of course and title; and
 - C) Total hours of supervised instruction within the course;
 - 2) Copies of the syllabus and all training materials to be used in the training course;
 - 3) Pertinent biographical information or credentials of all individuals instructing the training course participants;
 - 4) Criteria upon which successful completion of the course by participants will be judged, such as the test and the correct answers; and
 - 5) A sample copy of a course completion certificate.

AGENCY NOTE: Operators of training courses shall submit a separate application for each course, but if a single course will provide instruction for more than one type of licensed individual, only one application is required.

- b) To maintain approval of a training course, the course operator shall do all of the following:
 - 1) Issue a certificate of completion to each individual who successfully completes the course;
 - 2) Submit to the Agency a list of all individuals who successfully completed the course within 30 days after completion of the course. The list shall include name, business address, telephone number and radon license number;
 - 3) Request, in writing, the Agency's approval of any changes that would render the information contained in the application for approval inaccurate; and
 - 4) For a revised course, submit within 30 days before first teaching the revised course, an informational copy of the complete revised course, whether or not the revisions render the information contained in the application for approval inaccurate.
- c) The Agency may refuse to issue an approval and may revoke or suspend an approval issued pursuant to this Part if the operator of the course fails to meet the criteria specified in subsections (a) or (b) of this Section or if the course is not updated to incorporate new information pertinent to licensed activities.
- d) Approval of a training course shall be valid until the course is revised.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.90 Renewal and Termination of Licenses

- a) Licenses shall be renewed in accordance with Section 422.60 of this Part.
- b) All applicants seeking renewal shall complete the continuing education requirements in Section 422.80 of this Part.
- c) Licensees shall notify the Agency when they wish the Agency to terminate the license.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.100 Fees

- a) The annual fee in all categories shall be non-refundable and shall be as follows:

Radon Measurement Professional license - Individual	\$ 200
Radon Measurement Technician license - Individual	\$ 125
Radon Mitigation Professional license - Individual	\$ 200
Radon Mitigation Technician license - Individual	\$ 125
Laboratory Analysis	\$ 250

- b) The appropriate fees shall accompany a new application when filed with the Agency.

AGENCY NOTE: When the first annual fee statement is mailed, a licensee who has a full year or more remaining before expiration of the license shall be given a credit of one half the amount of the 2-year fee paid.

AGENCY NOTE: A local government or school employee may, upon application for a Radon Measurement Professional license, have the fees waived if his/her practice is limited to his/her employer's facilities and is not charging a fee for this service.

- c) The appropriate fees shall be paid within 60 days of the date on the statement issued by the Agency.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.110 Reports to the Agency

- a) All individuals licensed to perform radon measurements shall submit to the Agency the results and the address of all radon and radon progeny measurements on an annual basis. The file submitted to the Agency shall be an ASCII, comma delimited file. In general, this type of file can be generated by most spreadsheet and database software. Instructions for the specific information and formatting are available from the Agency or on the Agency website.
- b) All individuals licensed to perform radon mitigations shall submit to the Agency the address of all radon and radon progeny mitigations on an annual basis. The file submitted to the Agency shall be an ASCII, comma delimited file. In general, this type of file can be generated by most spreadsheet and database software. Instructions for the specific information and formatting are available from the Agency or on the Agency website.

- c) All licensees shall report apparent non-compliances with either the Radon Industry Licensing Act or this Part to the professional licensee upon discovery; then to the Agency in writing within 45 days upon discovery unless appropriate corrective action has been performed within 30 days of discovery.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.120 Disciplinary Action by the Agency

- a) The Agency may act to suspend or revoke a person's license, may issue a civil penalty, or may issue a civil penalty in addition to suspending or revoking a person's license for any one or a combination of the following causes:
 - 1) Knowingly causing a material misstatement or misrepresentation to be made in the application for a license, if such misstatement or misrepresentation would impair the Agency's ability to assess and evaluate the applicant's qualifications for a license pursuant to this Part, such as a misstatement or misrepresentation regarding training or experience;
 - 2) Willfully evading the statute or regulations pertaining to a license, or willfully aiding another person in evading the statute or regulations pertaining to a license;
 - 3) Having been convicted in any state of a crime that is a felony under the laws of this State or having been convicted of a felony in a federal court, unless such individual demonstrates to the Agency that he/she has been sufficiently rehabilitated, by restoration of all civil rights, to warrant the public trust;
 - 4) Misrepresenting the capabilities of a device for detecting and measuring radon or radon progeny or misrepresenting the results of a test to detect or measure radon or radon progeny;
 - 5) Gross and willful overcharging for professional services, including filing false statements for collection of fees or moneys for which services are not rendered; and
 - 6) A finding by the Department that the licensee, after having his or her license placed on probationary status, has violated the terms of probation.
- b) If, based upon any of the grounds in subsection (a) of this Section, disciplinary action is initiated, the Agency shall notify the person and shall provide an opportunity for a hearing in accordance with 32 Ill. Adm. Code 200.60. An

opportunity for a hearing shall be provided before the Agency takes action to suspend or revoke a person's license.

- c) Suspension of a license shall be for up to 1 year in time. The term of suspension shall be reduced by the Director, upon the recommendation of the hearing officer, if the hearing officer finds, based upon evidence presented to him/her at a hearing, and the Director concurs, that the conditions leading to the Preliminary Order for Suspension can be cured in less than 1 year. However, if the Agency finds that the causes are of a serious or continuous nature, such as past actions which posed an immediate threat to public health or safety, deficiencies that cannot be cured within 1 year or frequent child support arrearages, the Agency shall revoke the person's license.
- d) The Director may summarily suspend the license of a licensee without a hearing, simultaneously with the institution of proceedings for a hearing, if the Director finds that evidence in his or her possession indicates that continuation of the contractor in practice would constitute an imminent danger to the public. *If the Director summarily suspends a license without a hearing, a hearing by the Agency shall be held within 30 days after the suspension has occurred and shall be concluded without appreciable delay.* [420 ILCS 44/50] The hearing shall be held in accordance with 32 Ill. Adm. Code 200.
- e) When a person's license is suspended or revoked, the person shall surrender the license to the Agency and cease licensed activities.
- f) A person whose license has been revoked may seek reinstatement of the license by filing with the Agency a petition for reinstatement. Such petition may be filed after the beginning of the revocation period. The person shall be afforded a hearing in accordance with 32 Ill. Adm. Code 200 and shall bear the burden of proof of establishing that the license should be reinstated due to rehabilitation.
- g) A person who violates any provisions of this Part shall be guilty of a business offense and shall be assessed a penalty in accordance with Section 35 of the Act.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.130 Measurement Protocol

- a) Measurement Location
 - 1) Short-term or long-term measurements shall be made in each lowest structural area suitable for occupancy. For example, a split-level building with a basement, a slab-on-grade room and a room over crawlspace shall have measurements made in each of the foundation types: the basement, a slab-on-grade room and a room over the crawlspace.

- A) Measurements shall be made in rooms that can be regularly occupied by individuals, such as family rooms, living rooms, dens, playrooms and bedrooms.
- B) Charcoal canisters of any type shall not be placed in bathrooms, kitchens, laundry rooms, spa rooms or other areas of high humidity.
- C) Radon in air measurements shall be made either concurrently with or prior to any diagnostic radon in water measurements.
- D) Measurement devices shall be:
 - i) Undisturbed during the measurement period;
 - ii) At least 3 feet from doors, windows to the outside, or ventilation ducts and out of the direct flow of air from the ventilation duct;
 - iii) At least 1 foot from exterior walls;
 - iv) 20 inches to 6 feet from the floor;
 - v) At least 4 inches away from other objects horizontally or vertically above the detector;
 - vi) At least 4 feet from heat, fireplaces and furnaces, out of direct sunlight, etc.
- E) Measurement devices may be suspended in the general breathing zone and, if suspended, shall be 20 inches to 6 feet above the floor.
- F) Measurements made in closets, cupboards, sumps, crawlspaces or nooks within the foundation shall not be used as a representative measurement and shall not be the basis for a decision to, or not to, mitigate the radon level within a building.

b) Measurements

- 1) A short-term measurement shall range in duration from 48 hours to 90 days, depending upon the measurement device used. Unoccupied homes shall be tested with the HVAC system set and operating throughout the measurement interval in the normal range, such as 72 degrees F plus or minus 5 degrees F.
 - A) Short-term measurements shall be made under closed-building conditions. In measurements lasting more than seven days and less

than 90 days, closed-house conditions shall be maintained as much as possible while the measurement is in progress.

- B) Closed building conditions shall begin at least 12 hours prior to the beginning of the measurement period for measurements lasting less than 4 days.
- C) The following conditions shall be complied with during closed-building conditions:
 - i) Operation of permanently installed HVAC systems shall continue during closed-building conditions. Radon Measurement licensees shall inform the resident in writing that operation of dryers, range hoods, bathroom fans and other mechanical systems that draw air out of the building may adversely affect the measurement results.
 - ii) In buildings having permanently installed radon mitigation systems, the mitigation system shall be functioning during the measurement interval.
 - iii) Air conditioning systems that recycle interior air may be operated during closed-building conditions.
 - iv) All windows shall be kept closed.
 - v) All external doors shall be closed except for normal entry and exit. Structural openings due to disrepair or structural defects shall be repaired to correct their condition prior to initiation of closed-building conditions. All exterior windows and doors shall be inspected by a Radon Measurement Professional licensee or Radon Measurement Technician at the placement and retrieval of the detectors and the result of the inspection documented for the measurement file.
 - vi) Whole-house fans shall not be operated. Portable window fans shall be removed from the window or sealed in place. Window air conditioning units shall only be operated in a recirculating mode. If the building contains an air handling system, the air handling system shall not be set for continuous operation unless the air handling equipment is specifically used for radon control and is so labeled.
 - vii) Fireplaces or combustion appliances, except water heaters and cooking appliances, shall not be operated unless they are the primary sources of heat for the building.

viii) Ceiling fans, portable dehumidifiers, portable humidifiers, portable air filters and window air conditioners shall not be operated within 20 feet of the detector.

D) Short-term measurements of less than 96 hours shall not be conducted during severe storms or periods of sustained high winds (30 miles per hour or more). Radon Measurement licensees shall check and document local weather forecasts prior to placing short-term measurement devices when the measurement period is less than 96 hours.

AGENCY NOTE: The National Weather Service defines a severe storm as a storm that generates winds of 58 mph, and/or 3/4-inch diameter hail and that may produce tornadoes -- not necessarily in that order.

E) The Radon Measurement licensee shall document that instructions describing closed-building conditions in subsection (b)(1) of this Section were provided for the person who controls the building in accordance with subsections (d)(1) and (2) of this Section.

2) The Radon Measurement licensee shall advise the resident in accordance with Appendix A of this Part.

3) Follow-up measurements shall be conducted in the same location as the initial measurement, provided the initial measurement was performed in accordance with acceptable measurement placement protocol.

4) The results of both initial and follow-up measurements and the average of duplicate measurements shall be reported. The average shall be considered appropriate as the basis for determining the need for mitigation.

c) Options for Real Estate Testing

1) Option 1: Sequential Testing

A) The results of the first measurement shall not be reported prior to making the second measurement. The results of sequential measurements shall be reported to the client at the same time.

B) The average of the sequential measurements shall be reported and shall be considered appropriate as the basis for determining the need for mitigation.

- C) Sequential tests shall be:
 - i) Made with similar measurement devices (see Appendix C of this Part);
 - ii) For similar time periods;
 - iii) In the same locations; and
 - iv) Reported in the same units (pCi/L).

2) Option 2: Simultaneous Testing

- A) Simultaneous testing shall be comprised of a minimum of 2 indoor radon measurements conducted simultaneously with similar measurement devices (see Appendix C of this Part).
- B) Simultaneous tests shall be:
 - i) Co-located and spaced 4 to 5 inches apart;
 - ii) Be exposed for the same measurement period; and
 - iii) Produce results in the same units (pCi/L or WL).
- C) The results of both measurements and the average of the simultaneous measurements shall be reported and shall be considered appropriate as the basis for determining the need for mitigation.
- D) Simultaneous measurement results that are both less than 4.0 pCi/L shall agree with a Relative Percent Difference (RPD) of less than 67 percent. RPD is the difference between the 2 results divided by the average of the 2 results times 100. If the RPD is greater than 67 percent, the Radon Measurement Professional licensee shall investigate, document and correct the sources of the error.
- E) When one of the measurements is equal to or greater than 4.0 pCi/L and one is less than 4.0 pCi/L, and the higher result is greater than twice the lower result, the client shall be informed of the large discrepancy and the simultaneous measurements repeated at no added cost to the client.
- F) Simultaneous measurement results that are both equal to or greater than 4.0 pCi/L shall agree with a RPD of less than 36 percent. If the RPD is greater than 36 percent, the Radon Measurement Professional

licensee shall investigate, document and correct the sources of the error.

- G) The precision of simultaneous measurements shall be monitored and recorded in the quality assurance records. The analysis of data from simultaneous measurements shall be plotted on range control charts. If the precision estimated by the user is not within the precision expected of the measurement method, the cause of the problem shall be investigated and corrective action taken in accordance with the licensee's Agency-approved quality program.

3) Option 3: Performing A Single Test

- A) This option requires an active continuous monitor that has the capability to integrate and record a new result at least hourly. Shorter integration periods and more frequent data logging afford greater ability to detect unusual variations in radon or radon progeny concentrations.
- B) The minimum single test measurement period shall be 48 hours. The first 4 hours of data from a continuous monitor may be discarded or incorporated into the result using system correction factors. There shall be at least 44 contiguous hours of usable data to produce a valid average.
 - i) The "backing out" of data (i.e., removal of portions imbedded in the 44 contiguous hours of monitoring) shall invalidate the measurement.
 - ii) The periodic results shall be averaged to produce a result that is reported to the client.

4) Additional Requirement for Real Estate Option Testing

- A) Real Estate Option tests shall be conducted in accordance with subsections (a) (1) and (b)(1) of this Section.
- B) The measurement exposure time shall be a minimum of 48 hours.
- C) Measurement licensees shall establish controls consistent with the devices used in their measurements to prevent interference and document those controls in accordance with subsection (l)(1) of this Section.

d) Non-Interference Agreement

- 1) The buyer, seller, occupant, real estate professional or other individual in control of the property shall sign a non-interference agreement indicating an understanding of the testing conditions of this Part and of the penalties for interference with an in-progress radon measurement.
 - 2) If such an agreement cannot be or will not be signed by the buyer, seller, occupant, real estate professional or other individual in control of the property, the Radon Measurement licensee shall document on the agreement why the signature was not obtained. The agreement shall be retained for inspection by the Agency.
- e) **Radon Measurement In Progress Notification.** The licensee shall post at every building entry and in a conspicuous location a Radon Measurement In Progress Notification. The Notice shall be posted upon initiation of a radon measurement. A copy of a Radon Measurement In Progress Notice is provided in Appendix D of this Part.
- f) **School and Commercial Building Measurements**
- 1) Initial measurements shall be short-term measurements of at least 48 hours to 90 days, depending on the device used, and shall be made in all frequently occupied rooms in contact with the soil, whether the contact is slab-on-grade, a basement, berm, a room above a crawlspace or any combination.
 - A) Frequently occupied rooms include classrooms, offices, conference rooms, gymnasiums, auditoriums, cafeterias and break rooms.
 - B) Testing need not be conducted in infrequently used areas such as storage rooms, stairwells, restrooms, utility closets, elevator shafts or hallways.
 - C) A minimum of one detector shall be placed per every 2000 square feet of open floor area.
 - 2) All frequently occupied rooms shall be tested simultaneously.
 - A) The licensee shall ensure that the teacher or frequent adult user of the room being tested is aware of the detector.
 - B) The licensee shall perform and document a surveillance of the building to determine the rooms needing testing prior to placement.
 - 3) Follow-up measurements shall be performed in every room with a short-term, initial measurement result of 4.0 pCi/L or greater. Refer to Appendix A of this Part.

- 4) During both initial and follow-up measurements, the HVAC system shall be operated normally.
- 5) The Radon Measurement Professional licensee shall recommend in writing to the school or commercial building management, owners or representatives that a decision to mitigate not be based on initial measurement results.
- 6) School and commercial building measurements shall be performed in accordance with subsections (a) and (b) of this Section.
 - A) School and commercial building measurements of less than 4-days duration shall be performed under closed-building conditions as described in subsection (b)(1) of this Section.
 - B) Duplicate measurements shall be performed and shall represent 10 percent of all the detectors deployed, or a maximum of 50 detectors, whichever is less, within the building.
 - C) Blank measurements shall be performed and shall represent 5 percent of all the detectors deployed, or a maximum of 25 detectors, whichever is less, within the building.
 - D) A Device Placement Log and Floor Plan shall be finalized for each school or commercial building in which radon or radon progeny measurements are made. All measurement devices, including duplicate measures and blanks, shall be noted on the Device Placement Log and Floor Plan by serial number.
- 7) Requirements for Specific School and Commercial Building Designs
 - A) Slab-on-grade-Design. Measure all frequently-occupied rooms in contact with the ground.
 - B) Open-plan or Pod Design. If sections of a pod have moveable walls that can physically separate them from other sections, measure each section separately. If moveable walls are absent or inoperable, measure the pod as one room placing detectors every 2000 square feet.
 - C) Crawlspace Design. Measure all rooms directly above an enclosed crawlspace.
 - D) Basement Design. In addition to measuring all frequently-occupied basement rooms, measure all frequently occupied rooms above the basement that have at least one wall with substantial contact with the ground.

g) New Construction Testing Conditions.

- 1) Newly constructed buildings shall not be tested for radon or radon progeny unless the installation of the following items is completed:
 - A) All insulation;
 - B) All exterior doors with associated hardware shall be installed prior to testing;
 - C) All windows;
 - D) All fireplaces and fireplace dampers;
 - E) All heating, air conditioning, and plumbing appliances;
 - F) All ceiling covers;
 - G) All interior trim and coverings for the exterior walls;
 - H) All exterior siding, weatherproofing and caulking;
 - I) All interior and exterior structural components; and
 - J) Any interior or exterior work that may adversely affect the measurement validity.
- 2) Unoccupied homes shall be tested with the HVAC system set and operating in the normal range, such as 72 degrees F plus or minus 5 degrees F.

h) Post-Mitigation Testing

- 1) Post-mitigation measurements shall not be conducted if temporary radon reduction measures are in use.
- 2) Post-mitigation measurements shall be conducted to determine a system's effectiveness after a permanent radon reduction system has been fully operational for at least 24 hours but not later than 30 days following completion and activation of a mitigation system. The mitigation system shall be operated normally and continuously during the entire measurement period.
- 3) Post-mitigation measurements shall be conducted in accordance with subsections (a), (b) and (c) of this Section.

i) Temporary Radon Reduction Measures

1) Temporary radon reduction measures include:

- A) The introduction of unconditioned air into the building; or
- B) Closure of normally accessible areas of the building; or
- C) Lowering the thermostat below its normal use range, such as 72 degrees F plus or minus 5 degrees F.

2) Any of the conditions listed in subsection (i)(1) of this Section shall invalidate measurement results. The Radon Measurement licensee shall not conduct a measurement until the conditions have been corrected. The Radon Measurement licensee shall inform the client and other parties involved in a real estate transaction that these conditions invalidate the measurement results.

3) Any improper radon reduction efforts that may affect the measurement results identified prior to, during, or after initial, follow-up, real estate option or post-mitigation measurements shall invalidate the measurement results. The Radon Measurement licensee shall not conduct a measurement until the improper conditions have been corrected.

4) Post-mitigation measurements shall not be conducted if any improper radon reduction efforts that may affect the measurement results are identified.

j) When Radon Measurements Shall Not Be Made

1) Short-term radon measurements of less than 96 hours shall not be conducted during severe storms or periods of sustained high winds (30 miles per hour or more). Radon Measurement licensees shall check and document local weather forecasts prior to placing short-term measurement devices when the measurement period is less than 96 hours.

AGENCY NOTE: The National Weather Service defines a severe storm as a storm that generates winds of 58 mph, and/or 3/4-inch diameter hail and that may produce tornadoes -- not necessarily in that order.

2) Radon measurements of any duration shall not be made during renovation of a building, especially renovations involving structural changes, or during renovations of the HVAC systems or any change that disturbs the normal airflow of the building.

AGENCY NOTE: When renovations are planned, radon measurements should be made prior to renovations and immediately upon the completion of renovations.

- 3) Schools and commercial buildings shall only be tested for radon during periods when the HVAC system is operating as it is normally when the buildings are occupied even if the testing occurs when school is not in session or during long holidays.
- k) Quality Assurance for Radon Measurements.
- 1) Radon Measurement licensees shall abide by the Quality Assurance Program described in Section 422.60(a)(5)(D) of this Part.
 - 2) Measurements not performed in accordance with subsections (a), (b) and (c) of this Section shall be considered inappropriate for the purpose of determining the need for mitigation or the effectiveness of a mitigation service.
- l) Measurement Documentation
- 1) Radon Measurement Professional licensees shall ensure that sufficient information on each measurement is recorded in a permanent record to allow for future data comparisons, interpretations and reporting to clients. Radon Measurement Professional licensees shall keep the following information in a measurement record that shall be retained for a minimum of 5 years. Additional method-specific documentation is outlined in Section 422.140 of this Part.
 - A) A copy of the final report, including the measurement results, and the statement describing any recommendations concerning retesting or mitigation provided to the occupant, the owner of the building, his/her representatives or the client;
 - B) The address of the building measured, including zip code;
 - C) A diagram of the footprint of the building noting the exact locations of all measurement devices deployed and any information that would allow for future data comparisons and interpretations, such as the information in subsection (l)(1)(F) of this Section.
 - D) Exact start and stop dates and times of the measurement period, as required for analysis;
 - E) A description of the measurement devices used and serial numbers;

- F) A description of the condition of any permanent vents, such as crawlspace vents or combustion air supply to combustive appliances;
 - G) The name and Illinois license number of the service or analysis organizations used to analyze devices;
 - H) The name and Illinois license number of the individual who conducted the test;
 - I) A description of any variations from or uncertainties about standard measurement procedures, closed-building conditions or other factors that may affect the measurement result;
 - J) A description of any non-interference controls used and copies of signed non-interference agreements; and
 - K) A record of any quality control measures associated with the test, such as the results of simultaneous or diagnostic measurements.
- m) Reporting Measurement Results. Radon Measurement Professional licensees shall return radon measurement results to the occupant, the owner of the building, his/her representatives or the client within 45 days after retrieving exposed devices. Laboratories receiving an exposed device that has been delivered for analysis shall return results to the client within 45 days. As a minimum, the measurement report shall contain:
- 1) Measurement results reported in the units that the device measures. Any measurement results based on radon gas shall be reported to no more than one decimal place, e.g., 4.3 pCi/L. Any measurement result based on radon progeny shall be reported to no more than 3 decimal places, e.g., 0.033 WL.
 - 2) Working level values shall be converted to pCi/L and both shall be reported to the client. The conversions from WL to pCi/L shall be presented and explained clearly in the report to the client. A statement shall be included in the measurement report stating that this approximate conversion is based on a 50 percent equilibrium ratio. In addition, the report shall state that this equilibrium ratio is typical but that any indoor environment may have a different and varying relationship between radon and radon progeny.
 - 3) The dates of the measurement period and address of the building tested.
 - 4) A description of the measurement device used, its manufacturer, model or type, and serial numbers or other unique device identification numbers.

- 5) The name and Illinois license numbers of the person placing and retrieving the device and the Illinois license number of the laboratory analyzing the device.
 - 6) A statement describing any observed tampering, interference or deviations from the required measurement conditions.
 - 7) A copy of the diagram required in accordance with subsection (l)(1)(C) of this Section.
 - 8) Grab sampled measurements shall be reported with written notification stating that grab sample results are useful diagnostic tools, but are not a basis for making a decision regarding mitigation.
- n) Devices Placed by Clients. Radon licensees shall provide the client with the following:
- 1) For licensees providing measurement devices to clients, sufficient detectors to ensure that testing is performed consistent with this Part.
 - 2) The Agency's address and telephone number.
 - 3) Devices that will be placed by the client shall be accompanied by instructions on how to use the device. These instructions shall be consistent with this Section and include specific information on the minimum and maximum length of time that the device shall be exposed.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.140 Device Protocol

- a) Quality Assurance
- 1) Professional licensees providing measurement services using radon and radon product measurement devices shall establish and maintain a Quality Assurance Program (QAP). These programs shall include written procedures for attaining quality assurance objectives and a system for recording and monitoring the results of the quality assurance measurements for each device used. The QAP shall include the maintenance of control charts and related statistical data.
 - 2) The objective of quality assurance is to ensure that data are scientifically sound and of known precision and accuracy. This subsection (a)(2) discusses the 6 general categories of quality control measurements. Specific guidance is provided for each method in the relevant protocol.

- A) Calibration Measurements. Calibration measurements are samples collected or measurements made in a known radon environment, such as a radon chamber. Instruments providing immediate results, such as continuous working level and radon monitors, shall be operated in a radon chamber to establish individual instrument calibration factors.
- i) Calibration measurements must be conducted to determine and verify the conversion factors used to derive the concentration results. These factors are determined normally for a range of concentrations and exposure times, and for a range of other exposure and/or analysis conditions pertinent to the particular device.
 - ii) Determination of these calibration factors is a necessary part of the laboratory analysis and is the responsibility of the laboratory. These calibration measurement procedures, including the frequency of tests and the number of devices to be tested, shall be specified in the QAP maintained by manufacturers and analysis laboratories.
 - iii) Licensees providing measurements with active devices are required to recalibrate their instruments at least once every 12 months.
- B) Known Exposure Measurements (Spikes). Known exposure measurements or spiked samples consist of detectors that have been exposed to known concentrations in a radon chamber. These detectors, such as charcoal canisters, alpha track detectors and electret ion chambers, are labeled and submitted to the laboratory in the same manner as ordinary samples to preclude special processing.
- i) Suppliers and analysis laboratories shall provide for the blind introduction of spiked samples into their measurement processes and the monitoring of the results in their QAP.
 - ii) Licensees using passive measurement devices shall conduct spiked measurements at a rate of 3 per 100 measurements, with a minimum of 3 per year and a maximum required of 6 per month. Devices shall be exposed in a radon chamber at a minimum of 3 different radon concentrations, such as approximately 4.0, 10-30 and 30-100 pCi/L.

iii) Spikes shall be labeled in the same manner as field detectors to ensure identical processing. The results of analyses of detectors exposed to known radon concentrations shall be monitored and recorded. Any significant deviation from the known concentration to which they were exposed shall be investigated and corrective action taken.

C) Background Measurements. Background measurements are required both for continuous monitors and for passive detectors requiring laboratory analysis.

i) Licensees using continuous monitors shall perform sufficient instrument background measurements to establish a reliable instrument background and to act as a check on instrument operation.

AGENCY NOTE: Calibration laboratories routinely perform background measurements of continuous monitors during the calibration of instruments.

ii) Passive detectors requiring laboratory analysis require one type of background measurement made in the laboratory and another in the field.

iii) Laboratories shall measure the background of a statistically significant number of unexposed detectors from each batch or lot to establish the laboratory background for the batch and the entire measurement system. This laboratory blank value is subtracted (by the laboratory) from the field sample results reported to the user, and shall be made available to the users for quality assurance purposes.

iv) Laboratories performing these measurements shall calculate the lower limit of detection (LLD) for their measurement systems. This LLD is based on the detector and analysis system's background and can restrict the ability of some measurement systems to measure low concentrations.

v) Licensees using passive detectors shall employ field controls (called blanks) equal to approximately 5 percent of the detectors that are deployed, or 25 each month, whichever is smaller.

vi) These controls shall be set aside from each detector shipment, kept sealed and in a low radon environment,

labeled in the same manner as the field samples to preclude special processing, and returned to the analysis laboratory along with each shipment. These field blanks measure the background exposure that may accumulate during shipment and storage. The results shall be monitored and recorded.

- vii) The recommended action to be taken if the concentrations measured by one or more of the field blanks is significantly greater than the LLD is dependent upon the type of detector and is discussed in the protocol for each method.

D) Duplicate Measurements. Duplicate measurements provide a check on the precision of the measurement result and allow the user to make an estimate of the relative precision. Large precision errors may be caused by detector manufacture or improper data transcription or handling by suppliers, laboratories, or technicians performing placements. Precision error can be an important component of the overall error; therefore, licensees performing measurements shall monitor precision.

- i) Duplicate measurements shall be side-by-side measurements made in at least 10 percent of the total number of measurement locations, or 50 each month, whichever is smaller. The locations selected for duplicate measurement shall be distributed systematically throughout the entire population of samples.
- ii) The precision of duplicate measurements shall be monitored and recorded in the quality assurance records. The analysis of data from duplicates shall be plotted on range control charts. If the precision estimated by the user is not within the precision expected of the measurement method, the cause of the problem shall be investigated.
- iii) Detectors shall be treated identically in every respect. They shall be shipped, stored, opened, installed, removed and processed together, and not identified as duplicates to the processing laboratory.

E) Routine Instrument Performance Checks. Proper functioning of analysis equipment and operator usage require that the equipment and measurement system be subject to routine checks. Regular monitoring of equipment and operators is vital to ensure consistently accurate results. Performance checks include the frequent use of an instrument check source. Components of the device (such as a pump, battery or electronics) shall be checked

regularly and the results noted in a record. Each user shall develop methods for regularly monitoring (preferably daily with use) their measurement system and for recording and reviewing results.

- F) Cross-checks. Professional licensees using active monitors shall check their monitors for bias on a regular basis. Ideally, such measurements are made in a radon chamber. Exposure in a radon chamber is required during calibration. It can be difficult to expose active monitors more often than once every 12 months. It is important to more frequently access the continued satisfactory operation of the instrument response and to ensure damage from shipping has not occurred prior to an instrument being placed into service after calibration. Cross-checks shall be performed prior to placing an instrument being returned to service after calibration and at 6 months (plus or minus a month) after calibration. The following conditions shall be met:
 - i) Where feasible, a cross-check shall begin with an instrument background measurement.
 - ii) The cross-check measurement shall be made in an environment that has been chosen for its stability and radon concentration that is above the lower limit of detection.
 - iii) Cross-checks shall be side-by-side measurements.
 - iv) One of the instruments shall have been calibrated within the last 45 days.
 - v) A measurement of at least 48 hours duration shall be conducted.
 - vi) The bias of cross-check measurements shall be monitored and recorded in the quality assurance records. If the bias estimated by the user is not within the bias expected of the measurement, the cause of the problem shall be investigated and corrective action taken in accordance with the licensee's Agency-approved QAP.
- b) Protocol for using continuous radon monitors (CRs) to measure indoor radon concentrations
 - 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.

- 2) When performing a radon measurement, the CR shall be programmed to run continuously, recording periodically (hourly or more frequently) the radon concentration for at least 48 hours. Longer measurements may be required per the continuous monitor type and the radon level being measured.
 - 3) If the first 4 hours of data from a 48-hour measurement are discarded because data are produced prior to the establishment of equilibrium conditions in the test device, the remaining hours of data shall be averaged and shall be sufficient to represent a 2-day measurement.
 - 4) Every CR shall be calibrated in a radon chamber, approved by the Agency, before being placed into service, and after any repairs or modifications that could affect the calibration. Subsequent recalibrations and background checks shall be performed at least once every 12 months. Each scintillation cell requires an individual calibration factor.
 - 5) Background measurements shall be performed after every 1,000 hours of operation of scintillation cell-type CRs and whenever any type of CR is calibrated. The background shall be checked by purging the monitor with clean, aged air or nitrogen in accordance with the manufacturer's instructions. In addition, the background count rate shall be monitored in accordance with the manufacturer's instruction.
 - 6) Licensees providing measurement services with CR devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
 - 7) Pumps and flow meters shall be checked before and after each measurement in accordance with the manufacturer's instruction.
 - 8) Licensees providing measurement services with CR devices shall perform cross-checks. The performance and analysis of cross-checks shall be completed in accordance with subsection (a)(2)(F) of this Section.
- c) Protocol for using alpha track (AT) detectors to measure indoor radon concentrations
- 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) The laboratory background level for each batch of ATs shall be established by each laboratory licensed by the Agency. Laboratories shall measure the background of a statistically significant number of unexposed ATs that have been processed according to the licensee's Quality Assurance Program implementing/operating procedures.

- 3) Every AT laboratory system shall be calibrated in a radon chamber at least once every 12 months. Determination of a calibration factor requires exposures of ATs to a known radon concentration in a radon chamber. These calibration exposures shall be used to obtain or verify the conversion factor between net tracks per unit area and radon concentration.
 - A) ATs shall be exposed in a radon chamber at a minimum of 3 different radon concentrations such as approximately 4.0, 10-30 and 30-100 pCi/L or exposure levels similar to those found in the tested buildings.
 - B) Expose a minimum of 10 detectors at each radon concentration of the chamber.
 - C) A calibration factor shall be determined for each batch or sheet of detector material received from the supplier. Alternatively, calibration factors may be established for several sheets, and these factors extended to detectors from sheets exhibiting similar sensitivities (within pre-established tolerance limits).
 - D) Analysis instruments shall be checked at least daily for operability prior to operation. Analysis instruments do not need to be checked on days not used.
- 4) Licensees providing measurement services with AT devices shall perform known exposure measurements (spikes). The performance and analysis of spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.
- 5) Licensees providing measurement services with AT devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 6) Licensees providing measurement services with AT devices shall perform background measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - A) The results shall be monitored and recorded. If one or a few field blanks have concentrations significantly greater than the LLD established by the supplier, it may indicate defective packaging or handling and the licensee shall investigate the cause. If the average value from the field control devices (field blanks) is significantly greater than the LLD established by the supplier, this average value shall be subtracted from the individual values reported for the other devices in the exposure group.

- B) It may be advisable to use 3 sets of detectors (pre-exposure, field and post-exposure background) in order to allow the most thorough and complete evaluation of radon levels. For example, one group of detectors (pre-exposure detectors) may be earmarked for background measurement and returned for processing immediately after the other detectors are deployed. The results from these detectors determine if the number of tracks acquired before deployment is significant and should be subtracted from the gross result. The second set of background detectors (post-exposure background detectors) are obtained just before the field monitors are to be collected and are opened and kept in the same location as the returning field monitors for the same duration, and returned with them. Finally, this "post-exposure background" is subtracted from the field results, if found to be significant. In general, a value of 1 pCi/L or greater for any blank AT indicates a significant level that should be investigated and potentially subtracted from the field AT results.
- d) Protocol for using electret ion chamber radon (ES or EL) detectors to measure indoor radon concentration.
- 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Every short-term and long-term electret system and the electret reader(s) shall be calibrated in a radon chamber, approved by the Agency. Initial calibration for the system is provided by the manufacturer. Subsequent recalibrations shall be performed at least once every 12 months. Determination of calibration factors for short-term or long-term detectors requires exposure of detectors to known concentrations of radon-222 in a radon exposure chamber. Since short-term and long-term electret detector systems are also sensitive to gamma radiation, a gamma exposure rate measurement in the test chamber is also required annually.
 - 3) The following is provided to manufacturers and suppliers of ES or EL services as minimum requirements in determining the calibration factor:
 - A) Detectors shall be exposed in a radon chamber at a minimum of 3 different radon concentrations, such as approximately 4.0, 10-30 and 30-100 pCi/L, or exposure levels similar to those found in the tested buildings.
 - B) Expose a minimum of 10 detectors at each radon concentration of the chamber.

- C) Ensure a period of exposure sufficient to allow the detector to achieve equilibrium with the radon chamber atmosphere.
- 4) Licensees providing measurement services with ES or EL devices shall perform known exposure measurements (spikes). The performance and analysis of spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.
- 5) Licensees providing measurement services with ES or EL devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 6) Licensees providing measurement services with short-term or long-term electrets shall set aside a minimum of 5 percent of the electrets or 10, whichever number is smaller, from each shipment and evaluate them for voltage drift. The electrets shall be kept covered with protective caps in a low radon environment and analyzed for voltage drift over a time period similar to the time period used for those deployed in measurements. Any voltage loss found in the control electrets of more than one volt per week over a 3-week test period for short-term electrets, or one volt per month over a 3-month period for long-term electrets, shall be investigated.
- 7) Proper operation of the surface voltmeter shall be monitored following the manufacturer's procedures for zeroing the voltmeter and analyzing a reference electret. These checks shall be conducted at least once a week while the voltmeter is in use.
- e) Protocol for using activated charcoal adsorption (AC) devices to measure indoor radon concentrations
 - 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Every activated charcoal adsorption system shall be calibrated in a radon chamber at least once every 12 months. Determination of calibration factors for ACs requires exposure of the detectors to known concentrations of radon-222 in a radon chamber. The calibration factors depend on the exposure time and may also depend on the amount of water adsorbed by the charcoal container during exposure. Calibration factors shall be determined for each AC measurement system (container type, amount of charcoal, gamma detector type, etc.).
 - 3) Licensees providing measurement services with AC devices shall perform known exposure measurements (spikes). The performance and analysis of

spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.

- 4) Licensees providing measurement services with AC devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 5) Laboratory Control Detectors. The laboratory background level for each batch of ACs shall be established by each laboratory or supplier. Suppliers shall measure the background of a statistically significant number of unexposed detectors that have been processed according to their standard operating procedures (laboratory blanks). The analysis laboratory or supplier calculates the net readings, which are used to calculate the reported sample radon concentrations, by subtracting the laboratory blank values from the results obtained from the field detectors.
- 6) Licensees providing measurement services with AC devices shall perform background measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - A) One or a few of the field blanks have concentrations significantly greater than LLD established by the supplier may indicate defective devices or poor procedures and the licensee shall investigate the cause.
 - B) If most of the field blanks have concentrations significantly greater than the LLD, the average value of the field blanks shall be subtracted from the reported field detector concentrations and the supplier notified of a possible problem.
- 7) Counting equipment shall be subject to daily operability checks by counting an instrument check source and determining whether the reference source is constant to within established limits (2 standard deviations). Daily operability checks do not need to be performed on days the instrument is not used. The characteristics of the check source (geometry, type of radiation emitted, etc.) shall be similar to those of the samples analyzed. The count rate of the check sources shall be high enough to yield good counting statistics in a short time (for example, 1000 to 10,000 counts per minute) to provide a maximum random uncertainty of 5 percent.
- f) Protocol for using charcoal liquid scintillation (LS) devices to measure indoor radon concentrations
 - 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.

- 2) Every LS laboratory system shall be calibrated in a radon chamber at least once every 12 months. Determination of calibration factors for LS devices requires exposure of calibration devices to known concentrations of radon-222 in a radon chamber at carefully measured radon concentrations. The calibration factors depend on the exposure time and may also depend on the amount of water adsorbed by the device during exposure. Calibration factors shall be determined for a range of different exposure times and, as appropriate, humidities.
- 3) Licensees providing measurement services with LS devices shall perform known exposure measurements (spikes). The performance and analysis of spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.
- 4) Licensees providing measurements services with LS devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 5) Laboratory Control Devices. The laboratory background level for each batch of LS devices shall be established by each laboratory or supplier. Suppliers shall measure the background of a statistically significant number of unexposed LS devices that have been processed according to their standard operating procedures (laboratory blanks). The analysis laboratory or supplier calculates the net readings, which are used to calculate the reported sample radon concentrations, by subtracting the laboratory blank values from the results obtained from the field detectors.
- 6) Licensees providing measurement services with LS devices shall perform background measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - A) One or a few of the field blanks have concentrations significantly greater than the LLD established by the supplier may indicate defective devices or poor procedures and the licensee shall investigate the cause.
 - B) If most of the field blanks have concentrations significantly greater than the LLD, the average value of the field blanks shall be subtracted from the reported field detector concentrations and the supplier notified of a possible problem.
- 7) Counting equipment shall be subject to daily operability checks by counting an instrument check source and determining whether the reference source is constant to within established limits (2 standard deviations). Daily operability checks do not need to be performed on days the instrument is not used. The characteristics of the check source (geometry, type of radiation

emitted, etc.) shall be similar to those of the samples analyzed. The count rate of the check sources shall be high enough to yield good counting statistics in a short time (for example, 1000 to 10,000 counts per minute) to provide a maximum random uncertainty of 5 percent.

- g) Protocol for using grab radon sampling (GB, GC, GS) pump/collapsible bag devices (PBs), and 3 day integrating evacuated scintillation cells (SCs) to measure indoor radon concentrations
- 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Every GB, GC, GS, PB or SC device shall be calibrated in a radon chamber before being put into service and at subsequent intervals of not more than 12 months.
 - A) Calibration Factors. Determination of calibration factors requires exposure of calibration devices to known concentrations of radon-222 in a radon chamber at carefully measured radon concentrations. The cells shall be recalibrated annually at radon levels similar to those found in tested buildings. Scintillation counting systems used to count exposed cells shall be either the system used to calibrate the cell or one calibrated against that system.
 - B) Cell Calibration. If a GS method of measuring the radon concentration is used in the PB or GB methods, the following calibration procedure shall be followed.
 - i) The cell counting system consisting of the scaler, detector and high voltage supply shall be calibrated. The correct high voltage is determined by increasing the high voltage by increments and plotting the resultant counts. Each counting system shall be calibrated in a radon chamber before use and after any repairs or modifications that could affect the calibration. Subsequent recalibrations shall be performed once every 12 months, with cross-checks to a recently calibrated instrument at least semiannually. A check source or calibration cell shall be counted in each analysis system each day of use to demonstrate proper operation prior to counting any samples.
 - ii) A separate calibration factor shall be obtained for each cell in the counting system. Each cell shall be filled with radon of a known concentration and counted to determine the conversion factor (in counts per minute per pCi). The known concentration of radon may be obtained from a radon

chamber or estimated from a bubbler tube containing a known concentration of radium.

- C) Grab-Radon/Activated Charcoal (GC) Method Calibration. The special cartridge shall be calibrated in a radon chamber prior to use and at least once every 12 months thereafter to establish a calibration factor. Samples shall be taken at different humidities and temperatures to establish correction factors.
- 3) Licensees providing measurement services with GB, GC, GS, PB or SC devices shall perform Known Exposure Measurements (Spikes). The performance and analysis of spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.
 - 4) Licensees providing measurement services with GB, GC, GS, PB or SC devices shall perform Duplicate Measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
 - 5) Laboratory Control Devices. The background level for each device shall be established by each supplier. Suppliers shall measure the background of each device before each use.
 - A) A background count for each type of system is determined prior to measurement.
 - B) When the GC method is used, the background of the charcoal shall also be assessed.
 - 6) Licensees providing measurement services with GB, GC, GS, PB or SC devices shall perform Background Measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - 7) Counting equipment shall be checked prior to each days use with a check source. The characteristics of the check source (i.e., geometry, type of radiation emitted, etc.) shall be as similar to the samples to be analyzed as possible. The count rate of the check source shall be high enough to yield good counting statistics in a short time (for example, 1000 to 10,000 counts per minute) to provide a maximum random uncertainty of 5 percent.
 - 8) Pumps and flow meters shall be checked in accordance with the manufacturer's specification to ensure accuracy of volume measurements. This may be performed using a dry-gas meter or other flow measurement device of traceable accuracy.

- 9) Licensees providing measurement services with GB, GC, GS, or SC devices shall perform cross-checks. The performance and analysis of cross-checks shall be completed in accordance with subsection (a)(2)(F) of this Section.
- h) Protocol for using unfiltered track detection (UT) to measure indoor radon concentrations
 - 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Every UT laboratory system shall be calibrated in a radon chamber at least once every 12 months. Determination of a calibration factor requires exposure of UT detectors to a known radon and radon progeny concentration in a radon chamber. These calibration exposures shall be used to obtain or verify the conversion factor between net tracks per unit area and radon concentration. The following is provided to manufacturers and suppliers of this device as minimum requirements in determining the calibration factor:
 - A) UT detectors shall be exposed in a radon chamber at a minimum of 3 different radon and radon progeny concentrations similar to those expected in the tested buildings. Concentrations of radon progeny shall be known in order to be included in the calculation of the calibration factor.
 - B) A minimum of 10 detectors shall be exposed at each radon concentration of the chamber.
 - C) A calibration factor shall be determined for each batch of detector material received from the material supplier. Alternatively, calibration factors may be established from several sheets and these factors extended to detectors from sheets exhibiting similar sensitivities (within pre-established tolerance limits).
 - D) Altitude of the radon chamber shall be known if located at more than 600 feet (200 meters) above sea level so that a correction can be included in the calculation of the calibration factor.
 - 3) Licensees providing measurement services with UT devices shall perform known exposure measurements (spikes). The performance and analysis of spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.
 - 4) Licensees providing measurement services with UT devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.

- 5) Laboratory Control Detectors. The laboratory background level for each batch of UT detectors shall be established by each supplier. Suppliers shall measure the background of a statistically significant number of unexposed detectors that have been processed according to their standard operating procedures. Normally, the analysis laboratory or supplier calculates the net readings (which are used to calculate the reported sample radon concentrations) by subtracting the laboratory blank values from the results obtained from the field detectors.
- 6) Licensees providing measurement services with UT devices shall perform background measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - A) One or a few of the field blanks have concentrations significantly greater than the LLD established by the supplier may indicate defective devices or poor procedures and the licensee shall investigate the cause.
 - B) If most of the field blanks have concentrations significantly greater than the LLD, the average value of the field blanks shall be subtracted from the reported field detector concentrations and the supplier notified of a possible problem.
- 7) Analysis instruments shall be checked at least daily for operability prior to operation. Daily operability checks do not need to be performed on days the instrument is not used.
- i) Protocol for using continuous working level (CW) monitors to measure indoor radon progeny concentrations
 - 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) When performing a radon measurement, the CW shall be programmed to run continuously, recording the periodic WL and, when possible, the total integrated average WL. The longer the operating time the smaller the uncertainty associated with using the measurement result to estimate a longer-term average concentration.
 - 3) The integrated average WL over the measurement period shall be reported as the measurement result.
 - 4) Every continuous WL monitor shall be calibrated in a radon chamber, approved by the Agency, before being placed into service and after any repairs or modifications that could affect the calibration. Subsequent recalibrations shall be performed at least once every 12 months.

- 5) Background measurements shall be performed after every 168 hours of operation and whenever the unit is calibrated. The CW shall be purged with clean, aged air or nitrogen in accordance with the manufacturers instructions. In addition, the background count rate may be monitored more frequently by operating the CW in a low radon concentration.
 - 6) Measurement licensees providing measurement services with CM devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
 - 7) Pumps and flow meters shall be checked before and after each measurement in accordance with the manufacturer's instruction to ensure accuracy of volume measurements. This may be performed using a dry-gas meter or other flow measurement device of traceable accuracy.
 - 8) Licensees providing measurement services with CW devices shall perform cross-checks. The performance and analysis of cross-checks shall be completed in accordance with subsection (a)(2)(F) of this Section.
- j) Protocol for using radon progeny integrating sampling units (RPISUs or RPs) to measure indoor radon progeny concentrations
- 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Every RP shall be calibrated in a radon chamber, approved by the Agency before being placed into service and after any repairs or modifications that could affect the calibration. Subsequent recalibrations shall be performed at least once every 12 months, with cross-checks with a recently calibrated instrument at least semiannually. Calibration of RPs requires exposure in a controlled radon chamber where the radon progeny concentration is known during the exposure period. The detector shall be exposed in the radon chamber using the normal operating flow rate for the RP sampling pumps. Calibration shall include exposure to a minimum of 4 detectors exposed at different radon progeny concentrations representative of the range found in routine measurements. The relationship of thermoluminescent dosimeters (TLD) reader units or etched track reader units to working level (WL) for a given sample volume and the standard error associated with this measurement shall be determined. Calibration of the RPs includes testing to ensure accuracy of the flow rate measurement.
 - 3) Licensees providing measurement services with RP devices shall perform known exposure measurements (spikes). The performance and analysis of

spikes shall be completed in accordance with subsection (a)(2)(B) of this Section.

- 4) Licensees providing measurement services with RP devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 5) Laboratory Control Detectors. The laboratory background level for each batch of assembled TLDs should be established by each supplier. Suppliers shall measure the background of a statistically significant number of unexposed thermoluminescent assemblies that have been processed according to their standard operating procedures. To calculate the net readings used to calculate the reported sample radon concentrations, the analysis laboratory shall subtract this laboratory blank value from the results obtained from the field detectors.
 - A) Similarly, the laboratory background level for each batch of AT-type RPs shall be established by each supplier of these detectors. Suppliers shall measure the background of a statistically significant number of unexposed detector films that have been processed according to their standard operating procedures. The analysis laboratory shall subtract this laboratory blank value from the results obtained from the field detectors before calculating the final result.
 - B) Users of electret-type RPs shall follow control detector procedures described in subsection (d) of this Section.
- 6) Licensees providing measurement services with RP devices shall perform background measurements. The performance of background measurements shall be completed in accordance with subsection (a)(2)(C) of this Section.
 - A) One or a few of the field blanks have concentrations significantly greater than the LLD established by the supplier may indicate defective devices or poor procedures and the licensee shall investigate the cause.
 - B) If most of the field blanks have concentrations significantly greater than the LLD, the average value of the field blanks shall be subtracted from the reported field detector concentrations and the supplier notified of a possible problem.
- 7) Pumps and flow meters shall be checked before and after each measurement in accordance with the manufacturer's instruction to ensure accuracy of volume measurements. This may be performed using a dry-gas meter or other flow measurement device of traceable accuracy.

- k) Protocol for using grab sampling-working level (GW) technique to measure indoor radon progeny concentrations.
- 1) Refer to Section 422.130 of this Part for a list of general conditions that shall be met and standard information that shall be documented.
 - 2) Pumps and flow meters used to sample air shall be calibrated annually to ensure accuracy of volume measurements. This may be performed using a dry-gas meter or other flow measurement device of traceable accuracy.
 - 3) Every GW device shall be calibrated in a radon chamber before being put into service, and after any repairs or modifications that could affect the calibration. Subsequent recalibrations shall be performed once every 12 months. Grab measurements shall be made in a radon chamber of known radon progeny concentrations to verify the calibration factor. These measurements shall also be used to test the collection efficiency and self-absorption of the filter material being used for sampling. A change in the filter material being used shall require that the new material be checked for collection efficiency in a radon chamber.
 - 4) Counting equipment shall be checked to ensure proper operation. This shall be achieved by counting an instrument check source at least once per day prior to instrument use. Daily operability checks do not need to be performed on days the instrument is not used. The characteristics of the check source (i.e., geometry, type of radiation emitted, etc.) shall be as similar to the samples to be analyzed as possible. The count rate of the check source shall be high enough to yield good counting statistics in a short time (for example, 1000 to 10,000 counts per minute) to provide a maximum random uncertainty of 5 percent.
 - A) The radiological counters shall have calibration checks run daily prior to use to determine counter efficiency. Daily operability checks do not need to be performed on days the instrument is not used. These checks shall be made using a NIST-traceable alpha calibration source such as Am-241. In addition, the system background count rate shall be assessed in accordance with the manufacturer's specification.
 - B) Pumps and flow meters shall be checked in accordance with the manufacturer's specification to ensure accuracy of volume measurements. This may be performed using a dry-gas meter or other flow measurement device of traceable accuracy.

- 5) Licensees providing measurement services with GW devices shall perform duplicate measurements. The performance and analysis of duplicates shall be completed in accordance with subsection (a)(2)(D) of this Section.
- 6) Licensees providing measurement services with GW devices shall perform cross-checks. The performance and analysis of cross-checks shall be completed in accordance with subsection (a)(2)(F) of this Section.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.150 Mitigation Standard

- a) The Mitigation Standard (MS) includes requirements for installation of radon remediation systems and provides a basis for evaluating the quality of such installations. It provides the basis against which in-progress or completed inspections will be evaluated.
- b) Radon Mitigation Professional licensees shall be responsible for all radon mitigation systems installed by their firm or its subcontractors to ensure compliance with the requirements of this Mitigation Standard.
- c) Limitations
 - 1) Where discrepancies exist between provisions of the MS and municipal codes, the municipal codes shall take precedence, except that the municipal codes shall not take precedence with regard to alterations that may adversely impact the radon reduction functions for which such systems were originally designed and may adversely impact public health and safety regarding exposure to a radioactive element.
 - 2) Compliance with the MS does not guarantee reduction of indoor radon concentrations to any specific level.
 - 3) Mitigation systems altered after June 1, 1998, shall be upgraded to the requirements of this Section. Altering radon mitigation systems does not include activities such as replacing worn out equipment or providing new filters, while leaving the remainder of the system unchanged. When maintenance is performed by a licensee on a mitigation system that does not comply with this Part, the client shall be notified in writing that the mitigation system does not comply with the mitigation standards of this Part. In addition, the professional licensee shall provide a written estimate of the upgrades needed and the cost to bring the system into compliance.
 - 4) Radon Mitigation licensees shall have, as reference documents for the design, size, operation, use and selection of the most appropriate mitigation strategy for a given building the following references, as a minimum:

- A) “Radon Reduction Techniques for Detached Houses, Technical Guidance (Second Edition)”, EPA/625/5-87/019, January 1988.
 - B) “Radon Reduction Techniques for Detached Houses, Technical Guidance (Third Edition) for Active Soil Depressurization Systems”, EPA/625/R-93/011, October 1993.
 - C) “Application of Radon Reduction Methods”, EPA/625/5-88/024, August 1988.
- d) Quality Assurance. Radon Mitigation licensees shall follow the procedures specified in the Quality Assurance Program as required by Section 422.60(c)(5)(D) of this Part.
- e) General Practices. The following general practices are required for all contacts between Radon Mitigation licensees and clients.
- 1) In the initial contact with a client, the licensee shall review any available results from previous radon measurements to assist in developing an appropriate mitigation strategy.
 - 2) The licensee shall inform the client of or provide to the client, Illinois specific documents, approved by the Agency, that discuss interpretation of indoor radon test results and the health risk associated with the radon level found in the building. These documents are available from the Agency and are on the Agency web site.
 - 3) Whenever a temporary radon reduction system is installed in lieu of a permanent radon reduction system, the licensee shall:
 - A) Obtain a signed acknowledgement that the client understands the temporary nature of the system;
 - B) Label the system as temporary with a label readable from at least 3 feet away and that states “This system is temporary and will be replaced with a permanent radon reduction system. The estimated date of installation of the permanent radon reduction system is _____.”
 - C) Inform the Agency when the permanent installation is postponed for over 60 days.
 - 4) The licensee shall inform the client in writing, at the time a proposal for the installation of a radon reduction system is offered, of any sealants, caulks, or

bonding chemicals containing volatile solvents and of the need to ventilate work areas during and after the use of such materials. The licensee shall provide ventilation as recommended by the manufacturer of the material used if existing ventilation does not meet the recommendations of the manufacturer of the material used.

f) Building Investigation

- 1) The licensee shall conduct a thorough visual inspection of the building prior to initiating any radon mitigation work. The results of the inspection shall be recorded in detail on a drawing of the floor plan. The licensee shall identify and describe any specific building characteristics and configurations, such as large cracks in slabs, exposed earth in crawlspaces, open stairways to basements, and operational conditions, such as continuously running HVAC systems or operation windows, that may affect the design, installation, and effectiveness of radon mitigation systems.
 - A) As part of this inspection, the licensee shall request from the client any available information on the building, such as construction specifications, pictures, drawings, etc., that might be valuable in determining the radon mitigation strategy.
 - B) A floor-plan drawing shall be finalized from preliminary inspection sketches and shall include illustration of the building foundation, the location of all walls, drain fixtures, HVAC systems and radon entry points, results of any diagnostic testing, the layout of any radon mitigation system piping, and the location of any vent fan and system warning devices.
 - C) The finalized drawing shall be an auditable part of the mitigation file and shall be available to the occupant, the owner of the building, his/her representatives or the client, upon request.
- 2) The licensee shall conduct diagnostic tests to assist in identifying and verifying radon entry points and shall document the results of these tests in writing. Such tests may include radon grab sampling, continuous radon monitoring, and the use of smoke sticks.
- 3) If a contractor has concerns about backdrafting potential at a particular site, the contractor shall recommend that a qualified person inspect the natural draft combustion appliances and venting systems for compliance with local codes and regulations. The contractor shall recommend that the building owner bring into compliance any combustion appliance or venting system, found to be non-complying.

- 4) Licensees shall not install a fan-powered radon reduction system in any building wherein confirmed spillage from any natural combustion appliance occurs, until the licensee has confirmed that the problem has been corrected by the client.
- 5) Licensees shall conduct a communication test prior to completing a proposal for the installation of a radon reduction system in any building where the characteristics of the sub-slab material are unknown to the licensee. The results of the communication test shall be documented in writing or on a drawing of the building floor plan.

g) Systems Design

- 1) All radon mitigation systems shall be designed and installed as permanent, integral additions to a building, except in accordance with subsection (e)(3) of this Section.
- 2) All radon mitigation systems shall be designed to avoid the creation of other health, safety, or environmental hazards to building occupants, such as backdrafting of natural draft combustion appliances.
- 3) The main run of vent pipe, from primary suction point to exhaust, shall be a minimum 3 inches in diameter to avoid excessive flow noise inside the pipe and noise when the exhaust jet is released.
- 4) All radon mitigation systems and their components shall be designed to comply with the laws, ordinances, codes, and regulations of relevant jurisdictional authorities, including applicable mechanical, electrical, building, plumbing, energy and fire prevention codes.
- 5) All radon mitigation systems shall be designed to reduce a radon concentration in each area within the footprint of the building as low as reasonably achievable (ALARA).

h) Systems Installation

- 1) General Requirements
 - A) All components of radon mitigation systems shall also be in compliance with the applicable mechanical, electrical, building, plumbing, energy and fire prevention codes, standards, and regulations of local jurisdiction.
 - B) Where portions of structural framing material must be removed to accommodate radon vent pipes, material removed shall be no greater

than that permitted for plumbing installations by applicable building or plumbing codes.

- C) Where radon mitigation system installation requires pipes or ducts to penetrate a firewall or other fire resistance rated wall, floor or ceiling penetrations shall be protected in accordance with applicable building, mechanical, fire and electrical codes.

AGENCY NOTE: An example of a protected penetration would be the installation of a fire collar on a vent pipe penetrating a ceiling.

- D) Sump pits shall not be used as the primary suction point for mitigation systems, unless in accordance with subsection (h)(7) of this Section.

- E) Installations that require greater than 5 days for installation shall be treated as temporary installations in accordance with subsection (e)(3) of this Section until the permanent installation is complete.

- 2) Passive or skeletal new construction systems are not required components of new building construction, except as included in municipal building codes. Mitigation systems installed in new construction must be performed by a licensed mitigation professional or technician.

- 3) Radon Vent Pipe Installation

- A) All joints and connections in radon mitigation systems using plastic vent pipes shall be permanently sealed with adhesives as specified by the manufacturer of the pipe material used, with 2 exceptions:

- i) If secondary suction points are installed in sump pits, the system shall be designed with removable or flexible couplings to facilitate removal of the sump pit cover and for sump pump maintenance; and

- ii) To facilitate maintenance and future replacement, radon vent fans shall be installed in the vent pipe using removable couplings or flexible connections that can be tightly secured to both the fan and the vent pipe.

- B) Vent stack discharge points shall be directed vertically with no obstruction in the discharge except for a rodent screen of wire mesh no smaller than one-fourth inch. Rain caps shall not be installed on the discharge.

- C) Radon vent pipes shall be fastened to the structure of the building with hangers, strapping, or other supports that will adequately secure the vent material. Existing plumbing pipes, ducts, or mechanical equipment shall not be used to support or secure a radon vent pipe.
 - D) Radon vent pipes shall be supported as follows:
 - i) Supports for radon vent pipes shall be installed at least every 6 feet on non-vertical runs.
 - ii) Vertical runs shall be secured either above or below the points of penetration through floors, ceilings and roofs.
 - iii) Vertical runs shall be secured at least every 8 feet on runs that do not penetrate floors, ceilings or roofs.
 - E) To prevent blockage of air flow into the bottom of radon vent pipes, these pipes shall be supported or secured in a permanent manner that prevents their downward movement to the bottom of suction pits or sump pits, or into the soil beneath an aggregate layer under a slab.
 - F) Radon vent pipes shall be installed in a configuration that ensures that any rain water or condensation within the pipes drains downward into the ground beneath the slab or soil gas retarder membrane.
 - G) Radon vent pipes shall not block access to any areas requiring maintenance or inspection. Radon vents shall not be installed in front of or interfere with any light, opening, door, window or equipment access area required by code.
 - H) When a radon mitigation system is designed to draw soil gas from a perimeter drain tile loop (internal or external) that discharges water through a drain line to daylight or a soakaway, a one-way flow valve, water trap, or other control device shall be installed if diagnostic testing indicates that outside air is entering the system.
- 4) Vent Stack Discharge Point. The discharge from vent stack pipes of active soil depressurization systems shall prevent re-entrainment of radon, prevent vent stack blockage due to heavy snowfall and prevent the direct exposure of individuals outside of buildings to high levels of radon by meeting all the following requirements:
- A) Above the highest eave of the roof and as close to the roof ridge line as possible unless an attached garage may be used for vent stack pipe discharge and all the following additional conditions are met:

- i) The vent stack point penetrates the highest point on the roof that maximizes distance from people using the house, yard, patio, deck etc.;
 - ii) There are no windows in the direct line of sight from the vent stack point;
 - iii) The vent stack point penetrates the farthest point on the roof that maximizes distance from the nearest opening (such as windows, doors, etc.) into the house and garage that is less than 2 feet below the exhaust point; and
 - iv) The reason for routing through an attached garage shall be documented and maintained for inspection by the Agency;
 - B) 10 feet or more above ground level;
 - C) 10 feet or more from any window, door or other opening into conditioned spaces of the structure that is less than 2 feet below the exhaust point. The 10 feet may be measured either directly between the 2 points or be the sum of measurements made around intervening obstacles;
 - D) 10 feet or more from any opening into an adjacent building;
 - E) For vent stack pipes that penetrate the roof, at least 12 inches above the surface of the roof; and
 - F) For vent stack pipes attached to or penetrating the sides of buildings, vertical and at least 12 inches above the edge of the roof and in a position to prevent blockage from snow or other materials and from being filled with water from the roof or an overflowing gutter.
- 5) Radon Vent Fan Installation
- A) Vent fans used in radon mitigation systems shall be designed or otherwise sealed to reduce the potential for leakage of soil gas from the fan housing.
 - B) Radon vent fans used in active soil depressurization systems shall be installed in attics, in garages that are not beneath conditioned spaces, or on the exterior of the building. Radon vent fans shall not be installed below ground nor in the conditioned (heated/cooled) space of a building, nor in any basement, crawlspace, or other interior location directly beneath the conditioned spaces of a building.

- C) Radon vent fans shall be installed in a configuration that avoids condensation buildup in the fan housing. Fans shall be installed in vertical runs of the vent pipe.
- D) Radon vent fans shall be mounted and secured in a manner that minimizes transfer of vibration to the structural framing of the building.
- E) Radon vent fans shall be mounted to the vent pipe with removable couplings or flexible connections to facilitate fan removal for repair or replacement.
- F) The intakes of fans used in crawlspace pressurization, or in pressurizing the building itself, shall be screened or filtered to prevent ingestion of debris or personal injury. Screens or filters shall be removable to permit cleaning or replacement and the building occupant and owner shall be informed of the need to periodically replace or clean such screens and filters. This information shall be included in documentation provided to the client.

6) Suction Pit Requirement for Sub-Slab Depressurization (SSD) Systems.

Materials shall be excavated from the area immediately below the slab penetration point of SSD system vent pipes to provide optimum pressure field extension.

7) Sump Pit Requirements

- A) Sump pits shall not be used as the primary suction point for mitigation systems.
- B) When the sump pit is used as a secondary suction point, a submersible pump shall be installed in the sump pit or in areas where the water table is near the surface, causing flooding of the basement or interfering with the effectiveness of the mitigation system. Pedestal pumps with a higher pumping capacity may be installed in accordance with all the following conditions:
 - i) The pump is installed in accordance with the manufacturer's instructions.
 - ii) The sump lid can be sealed air tight with the exception of the tiny opening necessary to permit free operation of the pedestal pump's float.

- iii) The design does not create noise, through the float opening, that is objectionable to the client.
 - C) Sump pits that permit entry of soil gas or that would allow conditioned air to be drawn into a mitigation system shall be covered and sealed to prevent such entry.
 - D) The covers on sumps that previously provided protection or relief from surface water collection shall be fitted with a water or mechanically trapped drain. Water traps shall be fitted with an automatic supply of priming water.
 - E) Sump pit covers shall incorporate a clear view-port to permit observations of conditions in the sump pit.
 - F) Sump pit covers shall be made of durable plastic or clear polycarbonate and be designed to permit air-tight sealing.
 - G) Sump pit covers shall be designed to support the weight of a 155-pound individual standing on the cover.
 - H) To permit easy removal for sump pump servicing, the sump pit cover shall be sealed using silicone or other non-permanent type caulking materials or an air-tight gasket.
- 8) Sealing Requirements
- A) Openings around radon vent pipe penetrations of the slab, the foundation walls, or the crawlspace soil gas retarder membrane shall be cleaned, prepared and sealed in a permanent, air-tight manner using compatible caulks or other sealants.
 - B) Openings around other utility penetrations of the slab, walls or soil gas retarder shall also be sealed. Cracks in slabs and other small openings around penetrations of the slab and foundation walls shall be cleaned, prepared and sealed in a permanent air-tight manner using caulks or other sealants designed for such application.
 - C) Where a Block Wall Depressurization (BWD) system is used to mitigate radon, openings in the tops of the block walls and all accessible openings or cracks in the interior surfaces of the block walls shall be cleaned, prepared and sealed with caulks or other sealants designed for such application.
 - D) When sealing holes for plumbing rough-in or other large openings in slabs and foundation walls that are below the ground surface, non-

shrink mortar, grouts, expanding foam, or other sealants designed for such application shall be used.

- E) Openings or cracks that are determined to be inaccessible or beyond the ability of the licensee to seal shall be disclosed to the client and included in the documentation.
- F) Openings, perimeter channel drains or cracks that exist where the slab meets the foundation wall (floor-wall joint), shall be sealed with urethane caulk or other sealants designed for such application. When the opening or channel is greater than 1/2 inch in width, a foam backer rod shall be inserted in the channel before application of the sealant. This sealing technique shall be done in a manner that retains the channel feature as a water control system. Other openings or cracks in slabs or at expansion or control joints should also be sealed.
- G) When installing baseboard type suction systems, all seams and joints in the baseboard material shall be joined and sealed using materials recommended by the manufacturer of the baseboard system. Baseboards shall be secured to walls and floors with adhesives designed and recommended for such installations. If a baseboard system is installed on a block wall foundation, the tops of the block walls shall be closed and sealed.

9) Soil Gas Retarder Requirements

- A) A soil gas retarder membrane shall be installed in basement or crawlspace areas without a concrete floor.
- B) Plastic sheeting installed in crawlspaces as soil gas retarders shall be a minimum of 6 mil (3 mil cross-laminated) polyethylene or equivalent flexible material. Heavier gauge sheeting shall be used when crawlspaces are used for storage, or frequent entry is required for maintenance of utilities.
- C) Any seams in soil gas retarder membranes shall be overlapped at least 12 inches and sealed in a permanent air tight manner using compatible glues. The membrane shall also be sealed around interior piers and to the inside of exterior walls with furring strips and sealant or in accordance with specific procedures approved by the Agency.
- D) Access doors required by local building codes shall be fitted with air tight gaskets and a means of positive closure, but shall not be permanently sealed. In cases where both the basement and the adjacent crawlspace areas are being mitigated with active SSD and

SMD systems, sealing of the openings between those areas is not required.

- E) Crawlspace depressurization without the use of a soil gas retarder membrane shall only be used when the crawlspace is inaccessible. When crawlspace depressurization is used for radon mitigation, openings and cracks in floors above the crawlspace that would permit conditioned air to pass out of the living spaces of the building, shall be identified, closed and sealed. Sealing of openings around hydronic heat or steam pipe penetrations shall be done using non-combustible materials.
- F) Drain tile depressurization in a crawlspace shall only be installed under the following conditions:
 - i) In conjunction with a sub-membrane depressurization system; or
 - ii) Suction can be obtained beneath the soil gas retarder.

10) Electrical Requirements

- A) All electrical components of radon mitigation systems shall conform to provisions of the National Electrical Code and any additional local regulations.
- B) Wiring shall not be located in or chased through the radon vent piping or any heating or cooling ductwork.
- C) Any plugged cord used to supply power to a radon vent fan shall be no longer than 6 feet in length.
- D) No plugged cord shall penetrate a wall or be concealed within a wall.
- E) Radon mitigation fans installed on the exterior of buildings shall be hard-wired into an electrical circuit. Electrical disconnects shall be installed within line of sight and within 4 feet of the fan. Exteriorly, plugged fans shall be used only inside of weather-proofed fan housings or weather-proofed chases.
- F) If the rated electricity requirements of a radon mitigation system fan exceeds 50 percent of the circuit capacity into which it will be connected, or if the total connected load on the circuit (including the radon vent fan) exceeds 80 percent of the circuit's rated capacity, a separate, dedicated circuit shall be installed to power the fan.

- G) An electrical disconnect switch or circuit breaker shall be installed in radon mitigation system fan circuits to permit deactivation of the fan for maintenance or repair. Disconnect switches are not required with plugged fans.

11) Drain Installation Requirements

- A) If drains discharge directly into soil beneath the slab or through solid pipe to a soakaway, the licensee shall install a drain that meets local building codes.
- B) If condensate drains from air conditioning units terminate beneath the floor slab, the licensee shall install a trap in the drain that provides a minimum 6-inch standing water seal depth, reroute the drain directly into a trapped floor drain, or reconnect the drain to a condensate pump.
- C) Perimeter (channel or French) drains shall be sealed with backer rods and urethane or comparable sealants in a manner that will retain the channel feature as a water control system.
- D) When a sump pit is the only system in a basement for protection or relief from excess surface water and a cover is installed on the sump for radon control, the cover shall be recessed and fitted with a trapped drain meeting the requirements of subsection (h)(7) of this Section.

12) HVAC Installation Requirements

- A) Modifications to an existing HVAC system that are proposed to mitigate elevated levels of radon should be reviewed and approved by the original designer of the installed HVAC system or by a licensed mechanical contractor.
- B) Foundation vents, installed specifically to reduce indoor radon levels by increasing the natural ventilation of a crawlspace, shall be non-closeable. In areas subject to sub-freezing conditions, the existing location of water supply and distribution pipes in the crawlspace, and the need to insulate or apply heat tape to those pipes, shall be considered when selecting locations for installing foundation vents.
- C) Heat Recovery Ventilation (HRV) systems shall not be installed in rooms that contain friable asbestos.
- D) In HRV installations, supply and exhaust ports in the interior shall be located a minimum of 12 feet apart. The exterior supply and exhaust

ports shall be positioned to avoid blockage by snow or leaves and be a minimum of 10 feet apart.

- E) Contractors installing HRV systems shall verify that the incoming and outgoing airflow is balanced to ensure that the system does not create a negative pressure within the building. Contractors shall inform their client, the occupant and the owner that periodic filter replacement and inlet grill cleaning are necessary to maintain a balanced airflow. Information on filter replacement and inlet grill cleaning shall be provided to their client, the occupant and the owner and shall be included in the documentation.
- F) Both internal and external intake and exhaust vents in HRV systems shall be covered with wire mesh or screening to prevent entry of animals or debris or injury to occupants.

13) Materials

- A) As a minimum, all plastic vent pipes in mitigation systems shall be smooth-walled Schedule 40 PVC.
- B) Piping routed exteriorly shall be rated against deterioration from ultra-violet radiation from the sun.
- C) Exteriorly, Schedule 40 PVC or 3-inch by 4-inch metal downspout shall be used as the vent pipe.
- D) Vent pipe fittings in a mitigation system shall be of the same material as the vent pipes except as noted in subsection (h)(3)(A) of this Section.
- E) Cleaning solvents and adhesives used to join plastic pipes and fittings shall be as recommended by manufacturers for use with the type of pipe material used in the mitigation system.
- F) When sealing holes for plumbing rough-in or other large openings in slabs and foundation walls that are below the ground surface, non-shrink mortar, grouts, expanding foam or other sealants designed for such application shall be used.
- G) Penetrations of sump covers to accommodate electrical wiring, water ejection pipes, or radon vent pipes shall be designed to permit air-tight sealing around penetrations, using caulk or grommets.
- H) Plastic sheeting installed in crawlspaces as soil gas retarders shall be a minimum of 6 mil (3 mil cross-laminated) polyethylene or

equivalent flexible material. Heavier gauge sheeting should be used when crawlspaces are used for storage, or frequent entry is required for maintenance of utilities.

- I) Any wood that comes into direct contact with the soil or concrete and is used in attaching soil gas retarder membranes to crawlspace walls or piers shall be pressure treated or naturally resistant to decay and termites.
- J) When transitioning from one material or shape to another, an adapter specifically designed for the transition shall be used.

14) Monitors and Labeling

- A) All active soil depressurization systems shall include a mechanism to monitor system performance and warn of system failure.
- B) Electrical radon mitigation system monitors (whether visual or audible) shall be installed on non-switched circuits and be designed to reset automatically when power is restored after service or power supply failure. Battery operated monitoring devices shall not be used unless they are equipped with a low-power warning feature.
- C) Mechanical radon mitigation system monitors, such as manometer type pressure gauges, shall be clearly marked to indicate the range or zone of pressure readings that existed when the system was initially activated.
- D) A system description label shall be placed on the vent pipe next to the manometer. This label shall be legible from a distance of 3 feet and include the following information, "Radon Reduction System"; the installer's name, phone number and the Illinois license number; the date of installation; and an advisory that the building should be tested for radon at least every 2 years.
- E) All exposed and visible interior radon mitigation system vent pipe sections shall be identified with at least one label on each floor level that reads, "Radon Reduction System".
- F) Fans mounted outdoors and exterior vent pipe shall be identified with a label that reads, "Radon Reduction System" in a weatherproof manner.
- G) Sump pits that are depressurized by the mitigation system or covered to minimize radon entry shall be identified with a label that reads, "Radon Reduction System - Removal of this cover may result in

failure of the Radon Reduction System. Consult (installer's name and phone number) before removing this cover and for instructions on the correct procedure for replacing it”.

- H) Circuit breakers controlling the circuits on which the radon vent fan and system failure warning devices operate shall be labeled “Radon Reduction System”.

15) Post Installation Checklist

- A) Upon completion of the installation of any radon mitigation system, the licensee shall complete the following steps, and document them on an installation check sheet that shall be signed and dated by a mitigation licensee and shall become auditable evidence.
 - i) Re-examine and verify the integrity of the fan mounting seals and all joints in the interior vent piping.
 - ii) Verify suctions or flows in the system piping or ducting to assure that the system is operating as designed.
 - iii) Advise the client that retesting the building at least every 2 years or if the building undergoes significant alteration is recommended.
 - iv) Request a copy of the report of any post-mitigation testing conducted by the client or by a Radon Measurement licensee.
- B) Radon Mitigation licensees shall inform the client in writing that post-mitigation testing should be conducted no sooner than 24 hours nor later than 30 days following completion and activation of the mitigation system and that the test may be conducted by an independent Radon Measurement licensee or by the resident of the dwelling.

16) Post-Mitigation Testing

- A) Evaluate the effectiveness of the mitigation system using an approved measurement device to assure the system is performing as designed.
- B) Post-mitigation tests shall be performed in accordance with the applicable requirements of Section 422.130 of this Part.

17) Contracts and Documentation

A) No mitigation activity shall be undertaken before a proposal for the work is accepted by the client, as evidenced by the client's signature and date on the proposal. A proposal for the installation of any radon mitigation system shall include as a minimum:

- i) The Radon Mitigation Professional licensee's Illinois license number;
- ii) A statement describing the planned scope of the work and an estimated completion date;
- iii) A statement describing any known hazards associated with chemicals used in or as part of the installation;
- iv) A statement indicating compliance with and implementation of the mitigation standards described in this Section;
- v) A description of any system maintenance that the client, the occupant, or the building owner would be required to perform;
- vi) A firm price of the installation cost and an estimate of the annual operating costs of the system; and

AGENCY NOTE: The firm price may include stepped approaches.

- vii) A statement that the system is guaranteed to reduce the average radon concentration to less than 4.0 pCi/L and the conditions thereof; or a statement explaining that there is no guarantee and the reasons why there is no guarantee.

B) Licensees shall maintain the following records for 5 years or for the period of any warranty or guarantees, whichever is longer, and shall make the following records available to the homeowner upon request and documentation of home ownership:

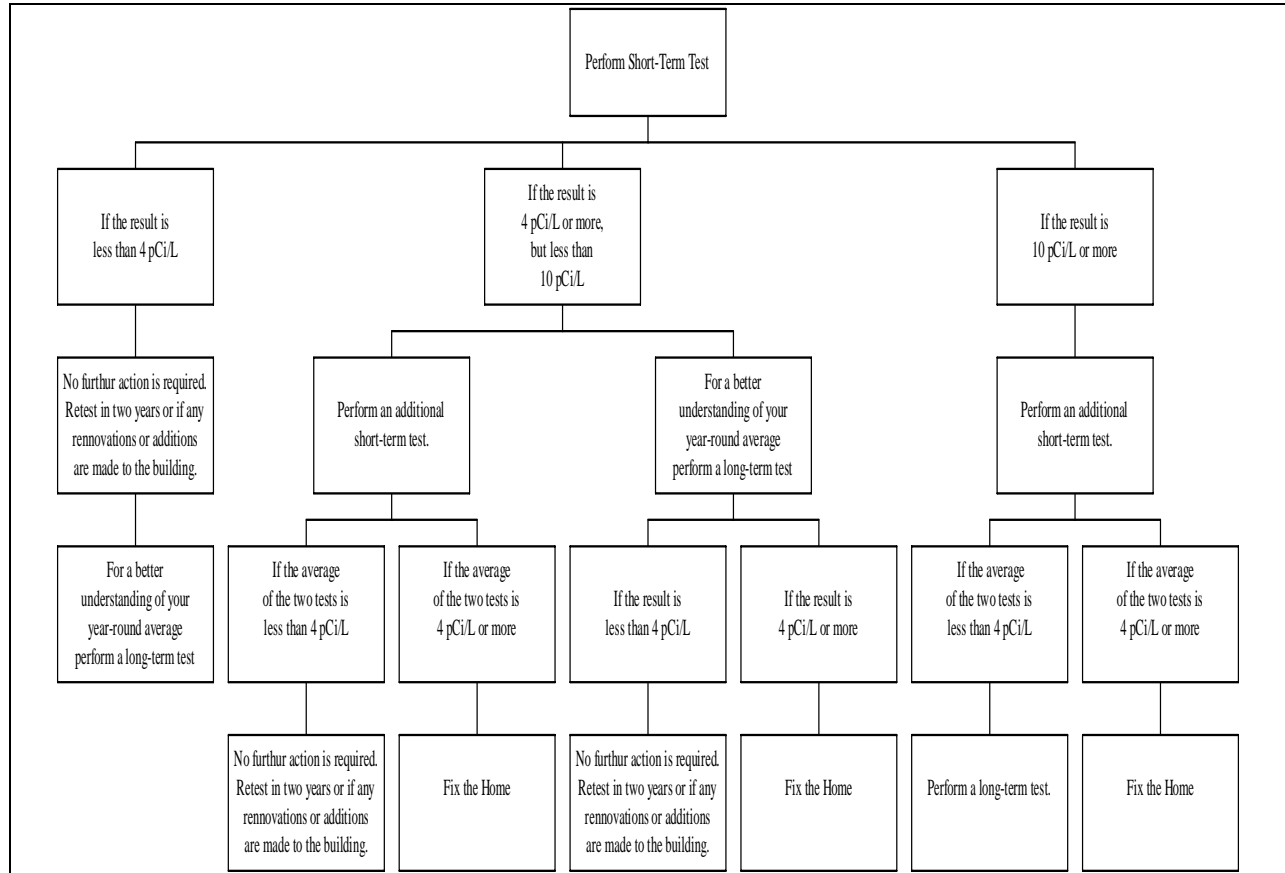
- i) Copies of the building investigation summary and floor plan sketch;
- ii) The finalized drawing that includes illustration of the building foundation, the location of all walls, drain fixtures, HVAC systems and radon entry points, results of any diagnostic testing, the layout of any radon mitigation system piping, and the location of any vent fan and system warning devices.

- iii) Pre-and post-mitigation radon test data;
 - iv) Copies of contracts and warranties;
 - v) A description of the mitigation system installed and its basic operating principles;
 - vi) A description of any deviations from the MS and applicable regulations of this Part;
 - vii) A description of the proper operating procedures of any mechanical or electrical systems installed, including manufacturer's operation and maintenance instructions and warranties; and
 - viii) The proposal, contract, and warranties or guarantees made to the client, and any other documentation important to the mitigation system installed.
- C) Licensees shall, upon completion of the mitigation project, provide clients with an information package that includes:
- i) A list of appropriate actions for clients to take if the system failure warning device indicates system degradation or failure; and
 - ii) The name, telephone number, and license number of the professional licensee and the phone number of the Agency's Radon Program.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422. Appendix A Recommended Testing Strategy for Home Environment Measurements (Buildings Not Involved in a Real Estate Transaction)

The first step is to perform a short-term measurement* in the lowest structural area(s)**.



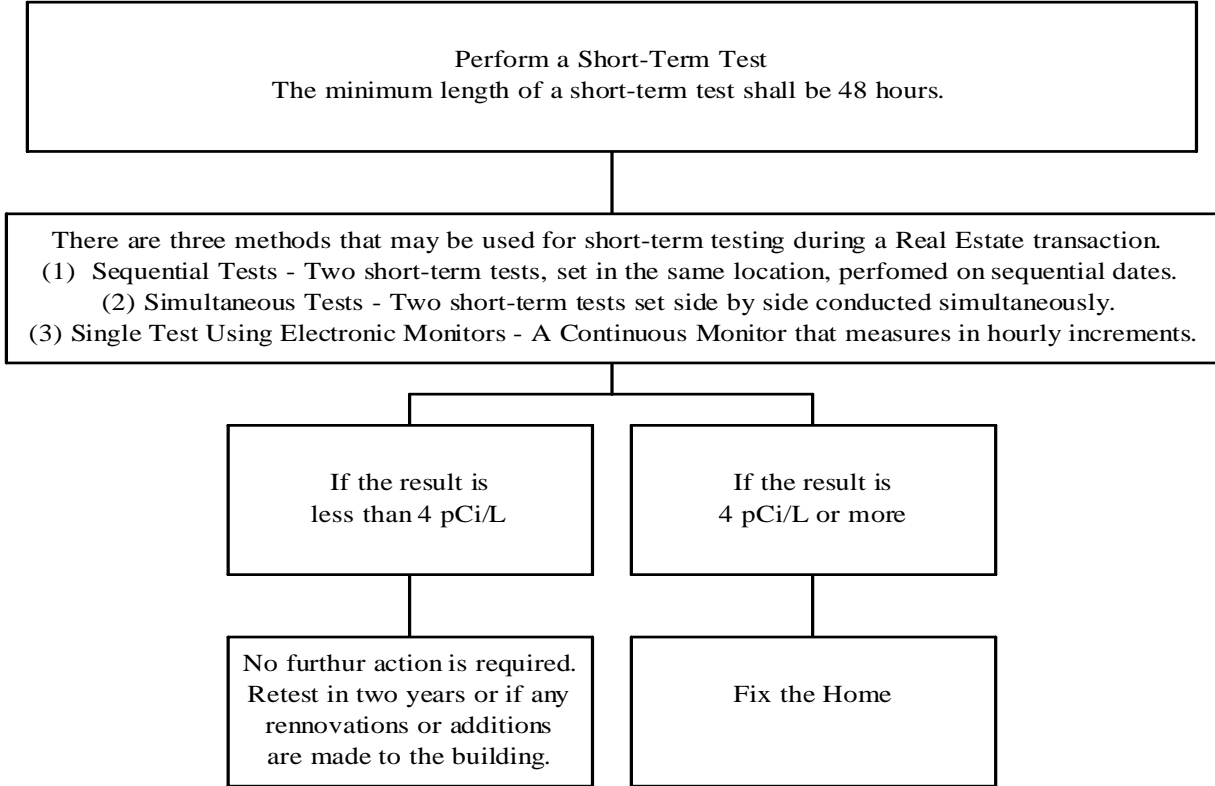
*Short-term tests may last between 2 and 90 days, most last between 2 and 7 days. Examples of short-term detectors used in home environment testing include: activated charcoal canisters, charcoal liquid scintillation vials, electret chambers and continuous monitors. Examples of long-term detectors used in home environment testing include: alpha track detectors and electret chambers.

**Conduct a short-term test in each of the lowest structural areas suitable for occupancy in the home. For example, if the home is a split-level building with one or more foundation types: test in the basement, in a room over the crawlspace and in a slab-on-grade room. In accordance with this protocol measurement professionals are required to test in each of the foundation types.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422. Appendix B Recommended Testing Strategy for Measurements in Buildings Involved in Real Estate Transactions

The first step is to perform a short-term measurement* in the lowest structural area(s)**.



*Short-term tests may last between 2 and 90 days, most last between 2 and 7 days. Tests between seven and 90 days are usually impractical for real estate transactions but are fine for homeowners assessing their own radon situation. Examples of short-term detectors used in home environment testing include: activated charcoal canisters, charcoal liquid scintillation vials, electret chambers and continuous monitors.

**Conduct a short-term test in each of the lowest structural areas suitable for occupancy in the home. For example, if the home is a split-level building with one or more foundation types: test in the basement, in a room over the crawlspace and in a slab-on-grade room. In accordance with this protocol measurement professionals are required to test in each of the foundation types.

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.Appendix C Radon and Radon Decay Product Measurement Method Categories

A (pCi/L)		B (WL)	
AC	Activated charcoal adsorption integrating	RP	Radon progeny sampling unit
AT	Alpha track detection	CW	Continuous working level monitor
LS	Charcoal liquid scintillation		
CR	Continuous radon monitor		
PB	Pump-collapsible bag		
SC	Evacuated scintillation cell (3 day integrating)		
EL	Electret ion chamber; long-term		
ES	Electret ion chamber; short-term		
UT	Unfiltered track detection		
GB	Grab radon collapsible bag		
GC	Grab radon activated charcoal		
GS	Grab radon scintillation cell		

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)

Section 422.Appendix D Sample Notice

Radon Measurement in Progress

This Notice is posted in accordance with Title 32, Chapter II, Subchapter b: Radiation Protection, Measurement Protocol, Section 422.130(e).

Tampering with a radon or radon progeny measurement is prohibited by law and may result in civil penalties.

Removal of this Notice, except by the Radon Measurement Professional licensee named below, is considered tampering.

Radon Measurement Professional licensee:

License No.:

Company:

Telephone No(s).:

(Source: Amended at 29 Ill. Reg. 3212, effective February 22, 2005)