Connecticut Department of Public Health
School Radon Testing Guidance

Purpose: This fact sheet has been prepared to provide NEHA and/or NRSB certified radon measurement professionals with instructions on how to properly test for the presence of radon in schools.

Background

- Radon is a naturally occurring radioactive gas that can cause lung cancer. It comes from the natural breakdown of uranium which is found in soil and rock all over the United States. Radon travels through soil and enters buildings through cracks and other holes in the foundation.

- Radon is colorless, odorless, and tasteless. Therefore, the only way to know whether an elevated level of radon is present in any room of a school is to test.

- EPA's investigations of radon in schools were initiated in 1988 with a study of schools in Fairfax County, Virginia. As the result of a nationwide survey of radon levels in schools, it is estimated that nearly one in five U.S. schools have at least one ground contact room with short-term radon levels above 4 pCi/L; the level at which the EPA suggests mitigation.

- It is recommended that all schools nationwide be tested for radon. EPA estimates that more than 70,000 schoolrooms in use today have high short-term radon levels.

- According to Connecticut General Statute Section 10-220 (d), *prior to January 1, 2008, and every five years thereafter, every school building that is constructed, extended, renovated, or replaced on or after January 1, 2003… shall be inspected and evaluated for radon levels in air and water...*

Initial Approach

☐ Meet with the school's facility manager to obtain a small floor plan of the building and to discuss school structure and dynamics. Ask if school is under renovation currently or renovations are planned for the near future. Also, meet with school's principle or superintendent to discuss EPA protocols regarding communication with students, parents, and staff.

☐ Conduct a walk through inspection to determine testing areas and record the information on the floor plan of the building.

☐ The school administration shall conduct an informational meeting with representatives of parent and teacher organizations to provide an overview of the scheduled radon testing. The individual responsible for radon testing should attend to address any questions/concerns.

☐ Two weeks prior to the scheduled radon testing, the school administration shall notify parents of students and staff with a letter (See Attachment A template) informing them of the scheduled radon testing accompanied by appropriate radon educational materials (See Attachment B pamphlet).

Radon in Schools pamphlets can be obtained by calling the DPH Radon in advance. An electronic version can be emailed for distribution to staff and hard copies are available for distribution to parents.

Initial Testing

Placement of Testing Devices

Number of Test Kits Needed:

☐ Obtain a sufficient number of short term, passive test devices to conduct initial radon testing in all frequently occupied rooms that come in contact with the ground within the school. In other words, the lowest occupied level will be tested unless the school is built into a hillside in which case upper floors may need to be tested as well. Frequently occupied rooms are usually classrooms, offices, laboratories, cafeterias, libraries, and gymnasiums. Areas such as rest rooms, hallways, stairwells, elevator shafts, utility closets, and storage closets need not be tested. Use the attached work sheet to calculate the number of test kits required (See Attachment C work sheet).

☐ Duplicates and blanks shall accompany all testing activities to provide assurance of the quality of the measurements.

- Duplicates are pairs of detectors deployed in the same location, side-by-side, and 4 inches apart for the same measurement period. They shall be placed in **10%** of all measurement locations in a school building to measure precision.
- Blanks are used to determine whether the manufacturing, shipping, storage or processing of the detector has affected the accuracy of the measurements. Blanks are unwrapped but not opened and immediately rewrapped at the end of the exposure period. The number of blanks shall be **5%** of the detectors deployed or 25 whichever is less.

Duplicate and blank testing devices must be shipped and labeled in the same manner as the other testing devices so that the analytical laboratory cannot distinguish them. For example, a test device is placed in Room 233 accompanied by a duplicate test device. The location name marked on the tracking sheet for the first device is "Room 233" while the location name marked on the tracking sheet for the duplicate device is "Room 233D". In other words, a duplicate location name of "Duplicate of Room 233" is not acceptable. Blanks should be named in a similar way, such as "Room 233B" as opposed to "Blank of Room 233".

☐ Spikes shall be included in one testing activity per month to measure bias in the normal measurement process. Count the total number of test devices placed in all of the schools where testing has occurred or is planned for the designated month. The number of spikes shall be **3%** of the detectors deployed during that month with a maximum of 6 spikes per month.

- Spikes are used to measure bias. Ask your device manufacturer for a spiking service referral and use a private radon chamber (laboratory).

Bowser-Morner, Inc. of Ohio is an example of a company that provides this service.

Spikes are test devices send to a spike service laboratory for spiking in a radon chamber. The test devices will be exposed in the chamber at a certain level that will be provided by the spike service laboratory. The test devices should be exposed in the chamber for the same amount of time you plan on conducting testing in your designated school. The spiked test devices shall be shipped via overnight delivery to arrive in time to include in your sample shipment.

Like duplicates and blanks, the spiked test devices must be shipped and labeled in the same manner as the other testing devices so that the analytical laboratory cannot distinguish them. The spiked test devices shall be named so as to be recognized by the tester but blind to the lab.

Test Conditions Needed:

☐ Testing shall be preceded by 12 hours of closed building conditions.

☐ Testing shall be conducted:

- under closed conditions for a minimum of 48 hours,
- during the coldest months of the year (November 1-March 31),
- and during weekdays while school is in session with HVAC systems operating normally.

☐ Testing shall **not** be conducted:

- during abnormal weather conditions such as major storms or high winds
- or during structural changes to a school building and/or the renovation
- or replacement of the HVAC system.

How to Test:

☐ All school rooms must be tested on the same start date. Canister identification numbers, locations, and start date/time will be recorded on a device tracking sheet (See Attachment D tracking sheet).

☐ Use a brightly colored warning sheet to place underneath the test device (See Attachment E example).

☐ Test devices must be placed:

- away from any drafts, vents, appliances (e.g. computers, projectors, etc),
- 20 inches above the floor,
- 3 feet away from any exterior doors or windows,
- 3 feet away from any exterior or interior wall,
- 4 inches away from other objects,
- away from heat, areas of high humidity, out of direct sunlight, and where they are least likely to be disturbed.

The devices should be left in place for three or four days to ensure optimum results (Testing should take place over at least 2 days/48 hours, but shall not exceed 7 days.)

Place the detectors every 2,000 square feet for larger spaces.

Retrieval of Testing Devices

☐ Retrieve all testing devices from each location in the school building on the same day and complete the device tracking sheets by marking down the end date/time. Make comments if the devices appear to have been tampered with or if windows are found to be open instead of closed.

☐ Make photocopies of the tracking sheets to keep as a record of the testing event.

☐ Package all testing devices neatly and securely so as to ensure proper shipment. Mail devices to the analytical laboratory immediately after retrieval or the next morning at the latest. Be sure each shipment parcel contains a copy of the tracking sheets.

- Overnight or two-day delivery is preferred for out of state labs
- Communicate with the analytical laboratory to inquire about preferences for shipping methods and to provide the lab with a schedule of your planned testing activities

Interpretation of Initial Results

☐ Review the results of the initial testing and highlight any results that are at or above 4.0 pCi/L.

☐ Compare the duplicate results by calculating the Relative Percent Difference (RPD).

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

If results over 4.0 pCi/L differ by 25% or more, the data quality should be questioned. In this case, you should call the processing laboratory to investigate the situation further and notify the school that a few results are in question; therefore, the room associated with the questionable duplicate may need to be retested.

☐ Check to be sure that the blank results are at or near 0.0 pCi/L to ensure accuracy of the device. If they are not, call the analytical laboratory and/or test device supplier to investigate further and notify the school that the problem is being investigated.

☐ Check to be sure that the spike results are accurate by calculating how close the measured value is to the target value.

$$\frac{\textit{Target Value-Measured Value}}{\textit{Target Value}}$$

The calculation should be + or – 10%. If the measured value is way off from the target value, investigate further and notify the school that the problem is being investigated.

☐ Obtain additional short-term test devices for follow-up testing in rooms with radon results at or above 4.0 pCi/L. Don't forget to include additional QA/QC measurements (duplicates and blanks).

☐ Provide a summary of initial test results to the school administration.

☐ If initial test results are over 20 pCi/L, the school administration shall notify parents and staff as soon as possible, but no later than one week after results have been received.

→ **EPA does not recommend that schools use a single short-term test as the basis for determining whether or not action needs to be taken to reduce radon levels. A follow-up measurement to confirm an initial short-term measurement of 4.0 pCi/L or higher should be conducted before making such a decision.**

Follow-Up Measurements

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

Interpretation of Follow-Up Test Results

☐ Take action to reduce the radon level if the average of the initial and follow-up measurement is 4.0 pCi/L or more.

☐ Provide school administration with a complete report that includes all results and interpretations.

☐ Recommend that school administration hire a radon mitigation professional certified by NEHA and/or NRSB to reduce elevated radon levels identified through testing. The CT DPH list of qualified professionals is provided in Attachment F. This list is updated monthly on the DPH website so be sure to obtain the most recently revised copy to provide to the school.

Completion and Reporting

☐ Fill out and sign the CT DPH *School Radon Testing Report Form* (See Attachment G form). The form shall be sent within five working days of providing the school with a complete report. The form should be faxed or sent to the following address:

Attn: School Radon Testing Program
State of Connecticut
Department of Public Health, Radon Program
410 Capitol Avenue, MS # 51-RAD
P.O. Box 340308
Hartford, CT 06134

If you fax the reporting form, do not also send a hard copy in the mail.

☐ School administrators shall notify parents and staff of radon testing results in a brief summary as soon as possible but no later than one month after follow-up test results are received. A copy of the complete report shall be kept in the main office of the school for parents and staff to view. If elevated radon levels exist, the notification should include the school's plan to reduce the levels.

Re-Evaluation

☐ Schools rooms with radon mitigation systems require re-evaluation of the mitigated rooms every two years to ensure the system is working to reduce the radon levels. This is considered part of system maintenance and does not require a *Re-Evaluation Form* to be filled out.

☐ Schools rooms NOT needing mitigation require a re-evaluation every five years in 10% of the original rooms tested and a different 10% in each future re-evaluation period. Fill out and sign the Re-Evaluation Form (See Attachment G). The form shall be sent within five working days of providing the school with the radon results. The form should be faxed or sent to the following address:

Attn: School Radon Testing Program
State of Connecticut
Department of Public Health, Radon Program
410 Capitol Avenue, MS # 51-RAD
P.O. Box 340308
Hartford, CT 06134

If you fax the form, do not also send a hard copy in the mail.

For more information or technical guidance, please contact the State of Connecticut Department of Public Health Radon Program at:

Phone: 860-509-7367
Fax: 860-509-7378
Website: www.ct.gov/dph/radon

ATTACHMENT A

Template Letter

(Date)
(Name of School)
(Street Address)
(Town, State, Zipcode)

Dear Parents and Staff:

The administration of the (insert name of school) would like to provide you with notification that initial radon-in-air testing will be conducted on (insert date). According to Connecticut General Statute 10-220(d), schools are required to inspect and evaluate the indoor air quality of school buildings by 2008. This required inspection and evaluation of indoor air quality includes evaluation of radon in air and water.

(insert radon professional company) will conduct the radon testing. To test for radon in air, small canisters containing charcoal will be placed in each of the occupied rooms that are in contact with the ground. These canisters will be left in place for three school days. You will be informed of radon test results and interpretations as soon as possible. In the event that high radon levels are found, steps will be taken to correct the problem using methods suggested by the United States Environmental Protection Agency.

Please read the enclosed educational pamphlet describing radon and the school testing program effort. If you have further questions or concerns regarding radon, please feel free to contact the (local health department) at (XXX) XXX-XXXX, or the State of Connecticut Department of Public Health Radon Program at (860) 509-7367.

Thank you, in advance, for your cooperation.

Sincerely,

_____(Name)

Superintendent of Schools or Principal of School

ATTACHMENT B

Pamphlet

Radon In Schools

Every School Should take this Simple Test.

CONNECTICUT DEPARTMENT OF
PUBLIC HEALTH

Keeping Connecticut Healthy

www.dph.state.ct.us

ATTACHMENT C

Work Sheet

School Radon Testing Program
Work Sheet for Determining the Number of Test Kits Needed

Item 1. Number of frequently occupied rooms less than 2,000 square feet in contact with the ground:

_____

Item 2. List rooms that exceed 2,000 square feet and their size estimate, then divide by 2,000 to calculate the number of test kits needed for each large room:

	Large Rooms	A= Size Estimate (in square feet)	B= Divide A by 2,000 square feet to get value for B	C= Round B up to a whole number
(For Example)	*Gymnasium*	*13,491*	*13,491 / 2,000=6.7455*	*7*
1				
2				
3				
4				
5				
6				
7				
8				
9				

Item 3. Add up all values in the C column to calculate how many additional tests kits are needed:

_____

Item 4. Add Items 1 and 3 to determine the amount of test kits needed not including duplicates and blanks:

D= _____

Item 5. Take the value figured in Item 4 and multiply it by 0.10 to calculate the number of duplicates needed (Round up to the nearest whole number):

E= _____

Item 6. Take the value figured in Item 4 and multiply it by 0.05 to calculate the number of blanks needed (Round up to the nearest whole number):

F= _____

Item 7. Add up the values in Items 4,5, and 6 to figure out total number of test kits needed:

D + E + F = _____

ATTACHMENT D

Tracking Sheet

SCHOOL TESTING PROGRAM TRACKING SHEET

School Name: _____ Weather Conditions: _____
School Location: _____ *Type of Radon Test (AC, LS, AT, CR): _____

Name of Tester: _____ Telephone #:_____
Mailing Address: _____
_____

Detector ID #	Location	Start Date	Start Time	End Date	End Time	Additional Comments

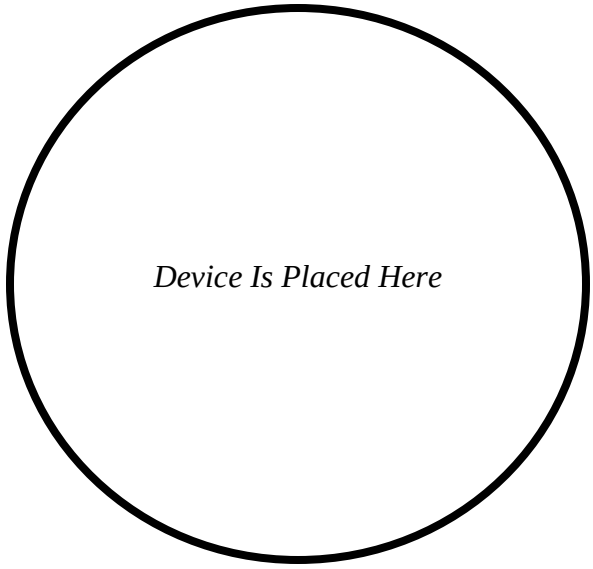
*Note: AC = Activated Charcoal Adsorption Device LS = Charcoal Liquid Scintillation
AT = Alpha Track Detectors CR = Continuous Radon Monitor

ATTACHMENT E

Example Warning Sheet

DO NOT TOUCH, MOVE, OR DISTURB UNDER ANY CIRCUMSTANCES!

(KEEP YOUR WINDOWS CLOSED)



RADON TESTING IN PROGRESS

(Canister and its contents are not harmful)

Please note if windows were opened at any time during the test and how long they were open or if the test was disturbed in any way…Thanks for your full cooperation.

_____

_____

_____

ATTACHMENT F

List of Qualified Mitigation Professionals

Connecticut Department of Public Health
Radon Program
List of Radon Mitigation Professionals

This following list contains the names of individuals or companies who have been trained according to the U.S Environmental Protection Agency (U.S. EPA) protocols for radon mitigation. These individuals or companies listed are registered with the State of Connecticut Department of Consumer Protection (DCP) as Home Improvement Contractors and certified by one of the two National Radon Proficiency Programs; (1) The National Environmental Health Association (NEHA) and (2) the National Radon Safety Board (NRSB).

The State of Connecticut, Department of Public Health (CT DPH) is required under Connecticut General Statute 19a-14b, to "maintain a list of companies or individuals that are included in current lists of National Radon Proficiency Programs." The CT DPH cannot be responsible for the knowledge or experience of these individuals or companies, nor for their fees or business practices. Inclusion on this list does not constitute an endorsement or a recommendation of the firms. People are encouraged to take normal business precautions before selecting a professional and be certain that the selected professional obtains all necessary building permits before proceeding with any work. Mitigation companies must utilize licensed electricians, plumbers, and other professionals for all applicable components of the work rendered.

Overview of Radon In Air Mitigation Techniques

If you have confirmed your radon in air level to be 4 picocuries per liter (pCi/L) or higher based on the average of two tests, U.S. EPA suggests that your home be fixed. There are several methods that a contractor can use to lower radon in air levels in your home. Some techniques prevent radon from entering your home while others reduce radon levels after it has entered. EPA generally recommends methods which prevent the entry of radon. Soil suction, for example, prevents radon from entering your home by drawing the radon from below the house and venting it through a pipe, or pipes, to the air above the house where it is quickly diluted. Refer to the U.S. EPA document, *Consumer's Guide to Radon Reduction*, for more information on radon mitigation systems, costs, and effectiveness. This document can be found on the CT DPH Radon Program website at www.ct.gov/dph or mailed to you. Please contact the CT DPH Radon Program at (860) 509-7367 to request a copy of this document.

Overview of Radon In Water Mitigation Techniques

If you have tested your private well and have confirmed your radon in water level to be 5,000 pCi/L or higher based on the average of two water samples, CT DPH recommends that your home be fixed in one of two ways.

Granular Activated Carbon (GAC) System

GAC systems are used to reduce radon levels that are between 5,000 and 10,000 pCi/L. This system uses special charcoal filters to remove radon from the water. You need to change the filter in this system according to the manufacturer's recommendations. The average cost for a GAC system is $1500-$3000.

Aeration System

Aeration systems are used to reduce radon levels that are above 10,000 pCi/L. This type of system bubbles air through the water so that the radon is released into the air and vented away from your home. The average cost for an aeration system is $3000-$5000.

For more information about radon in water, call the CT DPH Radon Program at (860) 509-7367 or visit the CT DPH website at www.ct.gov/dph.

List of Companies or Individuals that Offer Radon Mitigation Services

Last updated February 16, 2007 - Refer to website for most updated list

Name of Company	City/Town	State	Telephone	Individuals listed by NEHA/NRSB	Mitigation Services
A. Douglas Thibodeau LLC	Marlborough	CT	860-978-1513	A. Douglas Thibodeau	Air, Water
Advanced Water Systems, Inc.	Wolcott	CT	203-879-1343	Gene Fercodini	Air, Water
Air Sense	Pawcatuck	CT	860-599-5599	Douglas Hoagland	Air, Water
Air & Water Environmental, LLC	Granby	CT	860-413-9354	Jeffrey Sheridan	Air, Water
Alliance Water Treatment Company	Stamford	CT	800-838-0596	John Piatek	Air, Water
American Home Radon Services Inc.	Brookfield	CT	800-224-4441 203-775-1887	Peter Piller, Jr.	Air, Water
A & R Environmental LLC	Tolland	CT	860-871-1412	Al Bonner Daniel Fitzgerald	Air, Water
Buzzano Contracting Radon Reduction Service	Newtown	CT	203-426-7196	Steve Nicolosi	Air, Water
Connecticut Basement Systems	Stratford	CT	800-319-8867	Matthew Bednarz Steve Senkowicz	Air, Water
Connecticut Radon	Groton	CT	860-448-6780	Don Martin	Air, Water
DMI / Accusystems	Old Saybrook	CT	860-399-5799	Don Morrison	Air, Water
Energy Tech LLC	Higganum	CT	860-345-3993	Joseph Brasky	Air, Water
Houseworks Home Services, Inc.	Milford	CT	203-301-9051	Joseph Monte Stanley J. Bajerski	Air
HSW Radon Contractors LLC	Woodbury	CT	866-787-2366 203-910-7877	Kenneth Accashian	Air, Water
Nationwide Radon Consulting Group	E. Killingly	CT	800-277-8055	Paul Brisson	Air, Water
NorthEast System Radon In Water, LLC	Stratford	CT	203-395-9702	Fernando Alvarado	Air, Water
Oasis Environmental Solutions, Inc.	Redding Ridge	CT	203-268-6305	James Jasensky	Air, Water
Professional Water Systems, Inc.	Ridgefield	CT	203-458-6897	Andrew Hurlbut	Water
Radon Mitigation Corp of America	Elmsford	NY	914-345-8004	Kurt Dorfi	Air
Radon Systems of Connecticut	Cheshire	CT	203-272-3600	Bruce H. Corey	Air
U.S Radon, Inc. Radon Management, Inc.	Beacon Falls North Scituate	CT RI	866-723-6664 401-641-1549	Norman Johnson	Air, Water

ATTACHMENT G

Reporting Forms

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH
RADON PROGRAM
INTIAL SCHOOL RADON MEASUREMENT REPORT FORM

Nov. 2010

The following form must be submitted to the Connecticut Department of Public Health Radon Program within ten (10) business days of providing a final written report of radon measurement activities to school personnel. Submit this signed form by mail OR fax to the Radon Program at the address listed below:
*Please use the *Re-Evaluation Report Form* when performing 5-year re-evaluations.

CT Department of Public Health Radon Program
410 Capitol Avenue, MS #51 RAD
Hartford, CT 06134-0308
OR
Fax: 860-509-7378

Name of School: _____

Address:
(Street, town, zip code) _____
_____
_____

Dates of Testing: _____

Testing Company: _____

Measurement Professional: _____
NEHA/NRSB Certification #: _____

Please provide the following summary information:

Total # of Rooms Tested: _____

Total # of Rooms Requiring Re-Testing: _____

Total # of Rooms Where Average Results Were at or above 4.0 pCi/L: _____

Radon measurement activities were carried out in accordance with United States Environmental Protection Agency protocols and the Connecticut Department of Public Health Radon Program's *School Radon Testing Guidance* at the location described above.

Signature of Measurement Professional	Signature of School Designee	Date

Phone: (860) 509-7367
Telephone Device for the Deaf (860) 509-7191
450 Capitol Avenue - MS # 51RAD
P.O. Box 340308 Hartford, CT 06134
An Equal Opportunity Employer

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH
RADON PROGRAM
SCHOOL RADON RE-EVALUATION REPORT FORM

Dec 2010

The following form must be submitted to the Connecticut Department of Public Health Radon Program within ten (10) business days of providing a final written report of radon measurement activities to school personnel. Submit this signed form by mail OR fax to the Radon Program at the address listed below:

CT Department of Public Health Radon Program
410 Capitol Avenue, MS #51 RAD
Hartford, CT 06134-0308
OR
Fax: 860-509-7378

Name of School: _____

Address:
(Street, town, zip code) _____

_____

_____

Measurement Company Name : _____

Please provide the following summary information:

Testing Dates: _____

Total # of Rooms Tested: _____

Total # of Rooms Requiring Re-Testing: _____

Total # of Rooms Where Average Results were at or above 4.0 pCi/L: _____

Radon measurement activities were performed at the location above in accordance with United States Environmental Protection Agency protocols and the Connecticut Department of Public Health Radon Program's *School Radon Testing Guidance.*

Measurement Professional / NEHA/NRSB #	Signature	Date
School Designee / Title	Signature	Date

Phone: (860) 509-7367
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