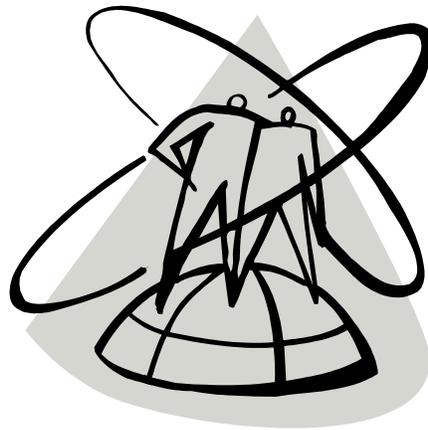


Radon, Real Estate and You

Instructor's Manual



Instructor's Manual

Environmental Health Topic: Radon

Lesson Title: Radon, Real Estate and You

Priority Population: Attendees of real estate salesperson training courses approved by the Department of Consumer Protection and Connecticut Real Estate Commission

Overall goals of presentation:

To provide attendees of the course with introductory information on radon gas, its health effects, testing protocols, and mitigation system design to increase the likelihood that as practicing realtors, they will be more likely to hire a qualified professional to test, and they will be more knowledgeable about radon, testing, interpretation of the results, and the basic identification of a mitigation system during real estate transactions for their clients.

To increase awareness, and promote quality testing and mitigation of radon during real estate transactions in Connecticut by training people enrolled in real estate salesperson training courses approved by the Connecticut Department of Consumer Protection and Connecticut Real Estate Commission.

The student manual will act as a resource and guide for attendees who decide to become licensed, practicing realtors.

Radon overview:

Radon-222 is a naturally occurring radioactive gas that is the byproduct of uranium-238 found in rocks and soils throughout the world. It is colorless, odorless, and tasteless, and can only be detected through direct measurement. As radon escapes from the ground, it is emitted into the air. Radon gas enters homes through cracks in basement floors and can accumulate to relatively high levels. Radon-222 has a half-life of 3.8 days after which it decays into its smaller isotopes. Radiation is released during this decay process. Radon progeny emit radioactive alpha particles that can readily attach to airborne dust and, when inhaled, cause direct damage to the lung tissue.

The most common cause of cancer-related death for both women and men in the U.S is lung cancer. The leading cause of lung cancer cases in the U.S. is cigarette smoking. However, the second leading cause of lung cancer in the U.S. is exposure to high levels of radon indoors. The global burden of lung cancer associated with radon is unknown at this time. The National Academy of Sciences (NAS; 1998) and EPA (2002) estimate that approximately 12% of all lung cancer deaths result from radon exposure. As such, the financial burden associated with radon-induced lung cancer deaths, based on a twelve percent estimate of all lung cancer deaths amounts to greater than \$5.9 billion dollars; a rather significant amount and great human burden. The EPA and NAS estimate that one third of the lung cancer cases caused by indoor radon exposure that occur in the U.S. can be prevented by simply testing for radon gas in the home, and mitigating high indoor radon levels to below 4.0 pCi/L (EPA, 2002; NAS 1998). Testing for radon gas and mitigating high radon levels are relatively affordable when compared to the testing and control of other environmental contaminants, such as asbestos and lead.

Radon has been established as a well-known environmental carcinogen by multiple scientific and federal organizations, and is the second leading cause of lung cancer in the U.S.. As mentioned earlier, because it is odorless, colorless, and tasteless, direct measurement of radon is the only means for identifying its presence in homes. If high levels of radon are found in a home, affordable mitigation methods enable the homeowner to reduce indoor radon levels and hence, reduce the risk of developing lung cancer for occupants of the dwelling. As such, approximately one third of radon-induced lung cancer deaths are preventable (NAS, 1998).

Objectives:

By the end of the radon training module, attendees in the class will:

- Be able to identify three characteristics of radon gas
- Be able to visually recognize the location of the different radon potential zones in CT
- Be able to list the one major health risk associated with radon exposure
- Understand the number of fatalities associated with radon compared to other causes of fatality
- Be able to list two sources of radon that enter the home
- Be familiar with the most common types of testing devices used for radon in air
- Be able to interpret short-term radon testing results taken during a real estate transaction
- Recognize the value in utilizing qualified radon testing professionals
- Be able to list at least two different types of mitigation systems available
- Be able to recognize a radon mitigation system for air and/or water
- Have the necessary information to act as a radon resource for your clients

Developmental Section:

The order and content of the presentation, the teaching methods used, the allotted time, and materials needed to complete this module are summarized in the table below. The supporting materials, instructions, and documentation for facilitating group activities are provided at the end of the instructor's manual. Training providers are encouraged to use methods other than straight lecture to cover the content of the training module to improve the learning experience of class participants.

The developer of the course recognizes that class composition, interest, and interaction with students can affect the length of the training module. The development section is meant as a guide to assist the training provider in presenting the course, as intended. The pre-test, post-test and course evaluations are a required component of this course, and must be used each time the materials are presented.

Content Outline	Method	Estimated Time	Materials Needed
I. Icebreaker exercise (Instructions are located at the end of the Trainer's Manual)	Large Group Discussion	5 minutes	A bag of different colored rocks (smaller)
II. Pre-Test • Participants take quiz • Answers provided at end of course	T/F quiz	10 minutes	Copies of pre-test to hand out to participants; Instructor key
A. Introduction to Radon • Basic characteristics of radon • EPA Action Level • Sources of radon	Lecture	5 minutes	Laptop, projector
B. Radon Potential Map: Clarifying the purpose of the radon potential map • Review and definition of zones • Map used as planning tool • Need to test to find out • Discussion re: misconceptions that are likely to occur by looking at map	Lecture/large group discussion	5 minutes	
C. Small group exercise • Fill in the chart – using consensus of group • Post exercise discussion to express	Small group discussion/values clarification	10 minutes	Sheet in student manual/answer slide with picture on it

feelings/beliefs about radon risk				
D. Health Effects of Radon	Lecture	10 minutes	Laptop, projector, student manual for exercise	
<ul style="list-style-type: none"> • 2nd leading cause of lung cancer • Number of deaths associated with lung cancer • Review of EPA risk estimates for radon at varying levels • Pathway of exposure and mechanism behind development of lung cancer • Role realtor plays in promoting health of clients 				
E. How Radon Enters the Home	Lecture	5 minutes	Laptop, projector	
<ul style="list-style-type: none"> • Radon in soils and rocks as source of radon gas in the home • Entry points in home for radon gas • Radon in water as source of radon gas in home 				
F. Testing for Radon	Lecture	15 minutes	Laptop, projector	
<ul style="list-style-type: none"> • Surgeon General's recommendation • Benefits of using qualified testing professionals • Where to get the list of qualified radon testing professionals • Overview of radon testing in air <ul style="list-style-type: none"> ○ Types of testing ○ Testing conditions ○ Common testing devices • Overview of radon testing for water <ul style="list-style-type: none"> ○ Test collection and analysis ○ Laboratory approval for radon in water ○ Relative contribution to airborne exposure 				
Display of radon test devices (optional)	Display	during break	Test devices (contact CT DPH Radon Program for AC test kits)	
G. Interpreting the Results	Lecture	10 minutes	Laptop, projector	
<ul style="list-style-type: none"> • Review of EPA test protocol used during home sales • Review of DPH guideline for radon in water • Meaning of the results 				
H. Reducing Radon in the Home	Lecture	10 minutes	Laptop, projector	
<ul style="list-style-type: none"> • Defining mitigation • Referral to Radon Program list of qualified mitigators • Overview of radon mitigation system for radon in air • Overview of two systems for controlling radon in water 				

I. Dealing with Radon During the Sale of a Home (Optional)	Small Group Discussion on handling the issue of radon and what to say to clients	10 minutes	Paper, handout
J. Laws Pertaining to Radon <ul style="list-style-type: none"> • Overview of applicable laws that relate to radon <ul style="list-style-type: none"> ○ DCP ○ DPH 	Lecture	5 minutes	Laptop, projector
III. Post-test and Evaluation	Quiz	10 minutes	Handouts of post test and student feedback form

Materials:

This training module includes:

- An Instructor's manual
- Student manual: Radon, Real Estate and You
- Audiovisual aids created in Powerpoint (2000 version).

Other Required Materials:

U.S. Environmental Protection Agency (2000). *Home buyer's and seller's guide to radon*. EPA Document 402-K-00-008. Available at <http://www.epa.gov/radon/pubs/hmbyguid.html>

U.S. Environmental Protection Agency (2003). *Consumer's guide to radon reduction: How to fix your home*. EPA Document 402-K-03-002. Available at <http://www.epa.gov/radon/pubs/consguid.html>

List of Radon Testing Professionals and Radon Mitigation Contractors maintained by the Connecticut Department of Public Health Radon Program available at http://www.dph.state.ct.us/BRS/Radon/radon_program.htm

Evaluations:

Each student must complete a pre-test and post-test for the course. Additionally, all instructors must complete a feedback form for each time the training is used. The evaluations should not contain personal identifiers and should remain anonymous. Evaluations and feedback forms can be sent to the CT DPH Radon Program at the following address:

Attn: Radon Program
 CT Department of Public Health
 410 Capitol Ave. MS # 51 AIR
 Hartford, CT 06134-0308

The forms are meant to assist the Radon Program in continuously improving the quality and applicability of the training module. The forms will be reviewed by the Radon Program to measure the effectiveness and impact of the training. Modifications will be made, as needed. The evaluations are not meant to act as an evaluation measure of instructor's abilities or to track individual performance.

References and Additional Resources:

- U.S. Environmental Protection Agency (1993). *Protocols for radon and radon decay product measurements in homes*. EPA Document 402-R-93-003. Available at <http://www.epa.gov/radon/pubs/homprot1.html>
- U.S. Environmental Protection Agency, U.S. Department of Health and Human Services & U.S. Public Health Service (2002). *A citizen's guide to radon: The guide to protecting yourself and your family from radon* (4th ed.). EPA Document 402-K02-006. Available at <http://www.epa.gov/radon/pubs/citguide.html>
- U.S. Environmental Protection Agency (2000). *Home buyer's and seller's guide to radon*. EPA Document 402-K-00-008. Available at <http://www.epa.gov/radon/pubs/hmbyguid.html>
- U.S. Environmental Protection Agency (2003). *Consumer's guide to radon reduction: How to fix your home*. EPA Document 402-K-03-002. Available at <http://www.epa.gov/radon/pubs/consguid.html>
- U.S. Environmental Protection Agency (1994). *Model standards and techniques for control of radon in new residential buildings*. EPA Document 402-R-94-009. Available at <http://www.epa.gov/radon/pubs/newconst.html>
- U.S. Environmental Protection Agency (1993). *A physician's guide—Radon: The health threat with a simple solution*. EPA Document 402-K-93-008. Available at <http://www.epa.gov/radon/pubs/physic.html>
- U.S. Environmental Protection Agency (1994). *Radon mitigation standards*. EPA Document 402-R-93-078. Available at <http://www.epa.gov/radon/pubs/mitstds.html>
- U.S. Environmental Protection Agency (2002). *Ground water and drinking water—Radon*. <http://www.epa.gov/safewater/radon.html>
- U.S. Environmental Protection Agency, Eastern Environmental Radiation Facility (1999). *National Primary Drinking Water Regulations; Radon-222* [pp. 59295-59344] Federal Register Document Vol. 66, No. 211. Available at <http://www.epa.gov/safewater/radon/radfr2.html>

These documents and others are also available by request from the EPA.

You can write to: U.S. Environmental Protection Agency
National Center for Environmental Publications (NSCEP)
P.O. Box 42419
Cincinnati, OH 42419

Or, you can call: 1-800-490-9198
Or, you can fax a request to: (513) 489-8695

Appendix A

Rocks Icebreaker

Instructions:

Bring in ziplock bags of rocks and/or dirt (enough for around 1/3 of the class participants.)
Do not tell class participants what the topic of discussion is for the training module.

- Ask them what they are holding. Rocks/dirt of course.
- Ask them which rock/dirt they think is a source of radon
- Allow the class to talk about this openly and take time deciding
- After much deliberation give them the answer: ALL*
- Begin introducing the subject of radon during real estate transactions and the Introduction to Radon Segment

* Most rocks and soils contain some amount of uranium or radium which produces radon. The sources of radon are not equally strong in all rocks and soils however.

Appendix B

Lecture

Instructions:

The training provider will use a computer and LCD projector to cover the topics described in the “Developmental Section” of the Instructor’s Manual.

The slides that are used for the lecture portion of the training module were developed in Powerpoint (2000). Animations and slide transitions were intentionally omitted from the slide presentations so that instructors could tailor the slides to their computer system needs.

Please note:

Slides should be printed three per page as class handouts for students to follow with the exception of the slides that are used as answers to classroom exercises.

Appendix C

Risk Estimates Exercise

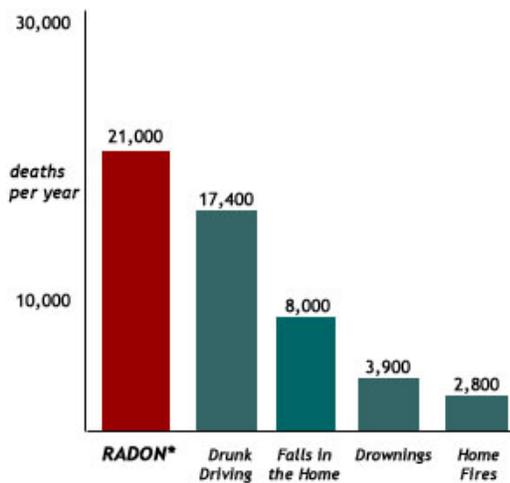
Instructions:

Prior to introducing health effects section for radon, break the class into groups of 5-7 people. Ask members of the group to place the appropriate letters for each health risk listed on the bottom of their student manual page in the correct location. After the exercise have groups and people in the class compare their results. Are any of the results similar?

Once all groups have shared their results, project the answer on an overhead or screen. Discuss these findings, and if students have a greater understanding of the relative risk of radon compared to other environmental risks.

- Ask them how they feel about these findings. (It is expected that some student answer that they do not believe this, or that they 'want to see the bodies'.) Be prepared by reviewing more recent epidemiological studies conducted in residential homes. Risk estimates have been supported by more up-to-date research (see below for links).
- Discuss the Surgeon General's and EPA's recommendation that all homes should be tested for radon. Has their opinion on radon testing and mitigation changed?
- This exercise acts as a nice segue to the next section on health risks.

Instructor's version that can be projected after groups have decided on assignment of risks, and discussions are completed



Radon is estimated to cause thousands of lung cancer deaths in the U.S. each year.

** Radon is estimated to cause about 21,000 lung cancer deaths per year, according to [EPA's 2003 Assessment of Risks from Radon in Homes \(EPA 402-R-03-003\)](#). The numbers of deaths from other causes are taken from the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Report and 2002 National Safety Council Reports.*

Instructor's version that can be projected after groups have decided on assignment of risks, and discussions are completed

** For updated information and summaries of the more recent research please visit the following websites.

- Iowa Radon Lung Cancer Study: <http://www.checc.uiowa.edu/misc/radon.html>
- American Association of Radon Scientists and Technologists: http://www.aarst.org/radon_news.shtml

Alternate Exercise to Risk Estimate Exercise:

Hershey Kisses in Bags/ Radon in Homes

Instructions:

This exercise requires at least 12-15 individuals in the class. Buy a bag of silver (plain) Hershey kisses, or some other uniformly colored candy. Also buy a smaller bag of different candy.

1. Place a single piece of candy in all of the bags. One out of 10-12 bags should contain a different piece of candy. (You can reduce the ratio for Connecticut because the possibility of radon being in a home is more likely than the national average.)
2. Hand out the bags to class participants.
3. Discuss that many people live in homes for several years and never test their homes for radon. Also discuss the health risks associated with radon (lung cancer), and that smokers have a MUCH greater risk of developing lung cancer when they are also exposed to radon in their homes.
4. Have attendees open their bags and those with the different piece of candy are the ones who have radon in their homes.

After the exercise is complete:

1. Tell attendees that testing for radon is the only true means of determining if radon is in a home.
2. Ask attendees if any of them have tested their homes...leave the questions unanswered and move onto the next section...Health Risks.

Appendix D

Display

Instructions:

During a classroom break time, display the different types of radon testing devices that are available. The Connecticut Department of Public Health Radon Program has old activated charcoal test kits that can be distributed to training providers. Basic and inexpensive test kits by other manufacturers can be purchased at a local hardware store.

Allow class participants to handle the test devices so that they are familiar with how they look and the basic mechanisms behind how they operate.

Appendix E

Small Group Discussion

Instructions:

Prior to introducing this section, break the class into groups of 5-7 people. Ask members of the group to sit next to each other. For this exercise to work, there should be mix of individuals within each group, some with experience and some without.

Hand out coping scenarios for each group to discuss. Each group should discuss how the issue is to be solved and how they would speak to their clients.

Scenario 1: A buyer hires a home inspector who is not qualified to test a home for radon. The results are 3.7 and 4.0 pCi/L. These results need to be disclosed under Connecticut Real Estate Disclosure Laws.

- The seller is your client, and asks you what she should do about the results of the testing, and what actions to take next. How would you advise your client?

Scenario 2: A qualified radon measurement company conducts radon testing using a Continuous Radon Monitor for your client as part of the home inspection. The results are above 4.0 pCi/L. The seller does not want to install a mitigation system and believes that the test results are not valid. Copies of the test report indicate that there were not unusual swings in radon levels during the test period, which show that there was not tampering.

- What advice to you provide to your client?
- How would you go about ensuring that radon was reduced in the home?

Scenario 3: Your client placed his home on the market and a potential buyer had a home inspection done. The deal fell through because the buyer could not secure a loan. However, your client has been left with the results of the home inspection that must now be disclosed to future potential buyers. Radon levels were at 10 pCi/L and 15 pCi/L. Your client is angry that he must now tell buyers about the radon, and is upset that he will probably have to spend between \$1200-\$1500 to fix this issue.

- How would you handle this situation?
- If you were the broker or realtor for the potential buyer, how would you handle the situation?

Appendix F
Pre-Test/Post Test Key

- 1) Radon gas is:
 - a) Odorless
 - b) Colorless
 - c) Radioactive
 - d) All of the above ***

- 2) List the one major health risk associated with radon exposure: Lung Cancer

- 3) Radon exposure is estimated to cause up to ____ deaths per year?
 - a) 5,000
 - b) 10,000
 - c) 20,000***
 - d) 50,000

- 4) List the two source of radon gas in the home:
Soils/rocks and water

- 5) Some common types of radon devices used to measure radon in the air include:
 - a) Activated charcoal test kits
 - b) Electret ion chambers
 - c) Continuous radon monitors
 - d) All of the above***

- 6) Benefits to referring clients to qualified radon testing professionals include:
 - a) Not having to worry about radon anymore
 - b) They are an independent tester
 - c) Tests are more likely to be performed properly and results will be more reliable
 - d) Both b and c***

- 7) ____ and ____ are types of radon mitigations systems.
 - a) Alpha tracks and E-Perms
 - b) Aeration systems and Sub-slab depressurization systems***
 - c) Gas displacers and approved laboratory facilities
 - d) Fans and sealers

PRE-TEST FOR CLASS PARTICIPANTS

Please answer the following questions:

- 1) Radon gas is:
 - a) Odorless
 - b) Colorless
 - c) Radioactive
 - d) All of the above

- 2) List the one major health risk associated with radon exposure: _____

- 3) Radon exposure is estimated to cause up to ____ deaths per year?
 - a) 5,000
 - b) 10,000
 - c) 20,000
 - d) 50,000

- 4) List the two source of radon gas in the home:
_____ and _____

- 5) Some common types of radon devices used to measure radon in the air include:
 - a) Activated charcoal test kits
 - b) Electret ion chambers
 - c) Continuous radon monitors
 - d) All of the above

- 6) Benefits to referring clients to qualified radon testing professionals include:
 - a) Not having to worry about radon anymore
 - b) They are independent testers
 - c) Tests are more likely to be performed properly and results will be more reliable
 - d) Both b and c

- 7) _____ and _____ are types of radon mitigations systems.
 - a) Alpha tracks and E-Perms
 - b) Aeration systems and Sub-slab depressurization systems
 - c) Gas displacers and approved laboratory facilities
 - d) Fans and sealers

Number correct:

POST-TEST FOR CLASS PARTICIPANTS

Please answer the following questions:

- 1) Radon gas is:
 - a) Odorless
 - b) Colorless
 - c) Radioactive
 - d) All of the above

- 2) List the one major health risk associated with radon exposure: _____

- 3) Radon exposure is estimated to cause up to ____ deaths per year?
 - a) 5,000
 - b) 10,000
 - c) 20,000
 - d) 50,000

- 4) List the two source of radon gas in the home:
_____ and _____

- 5) Some common types of radon devices used to measure radon in the air include:
 - a) Activated charcoal test kits
 - b) Electret ion chambers
 - c) Continuous radon monitors
 - d) All of the above

- 6) Benefits to referring clients to qualified radon testing professionals include:
 - a) Not having to worry about radon anymore
 - b) They are independent testers
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- 7) _____ and _____ are types of radon mitigations systems.
 - a) Alpha tracks and E-Perms
 - b) Aeration systems and Sub-slab depressurization systems
 - c) Gas displacers and approved laboratory facilities
 - d) Fans and sealers

Number correct:

Student Evaluation

Please take a moment to fill out this evaluation form to assist us in providing relevant and effective training opportunities for future students.

Date of training: _____

Location of Training: _____

Training Provider: _____

Please indicate your level of agreement with the following statements:

1 = Strongly agree 2 = Agree 3 = Neutral 4 = Disagree 5 = Strongly disagree

This presentation was relevant to my work as a realtor.	1	2	3	4	5
The material was presented in an organized manner.	1	2	3	4	5
The room conditions (temperature, noise, etc.) were conducive to learning.	1	2	3	4	5
The written material provided was helpful.	1	2	3	4	5
The <i>Radon, Real Estate and You</i> Student Manual contains information that will be useful to me as a realtor	1	2	3	4	5
I will be more comfortable with providing information to clients after receiving this manual and training.	1	2	3	4	5
I am more likely to provide clients with radon information, when requested, now that I have this training, and list of resources.	1	2	3	4	5

Which of the topics presented were most useful to you?

What topics *that were not presented* would you like to have learned about?

Please share any other comments or suggestions you have regarding this module. (Your comments will be used to improve the training effectiveness for future students.)

Evaluation for Course Instructor

Name: _____

Date of Training: _____

Telephone Number: _____

E-mail Address: _____

About the Course Manual and Materials:	Yes	No
Was the information in this course accurate?		
Was the information in this course complete?		
Was the Instructor's Manual easy for you to use?		
Was it possible to cover all of the material in the time allotted?		
Was the information in the course easy for student to comprehend?		
Were the materials for students complete? If you answer "NO" please list below what you think should be added.		
Were there any special problems or difficulties in a particular section of the module. If so, please list which sections by title:		
Students:		
Did the students appear to be interested?		
Did students seem to comprehend the subject matter?		
Are there any questions that students had that you would like answered? If yes, please provide questions and contact information.		

Evaluation form adapted from:
Lead-Safe Work Practices for Painting, Remodeling and Maintenance
 (2001) University of Connecticut