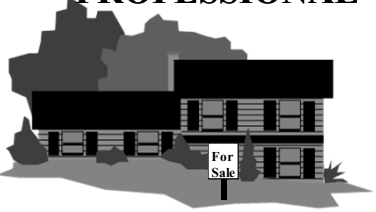





RADON AND THE REAL ESTATE PROFESSIONAL



Presented by: Doug Kladder
Center for Environmental Research and Technology, Inc.
On behalf of:
The Colorado Department of Public Health and Environment

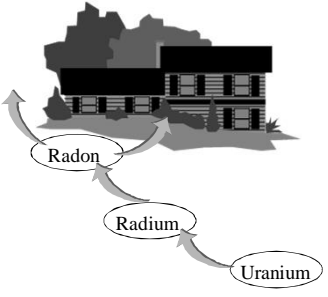


Radon Does Not Have To Be a Deal Breaker



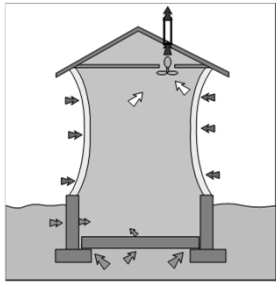
1. Home Buyers are concerned about radon
 - Resale
 - Health concerns
2. Radon is easy to test for and fix!
3. All homes can be fixed
 - Equally before or after the sale

Radon Created from Breakdown of Natural Deposits of Uranium and Radium

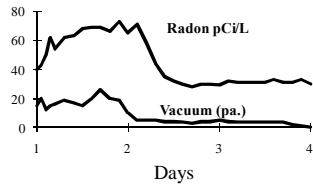


- Radon is a gas
- It is naturally occurring
- It is inert
- It cannot be seen or smelled
- It enters a building from the soil beneath

How Is Radon Drawn Into A Building?



- Vacuum
- ◆ Exhaust systems
- ◆ Thermal stack effects



Radon Can Be Elevated in:

- New homes
- Old homes
- Leaky homes
- Homes without basements
- Apartment buildings
- Schools
- Offices

Low Radon Potential Homes



Unless you live on a houseboat or in a tree house, your home can have elevated levels of radon!

EPA & Surgeon General Recommend That People Not Have Exposures Above 4 pCi/L On A Long-Term Basis



EPA A Citizen's Guide To Radon
 CDC The Guide To Protecting Yourself And Your Family From Radon



Colorado Radon Facts

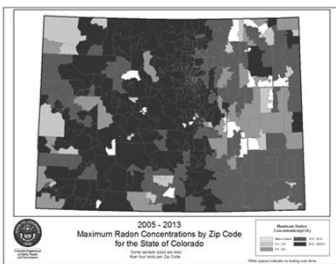
- Essentially half of Colorado Homes at or above EPA Action level
- Radon is listed within the Colorado Disclosure Form
 - Section K ó Environmental Conditions
- All Homes Can be Fixed
 - Equally before or after the sale
- Radon doesn't need to be a deal breaker!

Is This The Only Area Where Radon Concerns Exist?



No!
Many parts of the country have radon concerns.
Map developed as basis for radon control techniques in new construction.

Maximum Measurements by Zip Code CDPHE 2005-2013



- Maximums indicate potential
- Red Zip Codes have measurements observed in excess of 25 pCi/L
 - (6x action level)

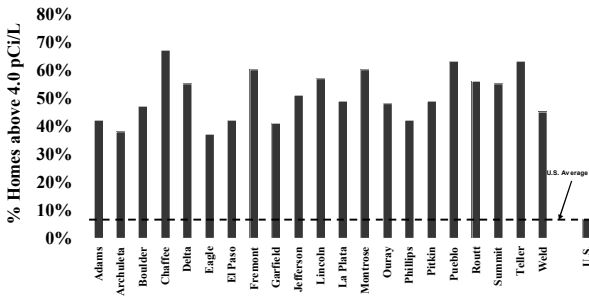
Current CDPHE Colorado Zone Map Revised March 2014



■ All counties (64) are High Potential Zone 1

ZONE 1 High radon potential (variable radon rates average 14pCi/L)

Percentage of Elevated Homes in Example Counties – Compared to U.S. Average



Source: Air Check: www.radon.com

Real Estate Related Strategies



EPA's Home Buyer's & Seller's Guide

<http://www.epa.gov/iaq/radon/pubs/>



If you like a home, buy it – Radon can be reduced!

Helps overcome concern of buying a home with radon

<http://www.cdphe.state.co.us/hm/rad/radon/realstate.htm>

Testing at the Time of Sale

- Purpose and objectives:
 - To determine radon potential, independent of occupant behavior.
 - Reduce liabilities and buyer anxieties
 - Reduce variables and interferences
 - Provide information upon which buyer can make an informed decision.
- Approach
 - Include as normal part of inspection process
 - Use third-party professionals
 - Be open, honest and proactive
 - Radon, if found at elevated levels can be fixed!

Test Purpose Dictates Conditions

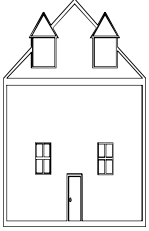
- | | |
|---|---|
| <ul style="list-style-type: none">■ Radon Potential:<ul style="list-style-type: none">• Short-term test• Typically 2-5 days• Closed building conditions 12 hours prior to and all during test• Device deployed on lowest occupiable level of home.• Commonly used at time of resale. | <ul style="list-style-type: none">■ Occupant Exposure:<ul style="list-style-type: none">• Long-term test• Typically 91 days to 1 year• Normal lived in conditions without special closed building conditions.• Device deployed on lowest occupied level of home.• Commonly used outside of resale, or as basis of escrow fund release. |
|---|---|

Short-Term Testing

Determines radon potential
Historically the most common method at time of sale.

2-3 days in Duration

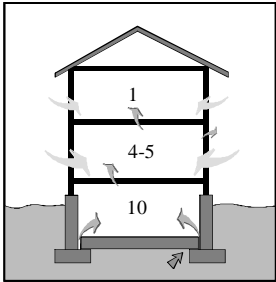
Closed House Conditions Help Determine Radon Potential



Short-Term Testing

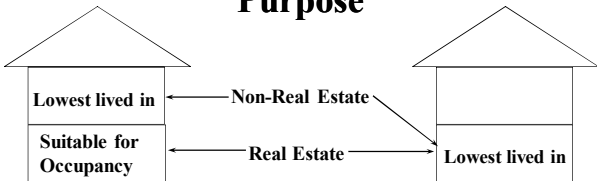
- All exterior doors and windows closed, except for normal entry and exit.
- Internal-external air exchange systems off.

Radon Distribution



- Radon enters from beneath foundation and travels upward.
 - Diluted with outdoor air infiltrating building.
- If radon is less than 4 pCi/L in lower level, one can say with reasonable confidence that upper floors are also less than 4 pCi/L.

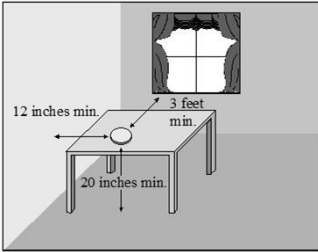
Test Location Depends on Purpose



Bedroom YES	Bedroom YES	Kitchen NO	Garage NO
Bedroom YES	Closet NO	Bathroom NO	

É Choose occupied room
É Only 1 room necessary

Test Placement Within a Room



- 3 feet from windows or exterior doors
- At least 20 inches above floor
- 4 inches from other objects
- Where it won't be disturbed
- **Keep away from**
 - Drafts
 - Moisture
 - Sunlight

Common Short-Term Test Devices



Activated charcoal devices from certified laboratories

- Placed by:
 - Measurement Providers offering Standard Services
- Analyzed by third-party labs
 - Results not available on site.
- Deployed for 2-3 days

Passive Device Use in Real Estate Testing



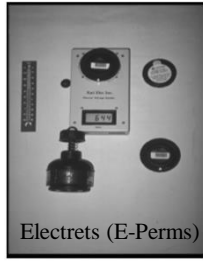
Activated charcoal devices shown as an example.

- Deployed simultaneously
- Placed 4 inches apart
- Results are averaged
- If average is equal to, or greater than 4 pCi/L, mitigation is recommended.

Common Short-Term Test Devices Providing on Site Results



- Provides average and hourly readings
 - Helps detect tampering



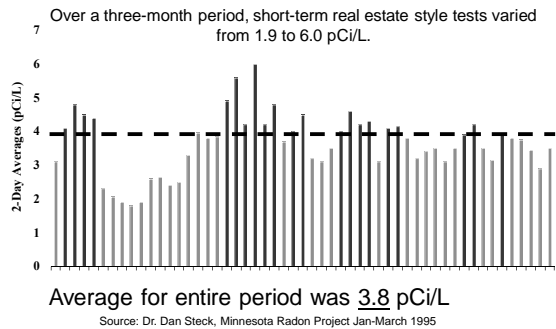
- Provides average reading

Deployed by Measurement Providers offering Standard and Analytical Services

What Test Results Mean

- There is no safe level of radon exposure.
- 4 picoCuries per liter is the action level.
- All radon problems can be fixed - levels can be reduced to between 2 - 4 picoCuries per liter.
- Short-Term test results can be quite variable.

Successive 2-Day, Short-Term Measurement Results in Same House



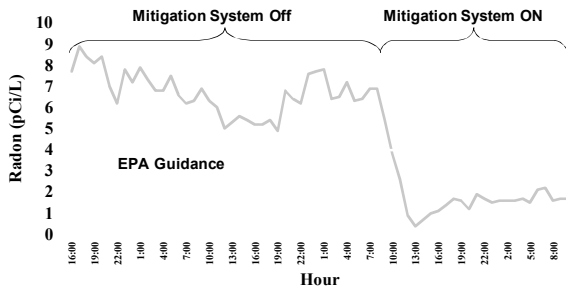
Long-term Tests Indicate Occupant Exposure




Alpha track detector

- Placed for a minimum of 91 days
- No special closed building conditions
- Can be used for release of escrow funds
- If result is equal to, or greater than 4 pCi/L, mitigation is recommended.

Radon Mitigation Works!







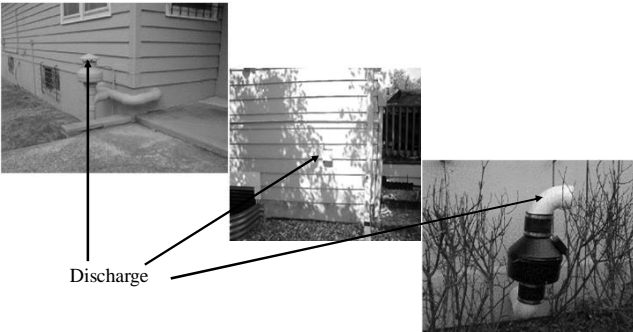
**EPA's
Consumer's Guide**

- Radon mitigation explained
- Suggests how to hire a contractor
- Has cost estimates
- Is a good overview
- Downloadable!

<http://www.epa.gov/iaq/radon/pubs/>

Is getting below 4.0 pCi/L the only consideration?

Discharges Should Be Above Roof



Discharge

Discharges to be Away From Openings



Discharges Carry Moisture



Fan Location

EPA Standards: Fans Should be Outside Living Space



Leakage on positive pressure side of fan can introduce radon into building

Use Solid PVC!



Dryer vent in Attic??



Caused Leak Through Ceiling

Unique Systems



Boulder



Denver

Electrical

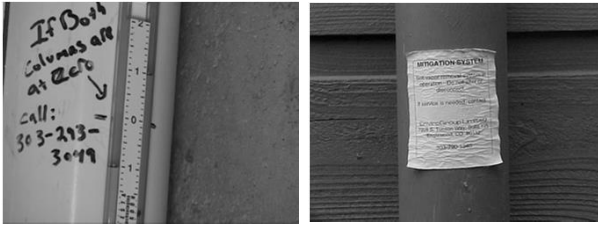


- Disconnects
- Non-rated fans
- Fan supports



- Tapping into existing circuits
- Licensed electrician?
- Permits?

Labeling



- What should it say?
- How durable should it be?
- Where should it be?

Existing Home Systems in Compliance







Placement for Aesthetics?

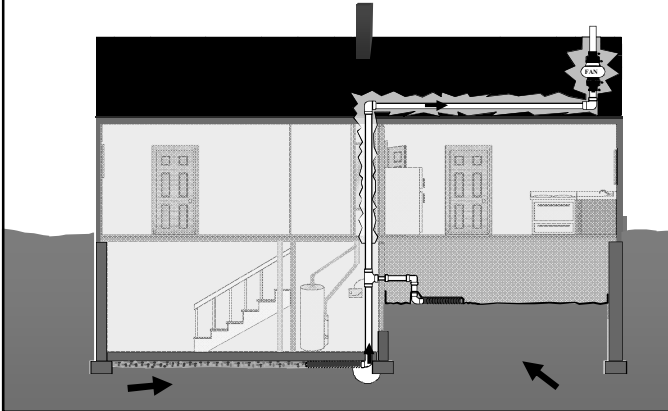


- They both work
- Rear location was a few \$ more

Pick Your System



New Homes Can Be Built With Radon Control Systems



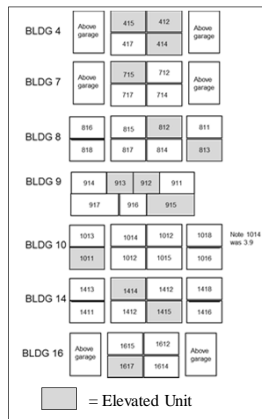
Multi-Family/Condos



- Just as likely to have radon concerns
- Variable levels from unit to unit
- HUD Requires radon testing and new building systems for properties (> 5 units) financed in high radon potential areas

High Variability

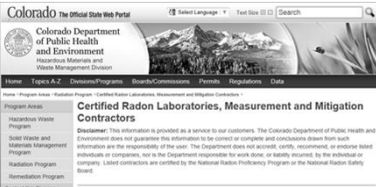
- Variability of results
 - Construction differences
 - Soil differences
 - Occupant behavior!
- Can't make assumptions about all units based upon a few measurements



Finding Certified Measurement and Mitigation Professionals

Listing by CDPHE

www.Coloradoradon.info



- Individuals:
 - Trained
 - Examined
 - CE requirements
 - Agree to follow protocols and building codes

Certification is not required in Colorado

SELLER'S PROPERTY DISCLOSURE

K. ENVIRONMENTAL CONDITIONS				
Do any of the following conditions now exist or have they ever existed:	Yes	No	Do Not Know	COMMENTS
1. Hazardous materials on the Property, such as radioactive, toxic, or biohazardous materials, asbestos, pesticides, herbicides, wastewater and other sludge, radon, methane, solvents or petroleum products				

K. ENVIRONMENTAL CONDITIONS

Do any of the following conditions now exist or have they ever existed

Hazardous materials on the Property, such as radioactive, toxic, or biohazardous materials, asbestos, pesticides, herbicides, wastewater and other sludge, radon, methane, solvents or petroleum products.

Possible Strategies

- All homes can be reduced to less than 4.0 pCi/L
 - Equally before or after the sale
 - Consider long-term testing
 - Mitigation by buyer based on LT result
 - Escrow funds or price negotiation
- Cost structure
 - Base cost to reduce radon - Seller
 - Additional costs to improve system - Buyer

Considerations

- Clients:
 - Concerned about health and welfare of family
 - Concerned about resale value
 - Many relocation companies require a radon test prior to home purchases.
- Yours:
 - Let radon be part of normal inspection process
 - All homes can be fixed
 - Consider escrow based upon bids and long-term tests to determine disposition.
 - Disclose, disclose, disclose
 - Mandatory information disclosure in Fort Collins

Suggest That Buyer Be Specific When Contingencies Are Written

- What is an acceptable radon reading?
- Will long-term results satisfy client?
- Will mitigation be acceptable if elevated levels found?
- Who, and how, will the test be performed?
- Who will pay for mitigation?
- How will mitigated concentrations be verified?

Avoid Statements Like:

- The house tested "safe."
 - No measurable level is safe. 4.0 pCi/L is an economic number, not a safe level.
- "I am not aware of a problem in this area."
 - Radon is quite variable from house to house. The only way to know is to have it tested.
- "Radon isn't as bad as some people think."
 - This implies an expert opinion and introduces concerns of negligent misrepresentation.

Radon Does Not Have To Be a Deal Breaker



Question and Answer Session

Radon Doesn't Have To Be a Problem Unless You Ignore It!

For More Information Contact:
Colorado Department of Public Health & Environment
(800) 846-3986

Center for Environmental Research and Technology
(719) 477-1714

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www.cert.us / DKladder@certi.us
