New Mexico Environment Department

Radon Detection and Remediation:
What Every Broker Should Know

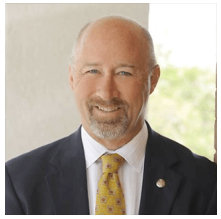
Michael A. Taylor, Environmental Scientist/Specialist

19 May 2021

Photo credit Rhett Zyla #IamNMED

Thank You

Terry Huertaz
Executive Director
American Lung Association in New Mexico



Kent Cravens
Chief Executive Officer
Greater Albuquerque Association of REALTORS®

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Chief Operations Officer
Greater Albuquerque Association of REALTORS®

EPA State Indoor Radon Grant

State Indoor Radon Grant (SIRG) Program

Overview

State and tribal radon programs are critical to the Agency's national goal of minimizing and preventing radon-related lung cancer. States and tribes receive grant funds from EPA that help finance their radon risk reduction programs.

By law, these State Indoor Radon Grant (SIRG) funds are not available to individuals or homeowners.

Conduct projects and activities that directly support the strategic goals, including promoting action by:

- consumers
- real estate professionals
- state and local building code officials
- school officials
- non-profit public health organizations
- professional organizations
- partnerships

Authorized by Sec. 306. *Grant Assistance to States for Radon Programs*, Title III, *Indoor Radon Abatement*, Toxic Substances Control Act (TSCA) , as amended, 15 U.S.C. §2661 et seq., P.L. 100-551, October 28, 1988.

Home Sweet Home!

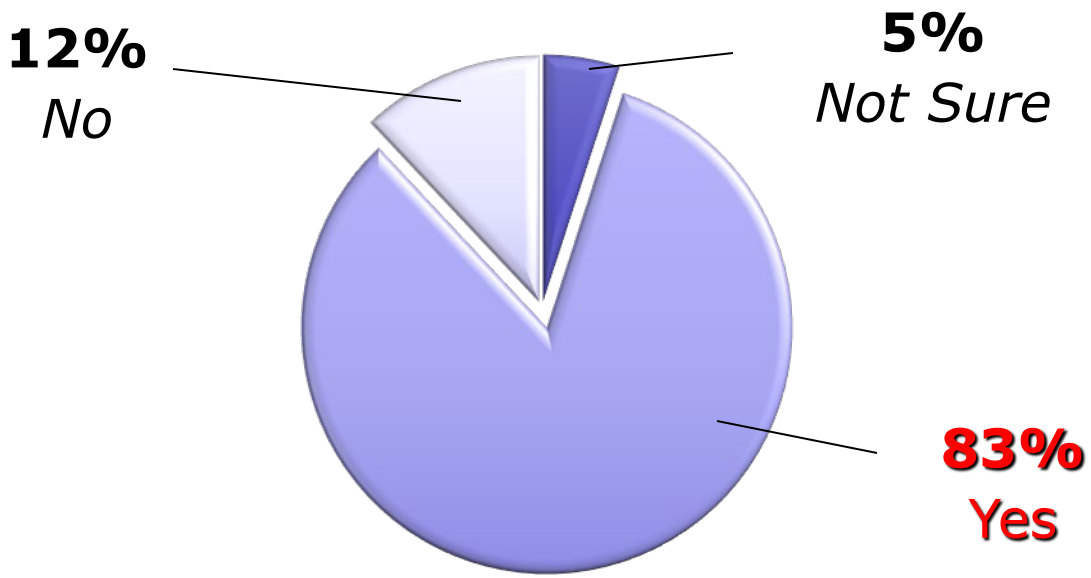
The Outreach Effort

The Outreach Effort

The Outreach Effort

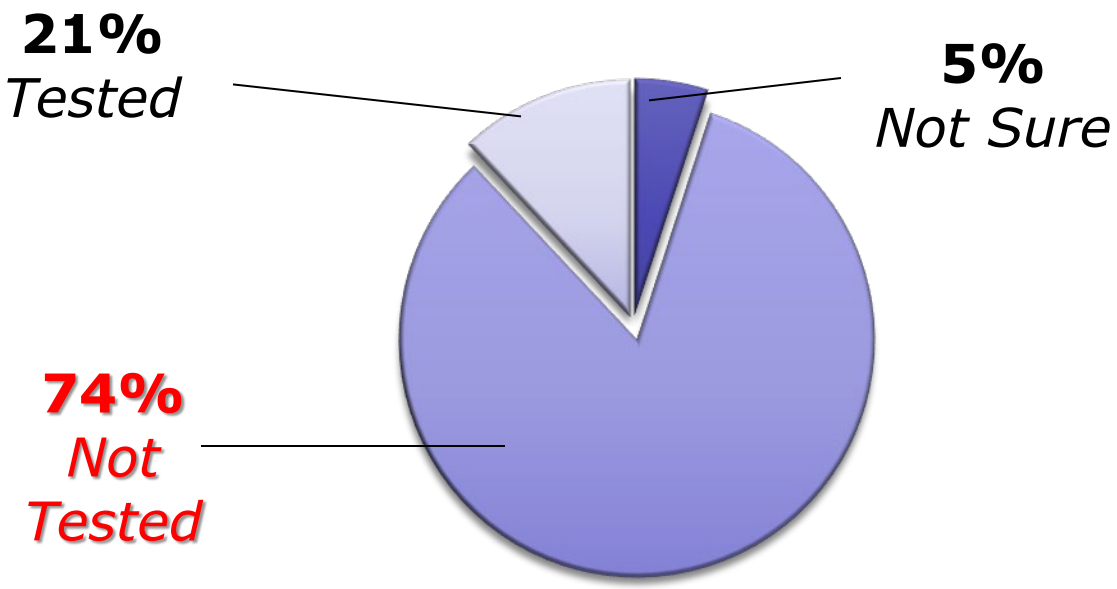
Reception of the Message

Homeowners Have Heard of Radon?



Acting on the Message

But Few Homeowners Have Tested for the Presence of Radon!



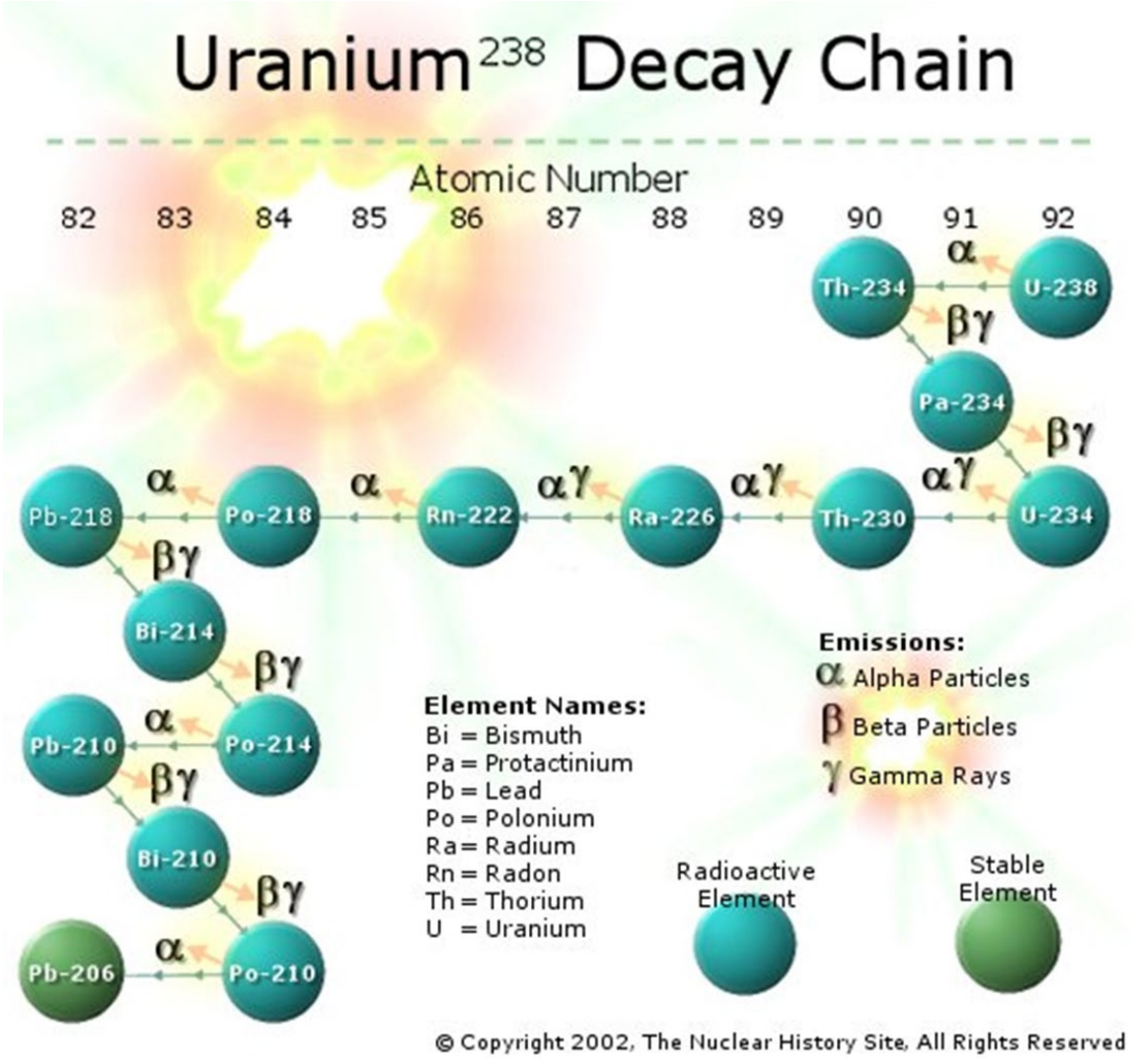
What is Radon and why should we care?

- Radon is Odorless, Colorless, Tasteless, Invisible Radioactive gas
- Radon Occurs naturally in most soils
- Radon does not go away over time
- Any building can have a radon problem
- Radon is the second leading cause of lung cancer
- THERE IS NO SAFE LEVEL OF RADON!
- Radon problems can be fixed or prevented!

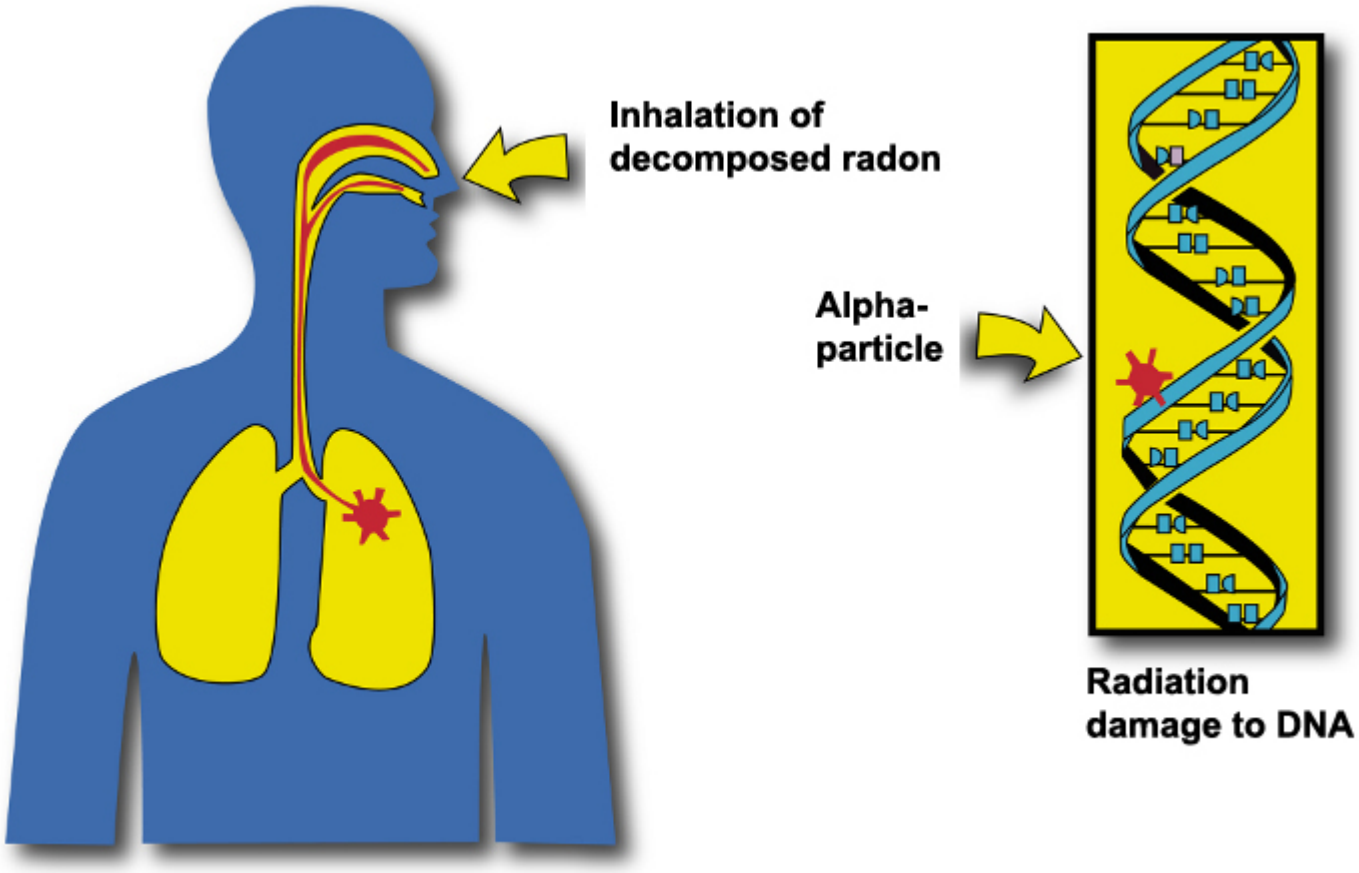
Where does Radon come from?

- Occurs naturally from the decay of uranium in rock, soil and ground water.
- Uranium is widely found in trace amounts in many if not most rocks and soils.
- Radon in rocks and soils under and adjacent to buildings, migrates through foundations, cracks and small openings and concentrates inside buildings.
- Some building materials can emit radon.

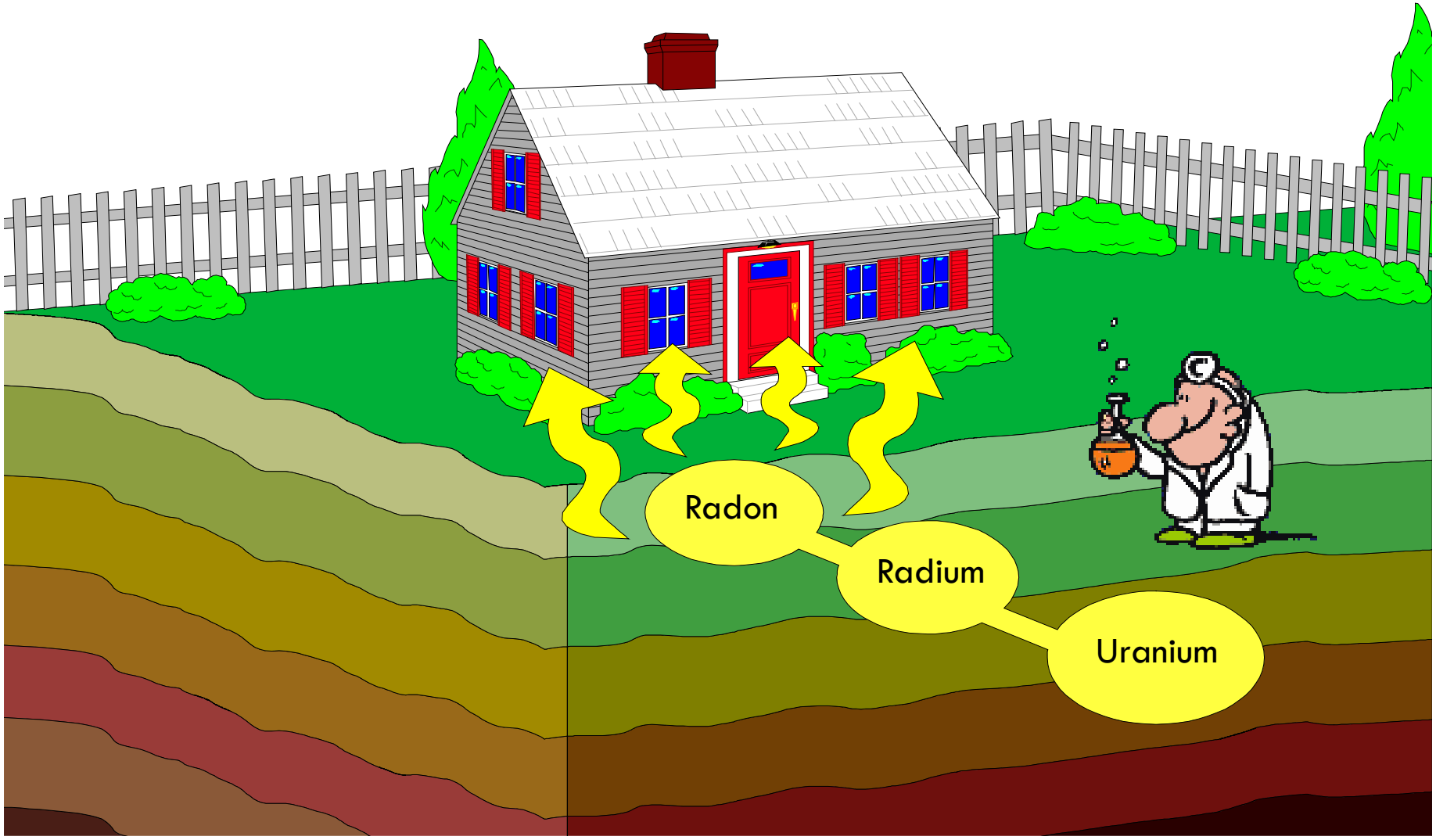
The Uranium Decay Chain



Radon in Lungs



The Net Result



A Brief History of Radon and Lung Cancer

1400's **Underground Miners in Europe were dying from an unknown lung disease**

1879 **Lung cancer first identified in European miners**

1950's **Connection made between lung cancer and radon**

1984 **Extremely high radon found in Pennsylvania home (2700 pCi/L)**

Le radon, aspects historiques et perception du risque

par Roland Masse, Académie des technologies

Paracelse

On a connu les dangers du radon en milieu professionnel bien avant d'en connaître la cause. Au quinzième siècle déjà, A.-P. Schneevogel décrivait, dans les mines d'argent des montagnes de Saxe et de Bohème exploitées depuis le 13ème siècle, les maladies du poumon qu'entrainait « l'air dangereux des profondeurs de la terre ». Le médecin suisse Paracelse devait décrire cette pathologie (« mala metallorum ») en 1530 avec suffisamment de précision pour qu'on lui en attribue l'observation initiale, tandis qu'à la même époque Agricola dans son traité « De re metallica » recommandait déjà de ventiler les mines pour éviter la maladie de la montagne (« Bergsucht »). La maladie était particulièrement fréquente dans la région du Schneeberg qui lui donna quelque temps son nom (« Bergkrankheit der Schneeberger Gruben »), avant que Härting et Hesse en 1879 reconnussent le caractère cancéreux de l'affection. Ce cancer du poumon était à l'époque décrit comme un lymphosarcome attribué à l'arsenic, aux métaux : cobalt, nickel et à la silice, ce qui était somme toute justifié puisque ces éléments sont maintenant connus pour leurs propriétés cancérogènes et qu'ils participent vraisemblablement à l'induction des cancers chez les mineurs exposés également au radon. Selon Härting et Hesse 75 % des mineurs étaient atteints et mouraient jeunes, ce qui témoigne de la tolérance au risque dans le monde minier, décimé par ailleurs par la silicose et la tuberculose.

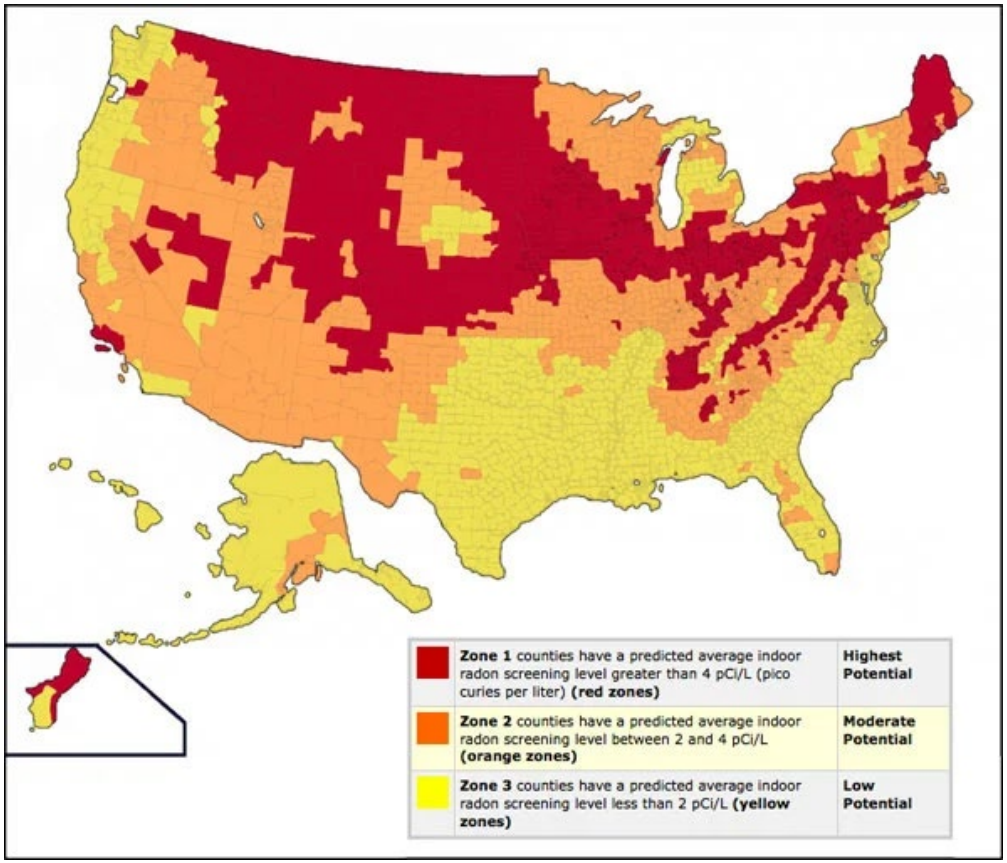
Dans ce contexte de risque très élevé, le rôle causal majeur du radon ne fut cependant reconnu que tardivement après la découverte de la radioactivité. On savait depuis les Curie, et Rutherford en 1900, que le radium extrait du minerai de Bohème libérait une « émanation » radioactive. En 1904 London montra les effets délétères de cette émanation sur la grenouille. H.-E. Schmidt en 1913 fit de cette émanation une cause possible de la maladie du Schneeberg, mais ce n'est qu'en 1924 que les mesures effectuées par Ludewig et Lorenser dans les mines de Saxe et de Bohème établirent une corrélation étroite entre la présence du radon et la fréquence du cancer chez les mineurs (définitivement reconnu comme un carcinome). Par la suite les données épidémiologiques s'accumulèrent des deux côtés de la frontière entre Allemagne et Tchécoslovaquie, publiées ouvertement de ce côté et, plus discrètement de l'autre. Dans le chapitre qu'il consacre au radon, N. Stannard dans « Radioactivity and Health[1]. A History » (1988, DOE-OSTI) constate que malgré ces données « la progression dans l'opinion des scientifiques de la suggestion vers l'acceptation du rôle cancérogène du radon a été tortueuse », l'exposition aux rayonnements étant jugée « trop faible » pour être l'unique cause, et ceci malgré des concentrations de l'ordre du million de Bq par m³, aboutissant à des doses efficaces de l'ordre du Sv par an.

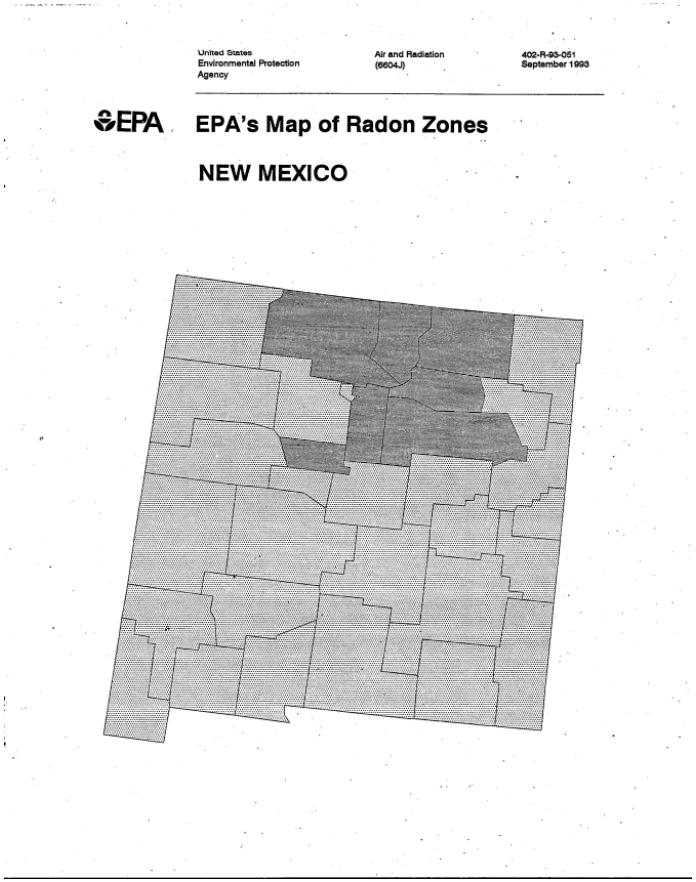
Il fallut attendre la fin des années 50, avec à la fois les données épidémiologiques

1. Dont est tiré la majorité des références historiques.

1

The National Radon Survey

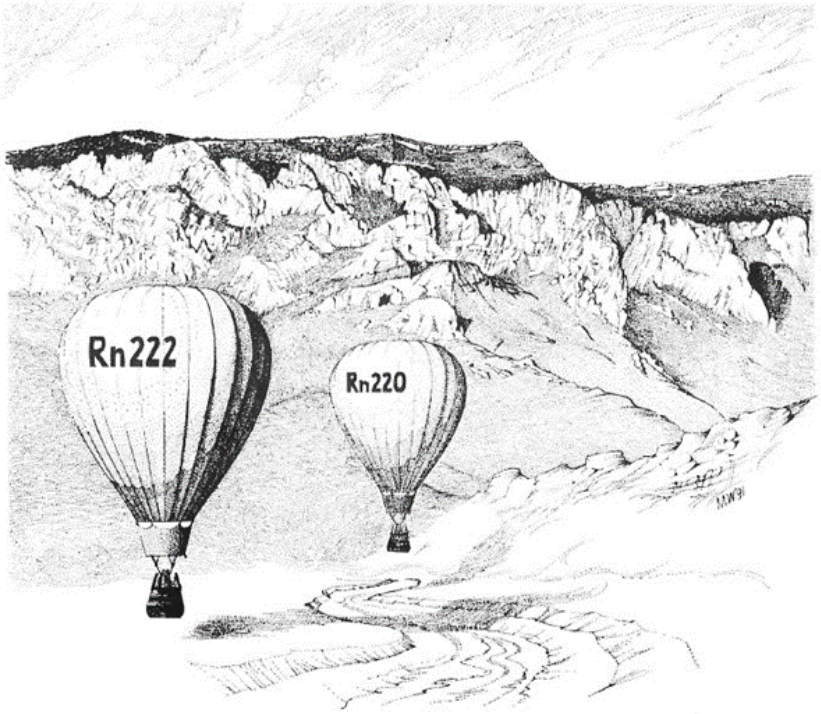




https://nepis.epa.gov/Adobe/PDF/000007Q7.PDF

Radon Report from NMED

NEW MEXICO RADON SURVEY
1987 - 1989



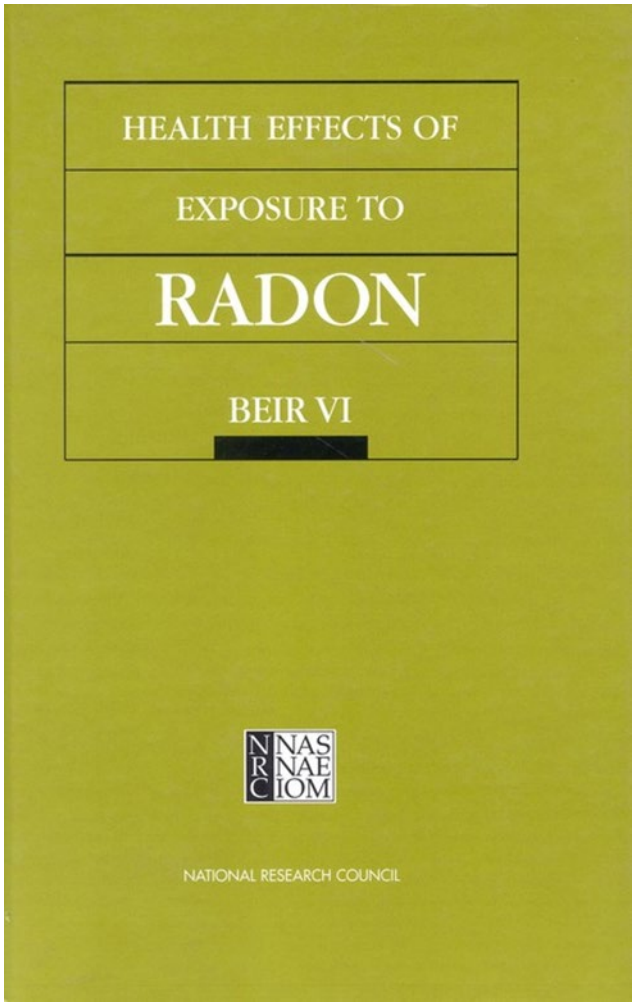
by

Ralph A. Manchego, Virginia T. McLemore and John W. Hawley

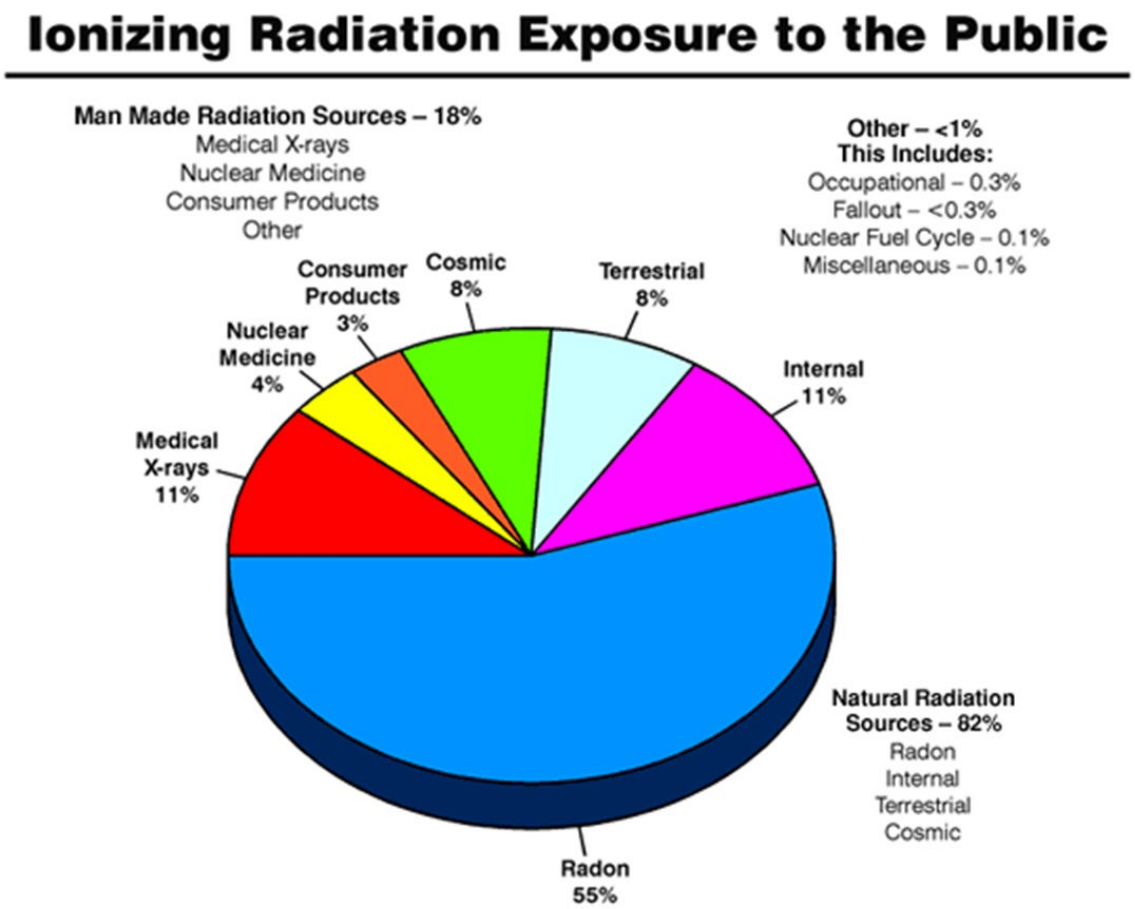
BEIR VI

National Research Council. 1999. Health Effects of Exposure to Radon: BEIR (Biological Effects of Ionizing Radiations) VI. Washington, DC: The National Academies Press. https://doi.org/10.17226/5499.

592 pages
ISBN: 978-0-309-05645-8



Sources of Radiation



The above chart is taken from the National Council on Radiation Protection and Measurements (NCRP) Report No. 93, "Ionizing Radiation Exposure of the Population of the United States," 1987.

This chart shows that natural sources of radiation account for about 82% of all public exposure while man-made sources account for the remaining 18%.

Who Says Radon is a Problem

- U.S. Environmental Protection Agency
- World Health Organization
- National Academy of Sciences
- U.S. Surgeon General, U.S. Public Health Service
- American Association of Radon Scientists and Technologists
- National Academy of Sciences
- U.S. Department of Health and Human Services
- National Cancer Institute
- National Environmental Health Institute
- American Lung Association
- National Safety Council
- Conference of Radiation Control Program Directors
- National Association of Counties
- National Association of Realtors

From Real Estate Professionals

In May 1993, the National Association of Realtors (NAR) joined the EPA in urging all Americans to test their homes for radon. The NAR encouraged state associations to develop and support legislation or regulation requiring mandatory property condition disclosure, including radon, by the seller.

From States

- Thirty-seven states require radon disclosure during real estate transactions.
- Seven states do not have any radon disclosure form, whether through legislative means or the Association of Realtors.
- Four states require tenant disclosure by the landlord.
- Twenty-five states have radon certification laws.
- Four states require testing in high priority buildings.
- Nine states require testing in daycare centers.
- Thirteen states require testing in schools.
- Eighteen states have radon mitigation laws.
- Eleven states require radon-resistant new construction.
- Twelve states require a public education program or radon awareness program.
- Eleven states impose civil penalties for misrepresenting radon readings.
- Eleven states impose criminal penalties for misrepresenting radon readings.
- Five states impose criminal and civil penalties for misrepresenting radon readings.

A Quote…

“ The nine most terrifying words in the English language are:

I’m from the government and I’m here to help.”

-Ronald Reagan

Another Actual Quote

"You should inform yourself as to the fact that there is no scientific evidence whatsoever that low-level radon exposure poses any risks to humans.

Moreover, I suspect that your lack of understanding of this fact has resulted in your supporting a useless radon testing industry that not only makes housing more expensive, but also wastes time and energy through useless testing.

Please check the requirements for radon testing in commercial buildings. There are none. The reason that there are none is because there is no actual risk.

Please stop wasting taxpayer and private resources in the pursuit of such a useless endeavor."

My Response…

There is in fact extensive scientific evidence, from sources here in the US and around the world, that radon is a significant health risk, and as a Class A carcinogen (such as benzene, mustard gas, tobacco smoke and others) needs to be addressed.
Much of this has been summarized in the report, *Health Effects of Exposure to Radon (BEIR VI*), by the Research Council on the biological effects of ionizing radiation (National Academies of Science).
https://www.nationalacademies.org/news/1998/02/radon-especially-in-combination-with-smoking-contributes-to-lung-cancer-deaths

Radon testing in commercial buildings is required if there is a question of radon exposure and is covered/enforced by OSHA (Occupational Safety and Health Administration).
A position paper on this from Richard E. Fairfax, Director, Directorate of Enforcement Programs for the US Department of Labor can be found at this website:
https://www.osha.gov/laws-regs/standardinterpretations/2002-12-23

If I can be of any further assistance, please feel free to contact me.

From the Government

- There are no *general* regulations allowing for or prohibiting radon in homes.
- The OSHA radon exposure limit is for adult employees is 100 picocuries/liter (pCi/L) averaged over a 40-hour workweek. OSHA considers it a *de minimis* violation if an employer complied with the current NRC exposure limit for adult employees of 30 pCi/L. OSHA would considers it a *de minimis* violation if an employer complied with the current exposure limit for employees under the age of 18 of 3pCi/L.
- The NRC posting is required in areas where the "airborne radioactive area" weekly average radon exposure limit is 0.18 pCi/L.

From the World

- WHO recommends: Establishing a national annual average residential radon concentration reference level of 100 Bq/m3 (2.7 pCi/L), but if this level cannot be reached under the prevailing country-specific conditions, the reference level should not exceed 300 Bq/m3 (8.1 pCi/l)
- Radon levels in Canada are set at 200 Bq/m3. Any buildings with higher levels require mitigating actions and, for spaces with levels higher than 600 Bq/m3, these actions must be taken within a year.

From the World

- Norway: The action level for reduction is set at 100 Bq/m3. Current legislations set the limit at 200 Bq/m3 for schools, new buildings, and rented accommodation.
- France: New buildings are expected to have levels of 200 Bq/m3 and below. However, because of the type of soil, the government only recommends taking corrective actions for levels higher than 400 Bq/m3.
- Europe: 13 countries in Europe recommend action levels between 200 Bq/m3 and 400 Bq/m3.

From the US Congress

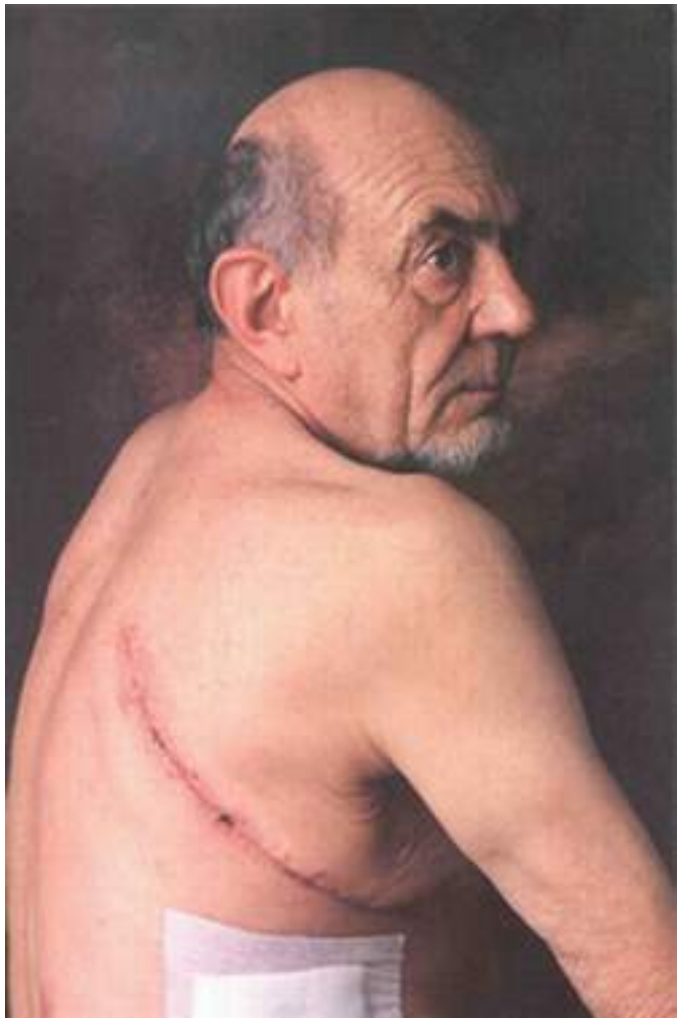
- The average indoor radon level is estimated to be about 1.3 pCi/L, and about 0.4 pCi/L of radon is normally found in the outside air. The U.S.
- Congress has set a long-term goal for indoor radon levels to be no more than outdoor levels.

Authorized by Sec. 306. *Grant Assistance to States for Radon Programs*, Title III, *Indoor Radon Abatement*, Toxic Substances Control Act (TSCA) , as amended, 15 U.S.C. §2661 et seq., P.L. 100-551, October 28, 1988.

EPA

- EPA: “While this goal is not yet technologically achievable in all cases, most homes today can be reduced to 2 pCi/L or below.”
- “It is estimated that 1 in 15 homes in the US has elevated radon that should be addressed.”
- **EPA: “There is no safe level of radon.”**

The Consequences

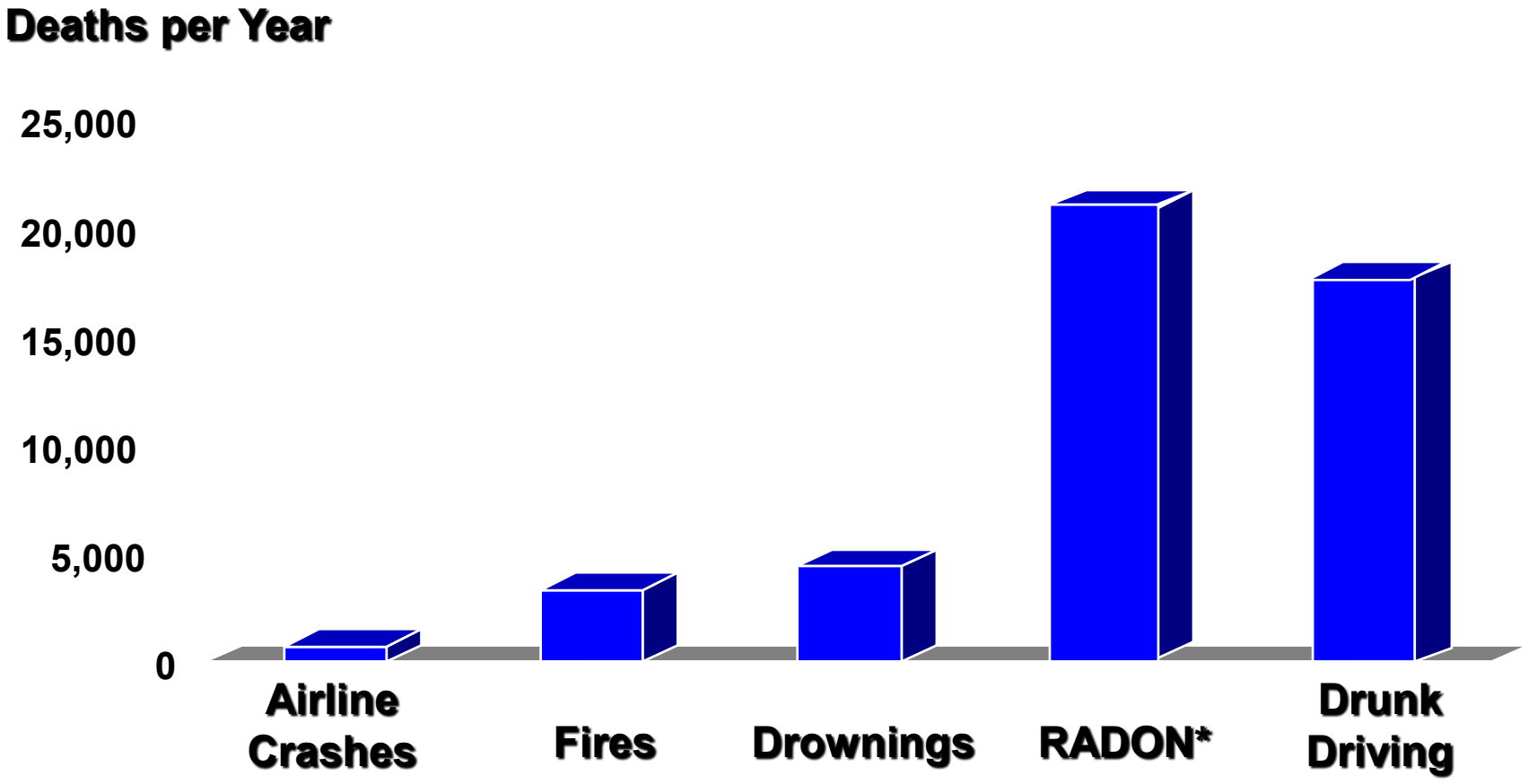


Radon is a Class A carcinogen, which means it is known to cause cancer in humans.

Radon is the second leading cause of lung cancer in the United States, resulting in approximately 21,000 lung cancer deaths each year. Only smoking causes more lung cancers.

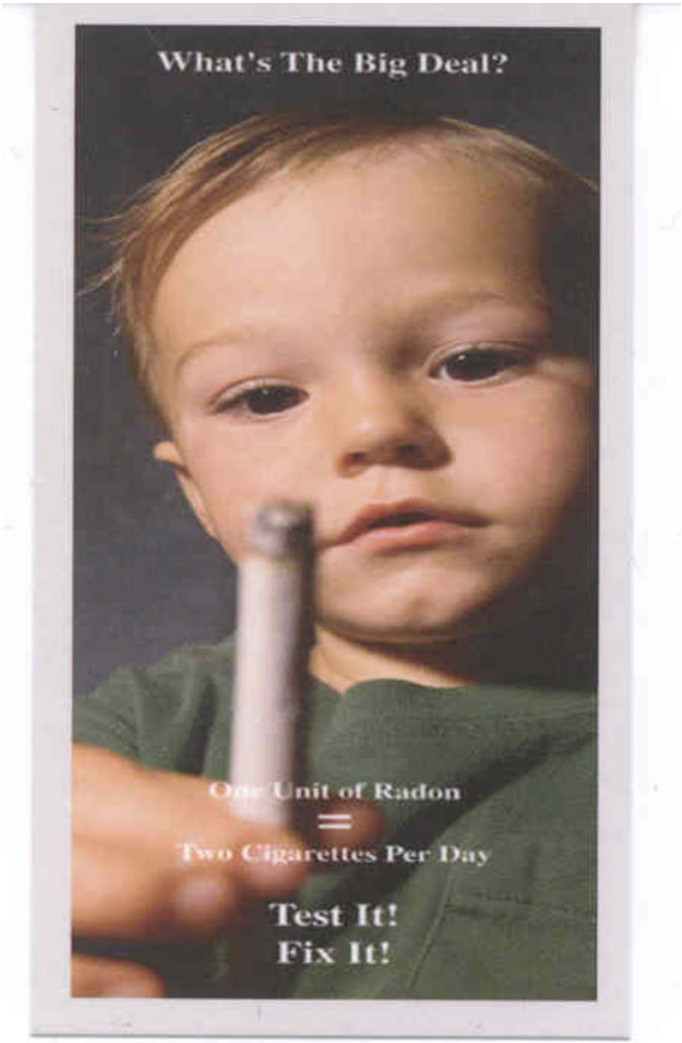
That's over 57 deaths per day.

Annual Death for Selected Causes



* Radon is estimated to cause 21,000 deaths per year, according to the National Academy of Sciences. The number of deaths from other causes are actuarial data taken from National Safety Council reports.

EPA: "There is no safe level of radon."



20-40 pCi/L ..... 2-4 Pack Cigarettes/Day
10-20 pCi/L ..... 1-2 Pack Cigarettes/Day
4 - 10 pCi/L ..... ½-1 Pack Cigarettes/Day
1 - 2 pCi/L ..... 20 - 40 Chest X-rays/year

Radon Risk (non-smokers)

Radon Level	If 1,000 people who never smoked were exposed to this level over a lifetime*...	The risk of cancer from radon exposure compares to**...	WHAT TO DO:
20 pCi/L	About 36 people could get lung cancer	35 times the risk of drowning	Fix your home
10 pCi/L	About 18 people could get lung cancer	20 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 15 people could get lung cancer	4 times the risk of dying in a fall	Fix your home
4 pCi/L	About 7 people could get lung cancer	The risk of dying in a car crash	Fix your home
2 pCi/L	About 4 person could get lung cancer	The risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 2 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult.)
0.4 pCi/L		(Average outdoor radon level)	

Note: If you are a former smoker, your risk may be higher.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

Radon And Smoking

Radon Level	If 1,000 people who smoked were exposed to this level over a lifetime*...	The risk of cancer from radon exposure compares to**...	WHAT TO DO: Stop smoking and...
20 pCi/L	About 260 people could get lung cancer	250 times the risk of drowning	Fix your home
10 pCi/L	About 150 people could get lung cancer	200 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 120 people could get lung cancer	30 times the risk of dying in a fall	Fix your home
4 pCi/L	About 62 people could get lung cancer	5 times the risk of dying in a car crash	Fix your home
2 pCi/L	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 20 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult.)
0.4 pCi/L	About 3 people could get lung cancer	(Average outdoor radon level)	

Note: If you are a former smoker, your risk may be lower.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

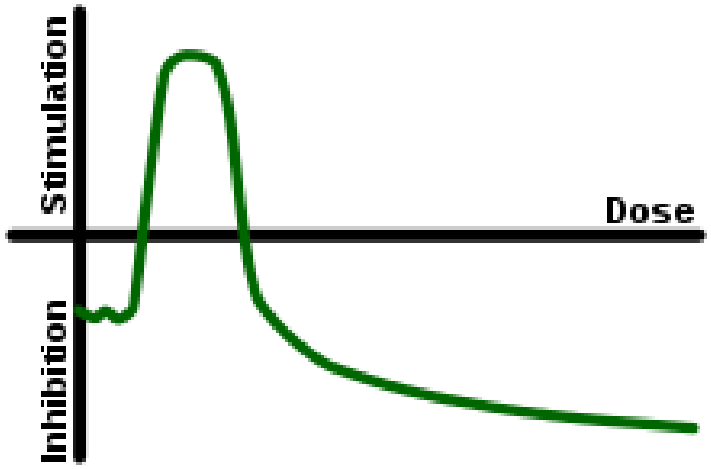
Centers for Disease Control

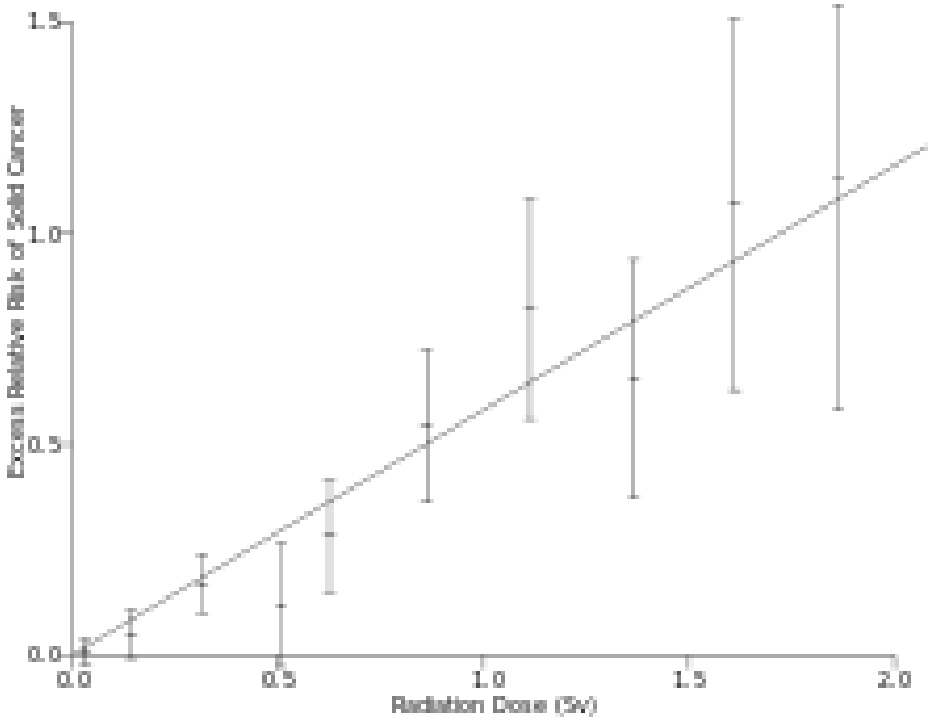
Keeping exposures within the risk level of 1 in 10,000 is the minimum level of protection and striving for lower levels of exposure is recommended for Class A carcinogens.

EPA considers Class A carcinogens as pollutants with adequate human data indicating the chemical causes cancer in people. Class B1 carcinogens have some human data and sufficient animal data to indicate its potential to cause cancer.

Hormesis versus LNT

Hormesis is a characteristic of some biological processes demonstrating a biphasic or triphasic response to exposure to small amounts of a substance or condition. Within this hormetic zone of exposure, there is generally a favorable biological response to low exposures to toxins and other stressors



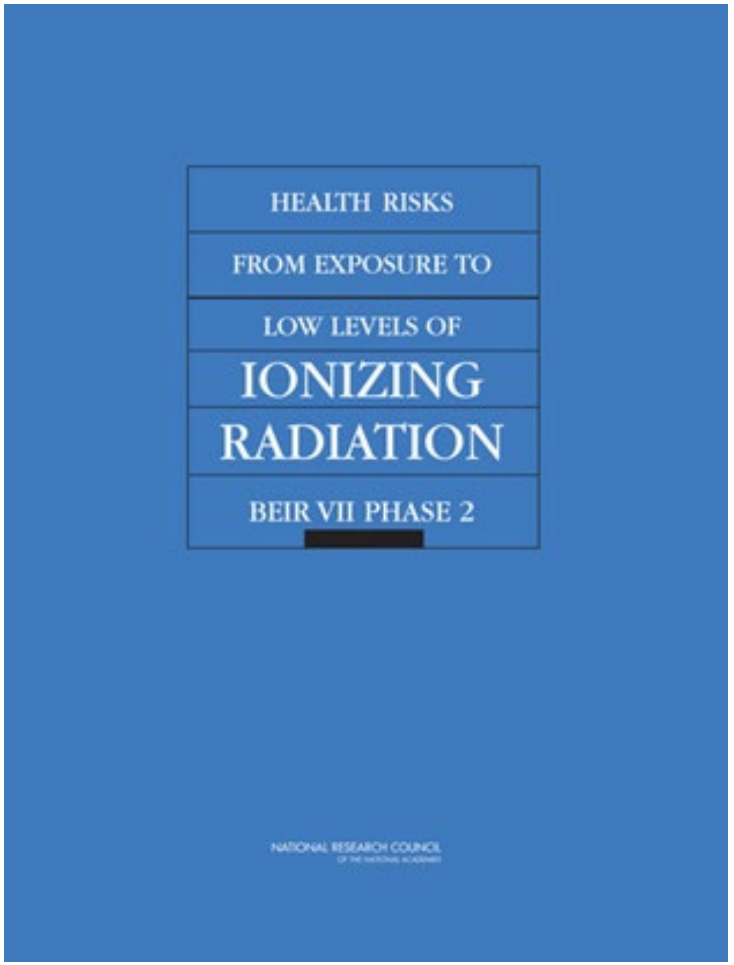


BEIR VII

National Research Council. 2006. *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2*

- At doses of 100 mSv or less, statistical limitations make it difficult to evaluate cancer risk in humans. A comprehensive review of available biological and biophysical data led the committee to conclude that the risk would continue in a linear fashion at lower doses without a threshold and that the smallest dose has the potential to cause a small increase in risk to humans.

422 pages
ISBN: 978-0-309-09156-5
DOI: https://doi.org/10.17226/11340



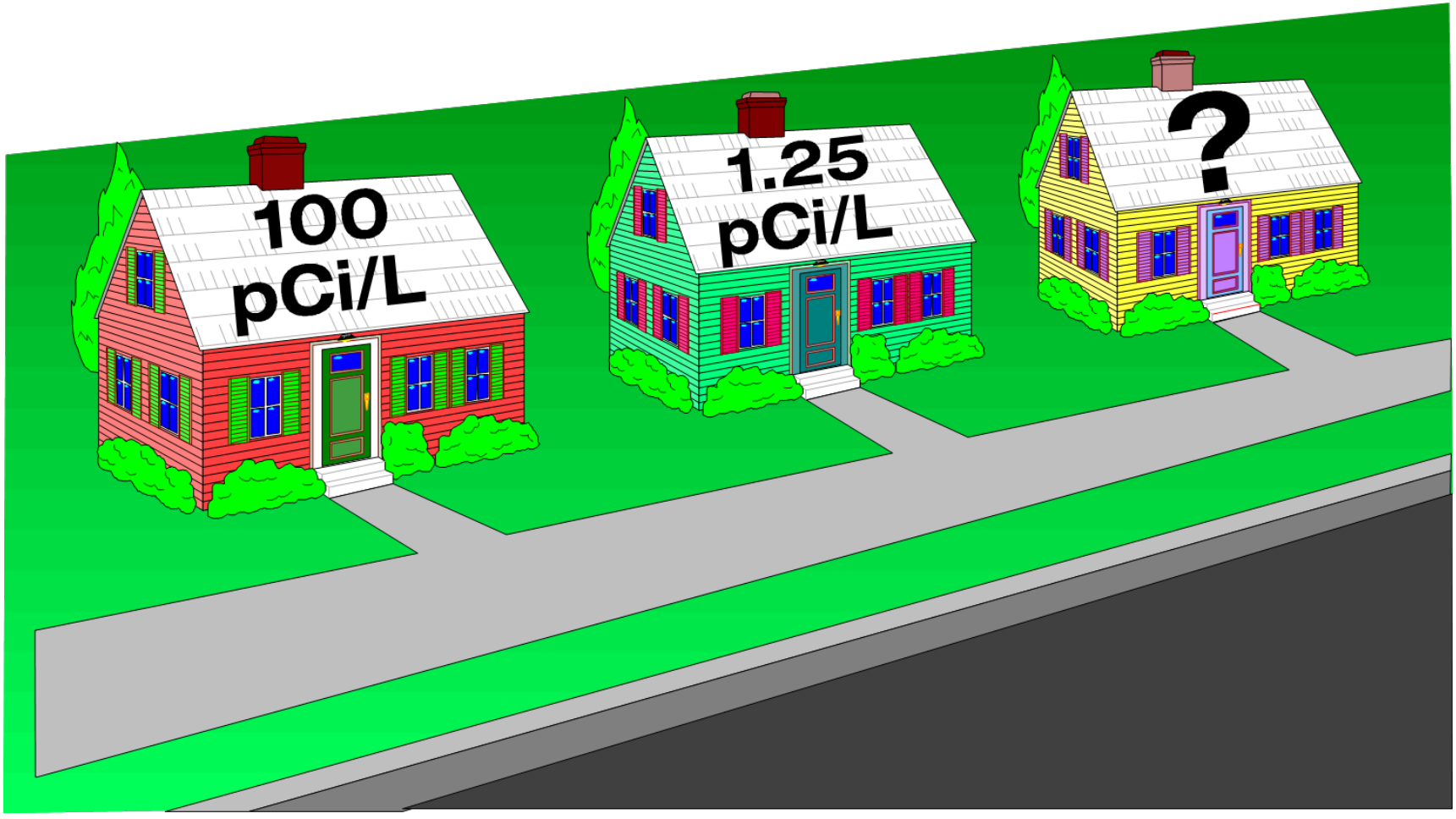
Regarding Hormesis and Radiation

- The *United States National Research Council* (part of the National Academy of Science) the *National Council on Radiation and Measurements* (a body commissioned by the the United States Congress), and the *United Nations Scientific Committee on the Effects of Ionizing Radiation* (UNSCEAR) all agree that radiation hormesis is not clearly shown, nor clearly the rule for radiation doses.
- A United States-based *National Council on Radiation Protection and Measurements* stated in 2001 that there is insufficient evidence for radiation hormesis and that radiation protection authorities should continue to apply the LNT model for purposes of risk estimation.

Radon Facts

- Old or New – Any House can have a radon problem
- Regardless of construction type
- All areas of New Mexico have the potential for radon problems

The Only Way to Know if You Have a Radon Problem is to Test



Testing for Radon

- The ONLY way to detect radon is to TEST
- Testing for radon is EASY
- Testing is NOT expensive
- IMPROPER or NOT testing can expose you, your family, coworkers to dangerous levels of radon

Testing in Real Estate

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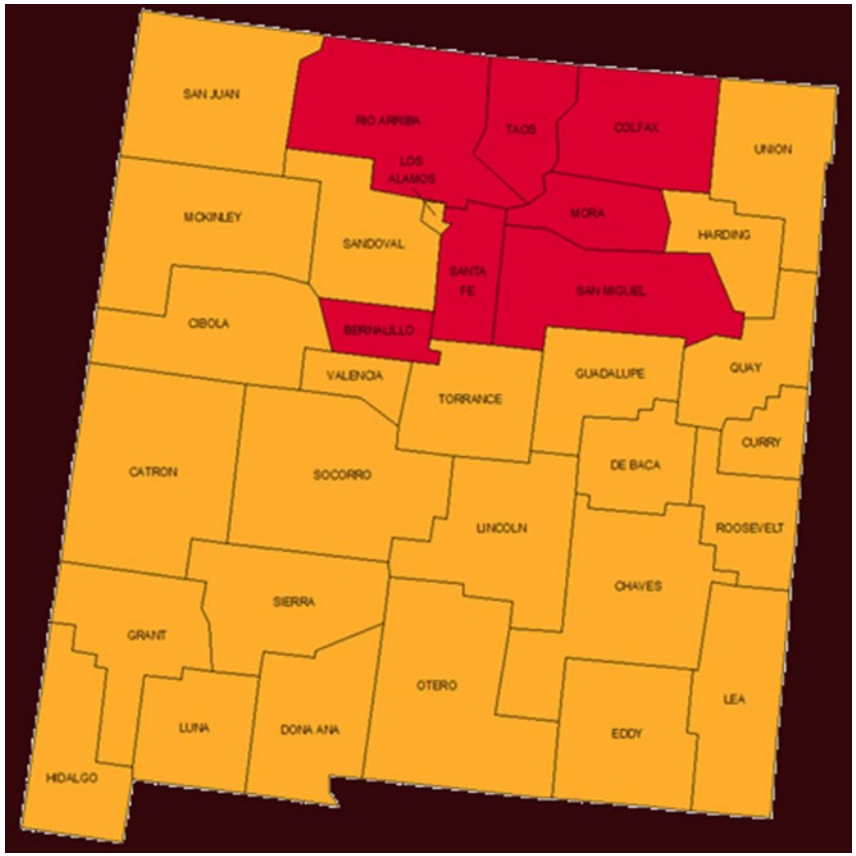


High

Medium

Low

EPA has never published a
"...don't bother to test for radon here, map"

Statistics

3.9 + 3.9 + 3.9 + 3.9 + 3.9 = Average 3.9

0.0 + 0.0 + 0.0 + 0.0 + 19.5 = Average 3.9

Radon Testing Devices

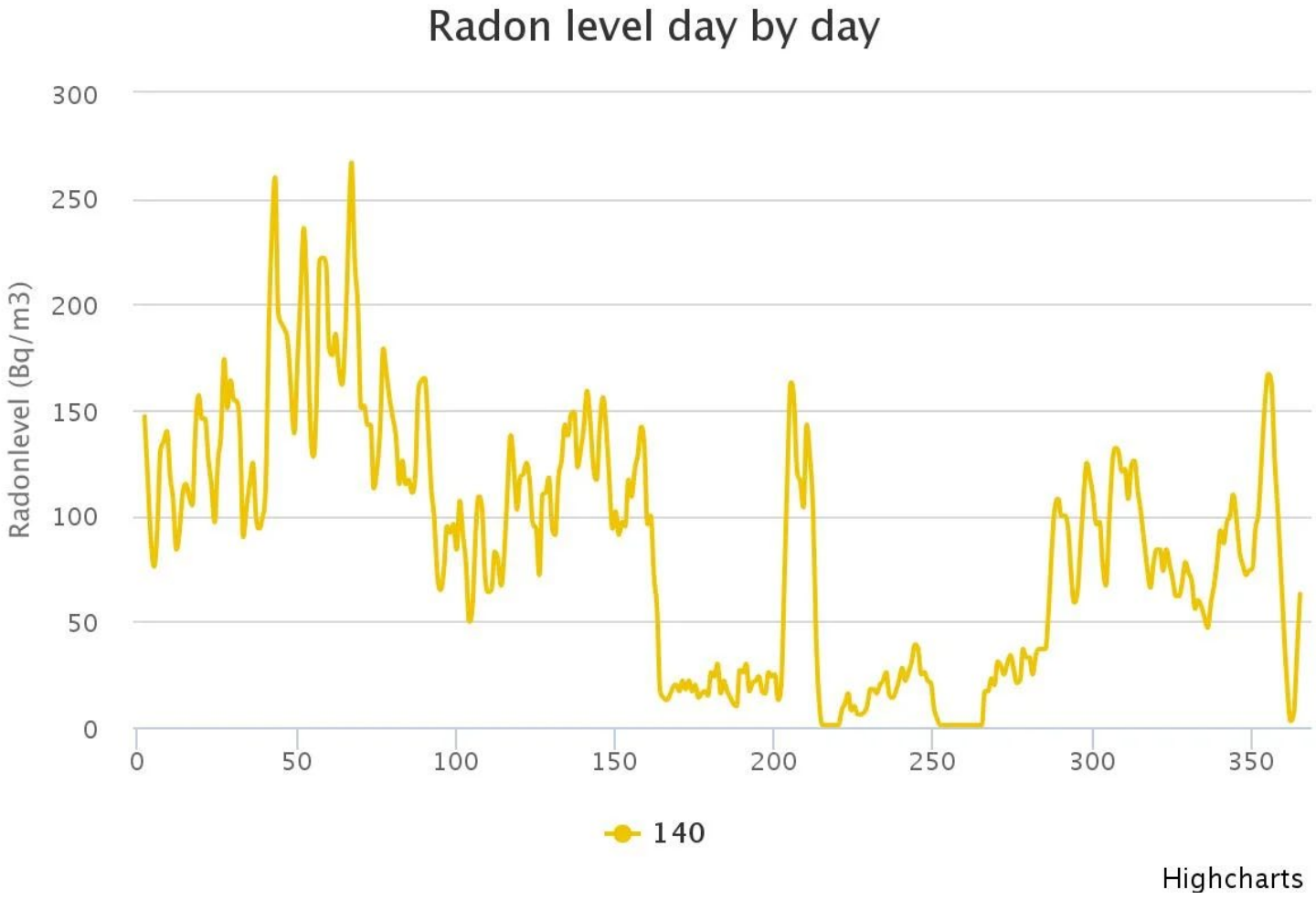
Radon Testing Machines

A True Result versus a “Good Result”

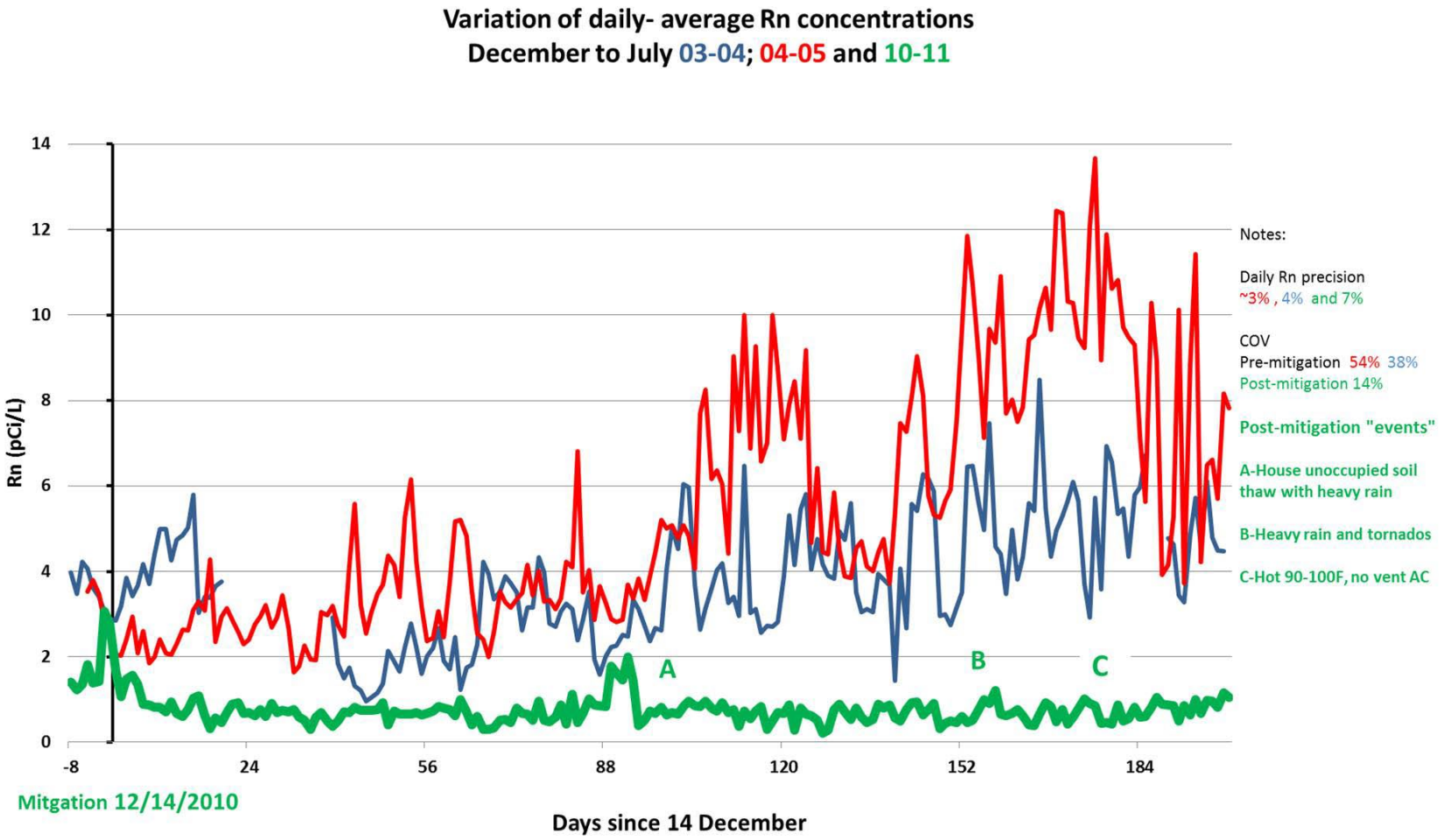
- One short term test is not the definitive answer.
- Deviating from the testing protocols invalidates the testing
- Interpreting test results is not always straight forward
  (averages versus peaks and valleys)

A True Result versus a Good Result

Radon Results - Annual



Radon Pre- and Post-Mitigation



What to do When You Get the Results

- Ignore it
- Worry about it
- Blame someone
- Move on
- Fix it

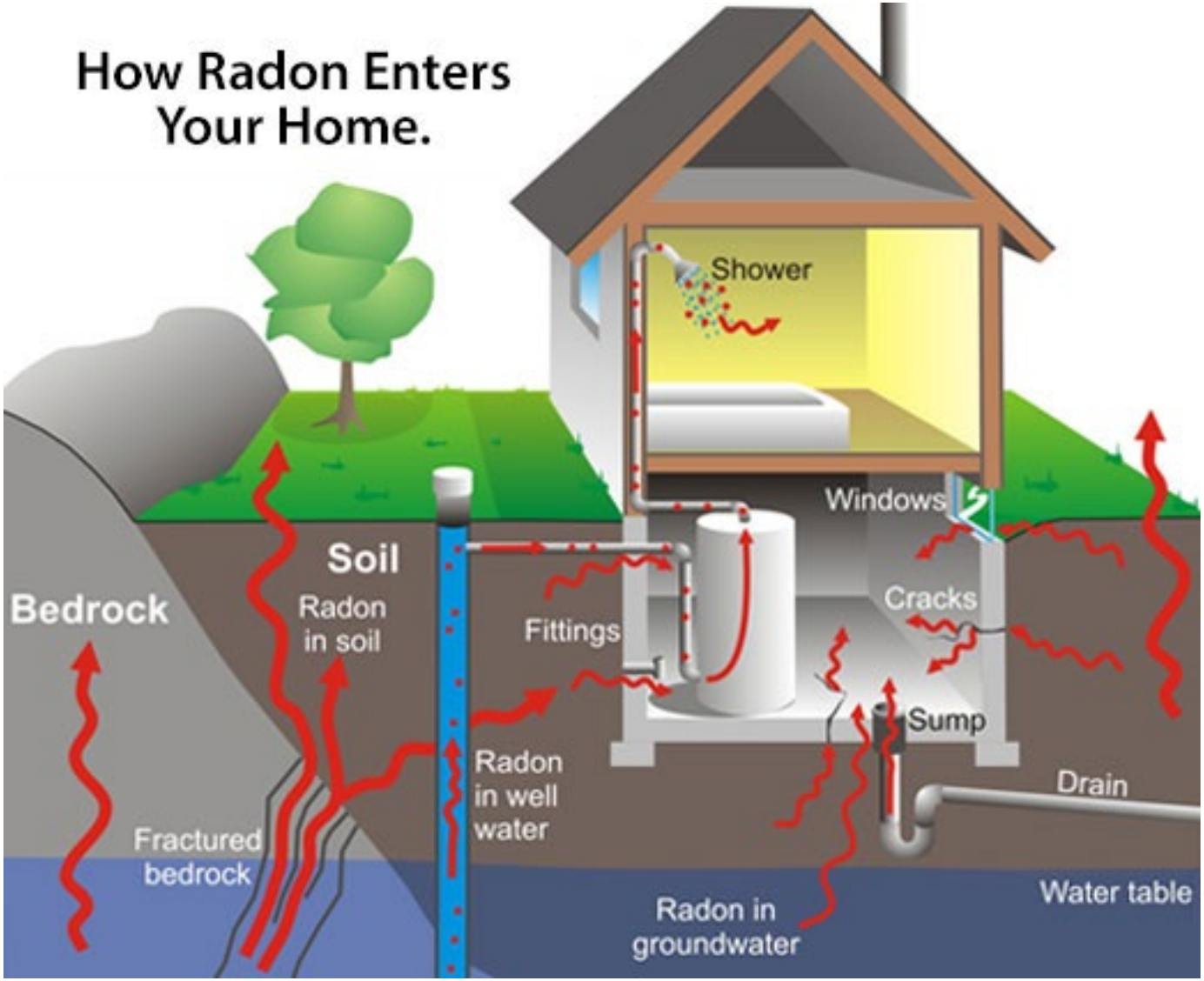
Why Radon Enters Your Home

Houses (buildings) suck!

- Stack (chimney) effects
- Wind (wing) effects

Brought in with your water.

How Radon Enters Your Home



Radon In Water

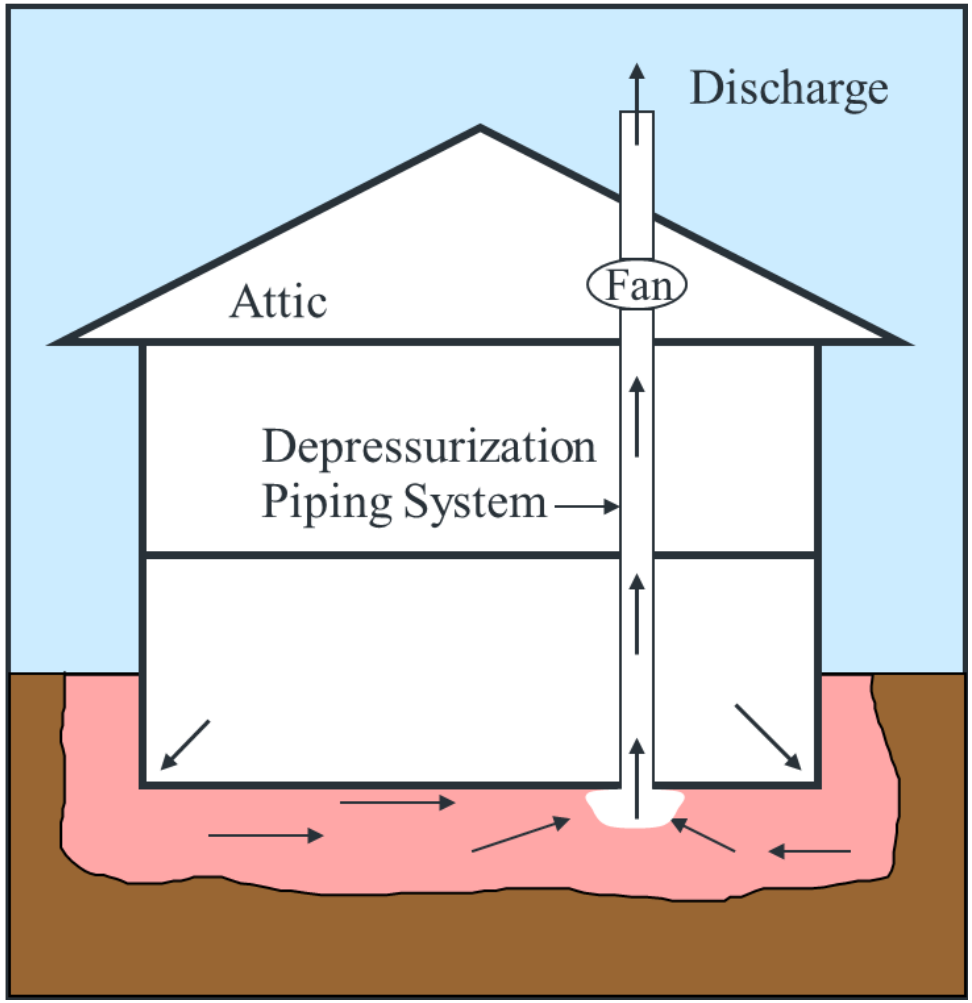
- The federal Safe Drinking Water Act provided for an extensive study by the National Academy of Science to determine a radon standard in the drinking water. Final federal regulations for radon have not yet been adopted.

- The proposed federal standards will apply only to community water systems that regularly serve 25 or more people and that use ground water or mixed ground and surface water.

- They will not apply to systems that rely on surface water where radon levels in the water are very low. They also will not apply to private wells.

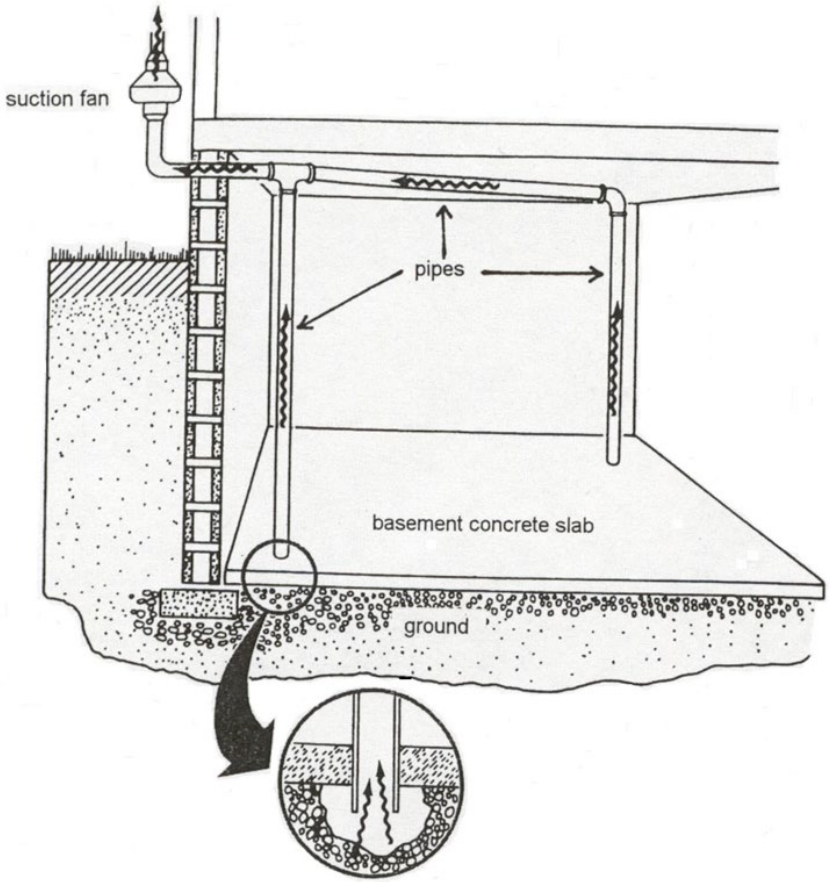
- Water systems will be required to reduce radon levels in drinking water to 4,000 pCi/L (which on average would contribute 0.4 pCi/L of radon to the air in your home) or lower.

Radon Mitigation



- Suction created by fan draws radon from beneath the concrete slab and safely vents radon outdoors
- Most common type of radon mitigation system, but not the answer for every problem

Radon Mitigation



Radon Mitigation

Radon Mitigation

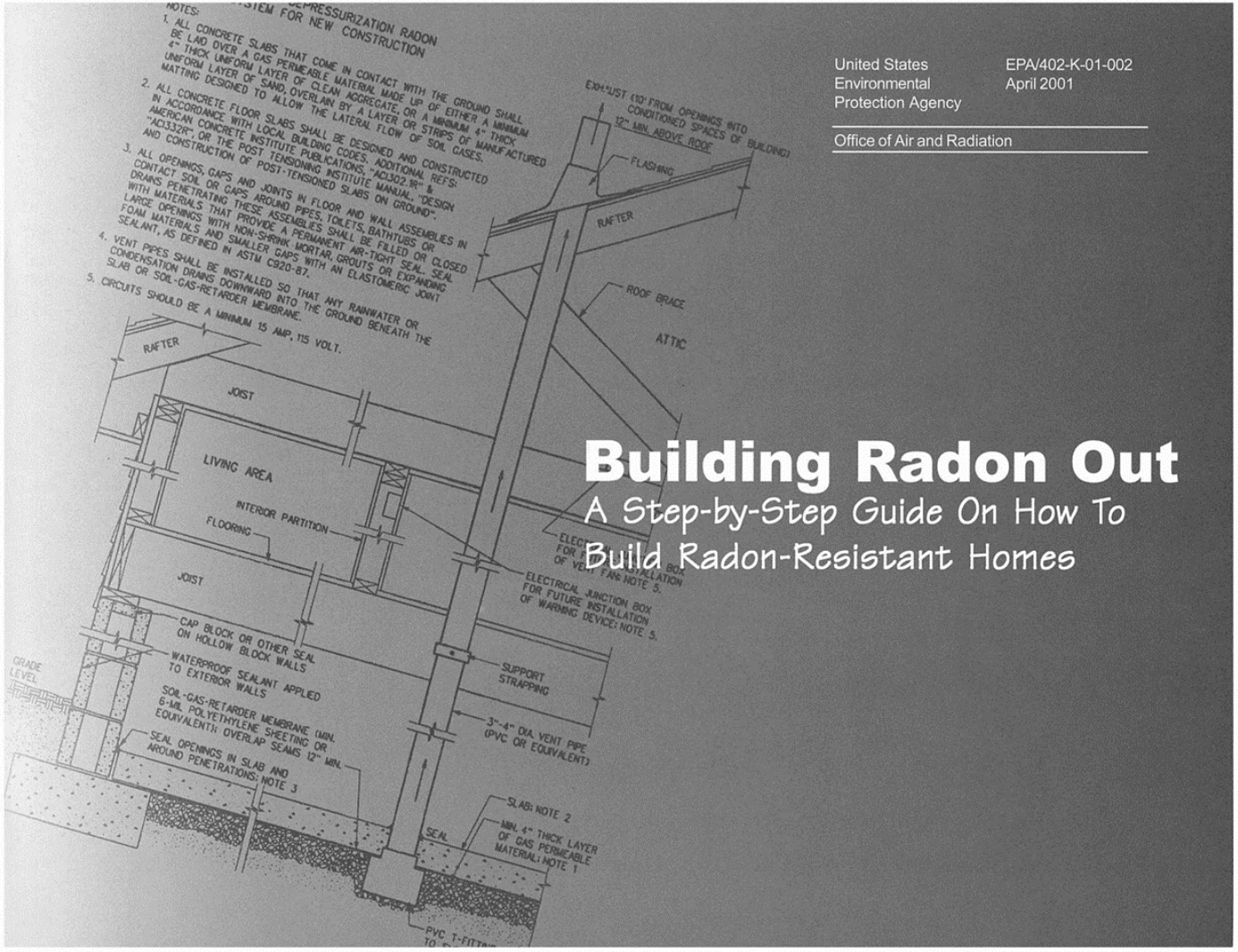
Radon Resistant New Construction

Radon Mitigation

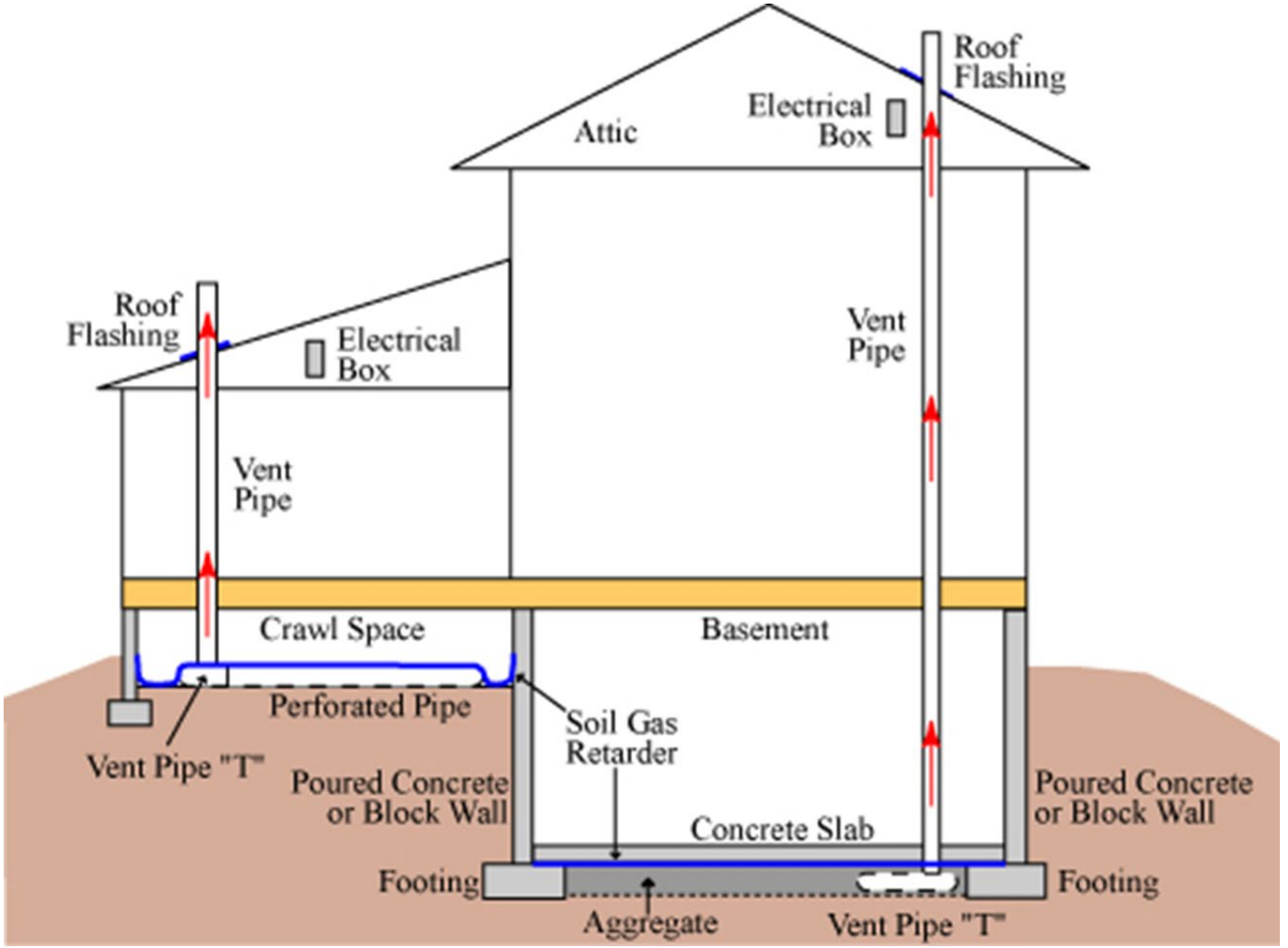
Radon Mitigation

Radon Mitigation

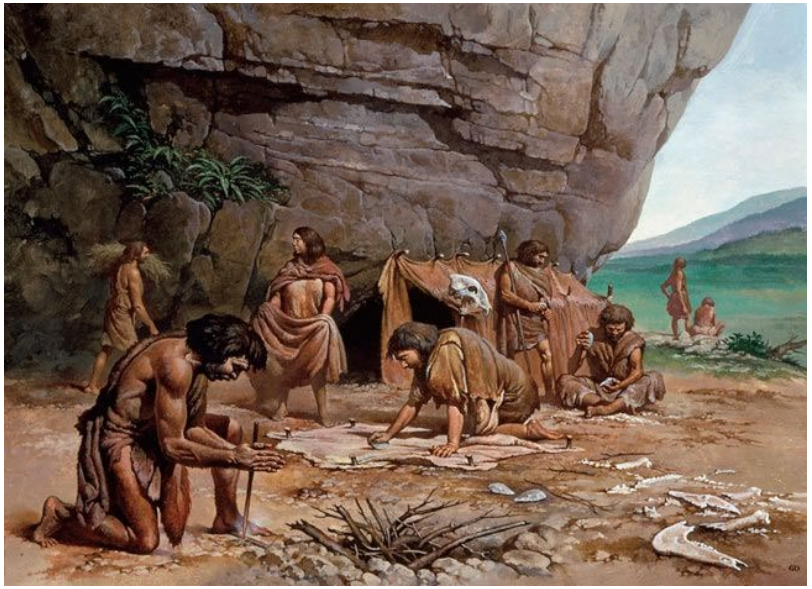
Radon Resistant New Construction

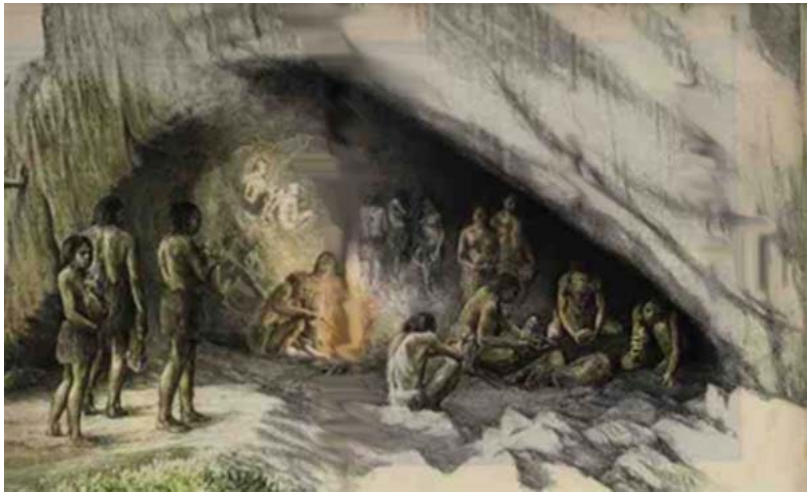


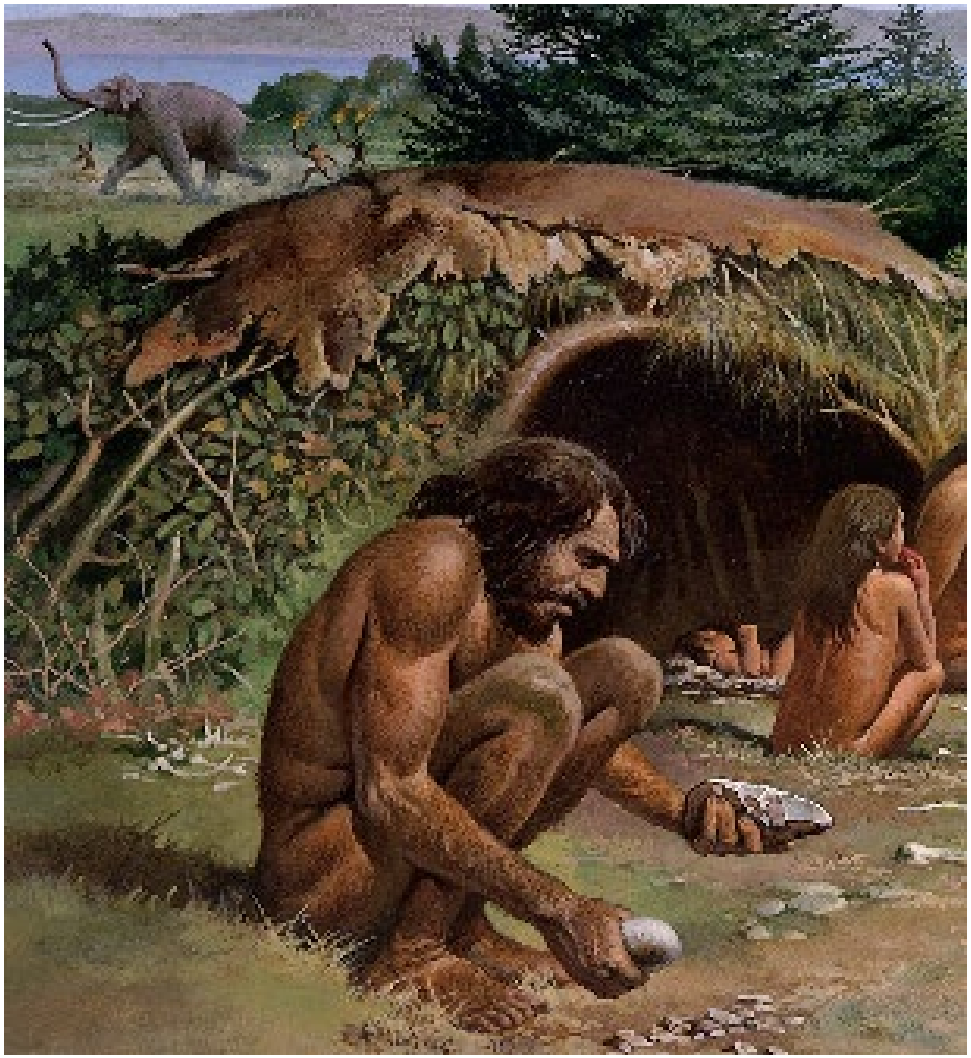
Radon Resistant New Construction



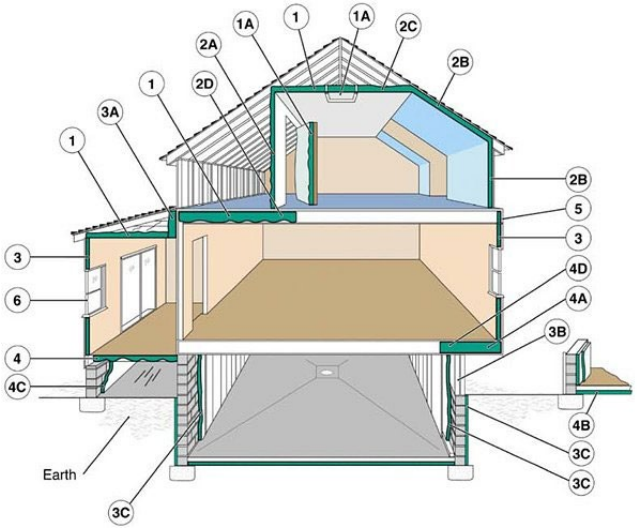
Building Standards

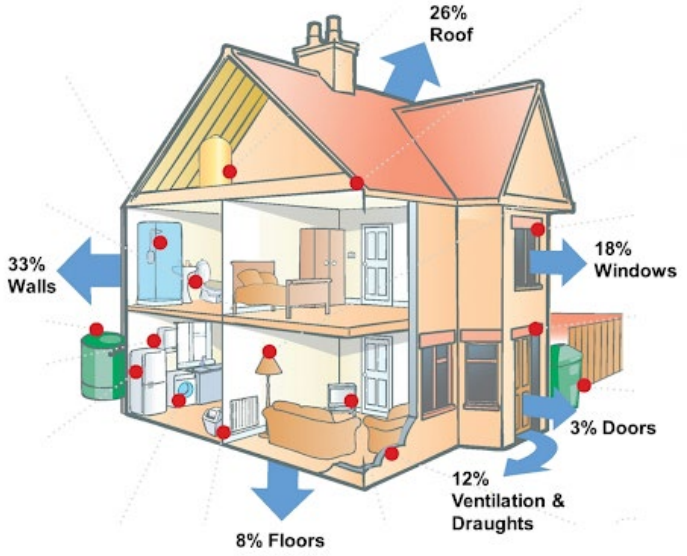






Building Standards





Building Standards

Radon Referencing Building Codes

Building Codes and Standards for Radon-Resistant New Construction (RRNC)

The most common residential codes and standards that address radon-resistant building techniques are:

International Code Council Codes & Standards:

- International Green Construction Code (IgCC): Chapter 8 – Indoor Environmental Quality and Chapter 10 – Construction and Plans for Operation.
- International Code Council (ICC-700): National Green Residential Standard • Extensive radon provisions will be included in 2020.
- International Residential Code (IRC): Appendix F of the 2015 International Residential Code (IRC): Radon Control Methods.The National Fire Protection Association: Building Construction and Safety CodeSection 49.2.5 of NFPA 5000TM: Radon Control Methods (Available for purchase from NFPA.)

American National Standards Addressing Radon in New Construction: (Available for purchase from AARST.)

- CCAH: Reducing Radon in New Construction of 1 & 2 Family Dwellings & Townhouses (Homes).
- CC-1000: Soil Gas Control Systems in New Construction of Buildings (Schools & Large Buildings).

Radon Regulation in NM

- None (sort of...)
- The State does not train, test, certify or register radon service providers.
- Some local codes exist that do address radon (City of Santa Fe – Green Building Code "Radon details will be required for all additions that increase the overall building footprint.").
- OSHA enforces radon work standards.
- International Residential Code (IRC) – Appendix F (https://sosradon.org/files/sosradon/RRNC_Codes/AppendixF_RadonControlMethods.pdf)

BUILDING PERMIT GUIDE FOR RESIDENTIAL CONSTRUCTION
State of New Mexico – Construction Industries Division

APPLICABLE CODES

The Construction Industries Division currently enforces the following codes:

- 2009 New Mexico Commercial & Residential Building Code
- 2009 International Building Code
- 2009 International Residential Code
- 2009 Solar Energy Code (IAPMO)
- 2009 NM Energy Conservation Code
- ICC/ANSI A117.1-2003
- 2009 New Mexico Plumbing and Mechanical Code
- 2009 Uniform Mechanical Code (IAPMO)
- 2009 Uniform Plumbing Code (IAPMO)
- 2009 Uniform Swimming Pool, Spa and Hot Tub Code
- 2011 New Mexico Electrical Code
- 2011 National Electrical Code
- 2008 National Electrical Safety Code
- Liquefied Petroleum Gas Standards
- 2011 NFPA 58
- 2008 NFPA 921
- 2009 NFPA 54
- 2010 NFPA 52
- 2011 NFPA 1192

http://www.rld.state.nm.us/uploads/files/bldg%20permit%20guide%20for%20residential.pdf

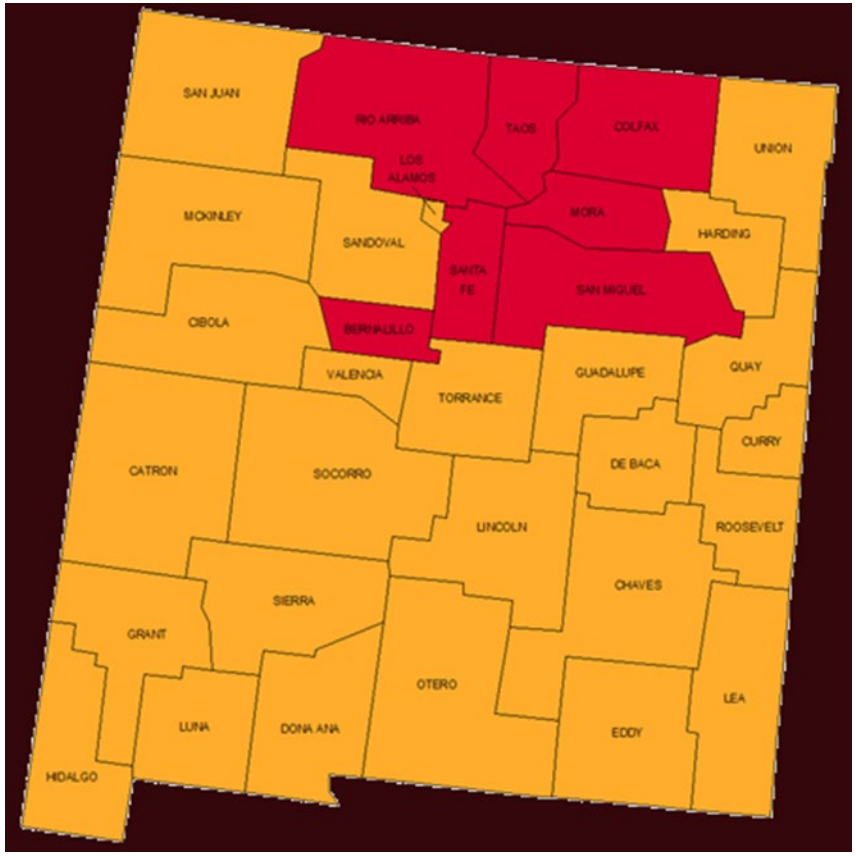
IRC – Appendix F
Radon Control Methods

SECTION AF101
SCOPE

AF101.1 General. This appendix contains requirements for new construction in jurisdictions where radon-resistant construction is required.

Inclusion of this appendix by jurisdictions shall be determined through the use of locally available data or determination of Zone 1 designation in Figure AF101.

EPA Radon Map of New Mexico



High

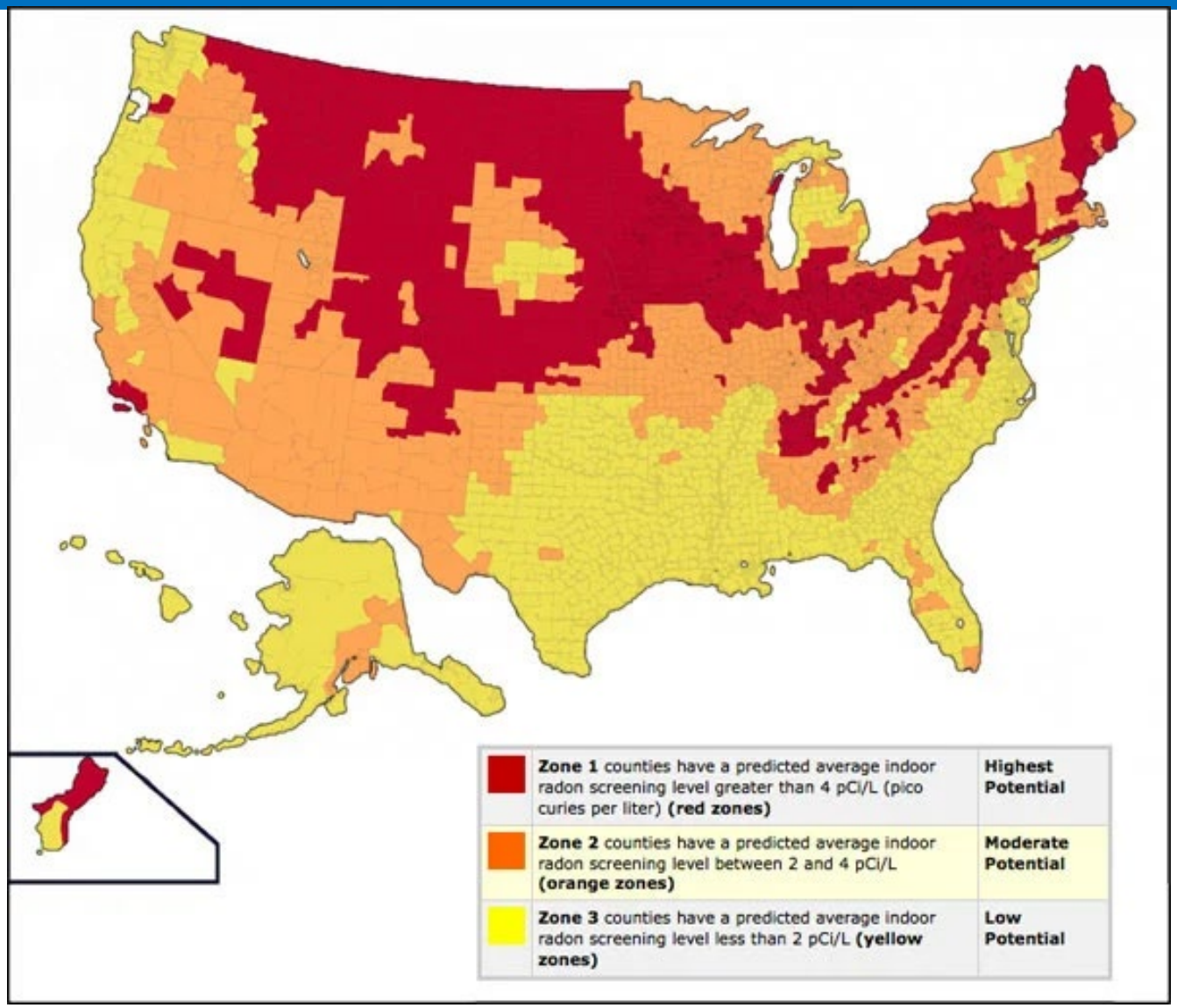
Medium

Low

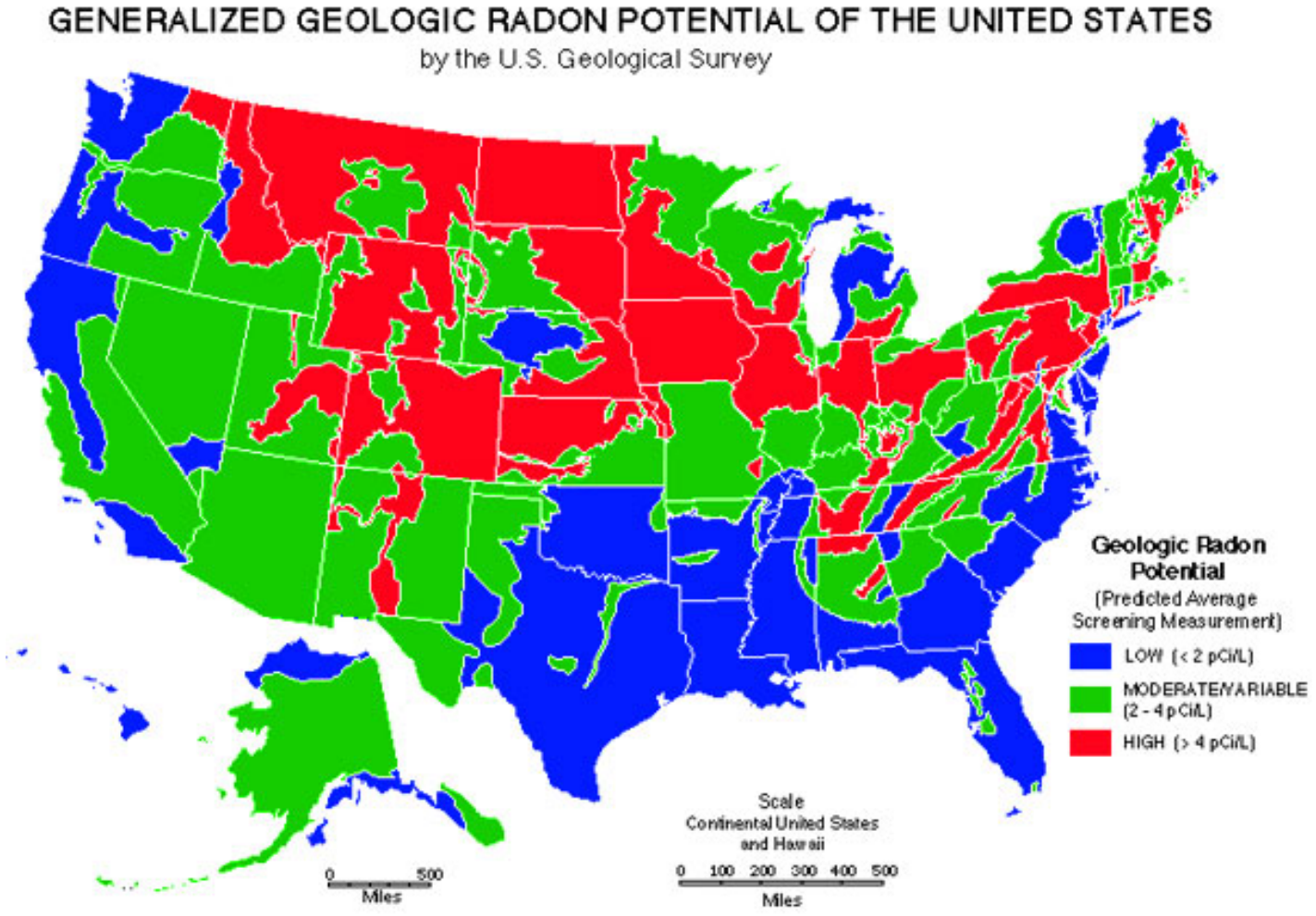
EPA has never published a
"...don't bother to test for radon here, map"

What about Testing the Soil before Building?

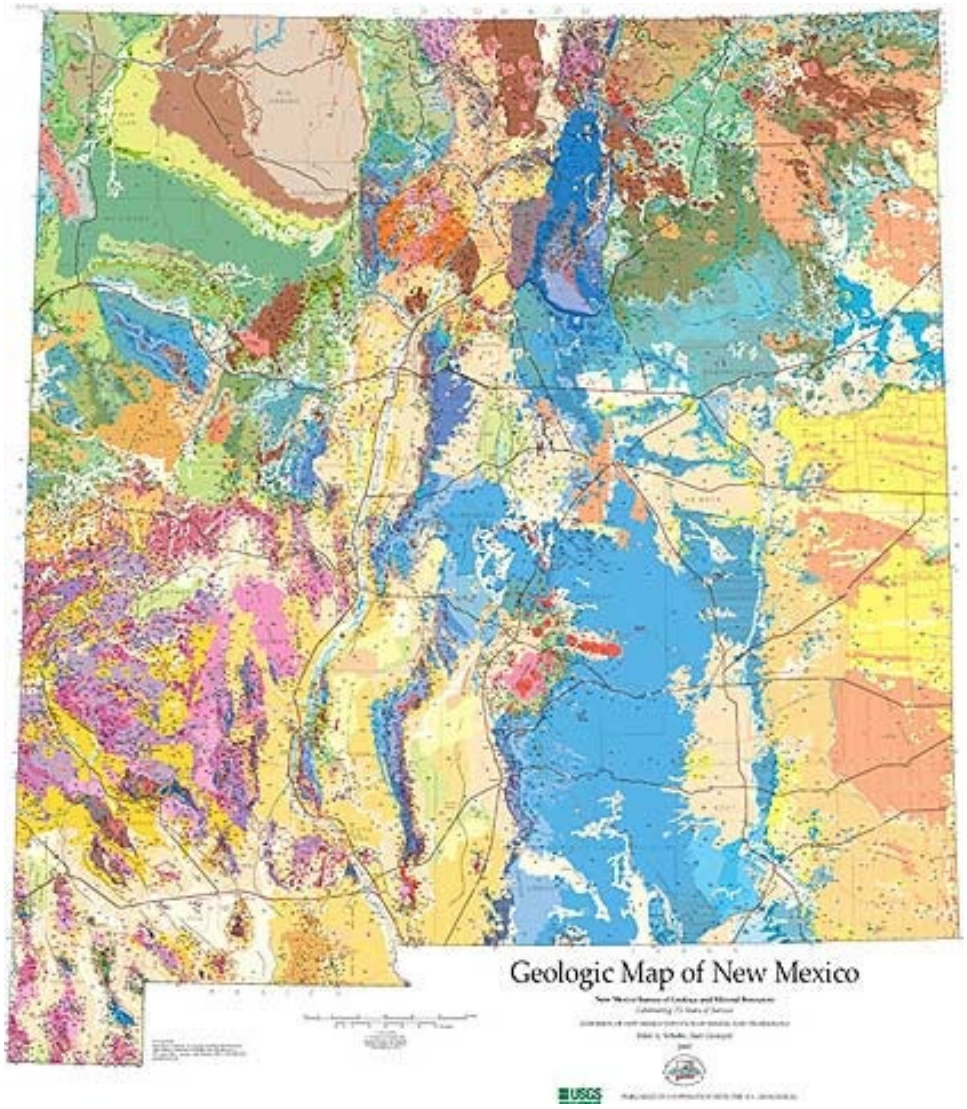
EPA Radon Map



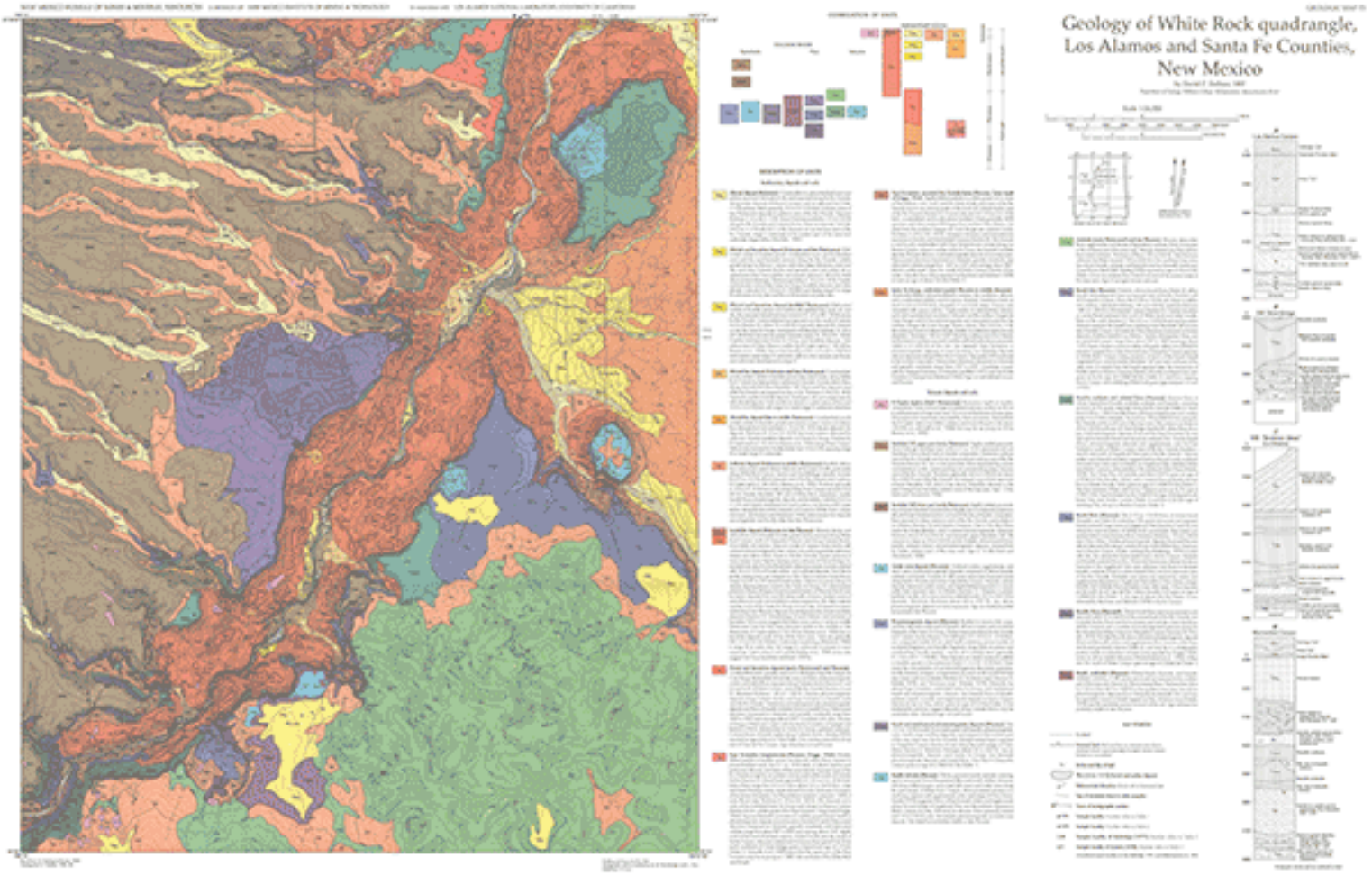
USGS Map


GENERALIZED GEOLOGIC RADON POTENTIAL OF THE UNITED STATES
by the U.S. Geological Survey
Geologic Radon Potential
(Predicted Average Screening Measurement)
LOW (< 2 pCi/L)
MODERATE/VARIABLE (2 - 4 pCi/L)
HIGH (> 4 pCi/L)
Scale
Continental United States and Hawaii
0 100 200 300 400 500
Miles
0 500
Miles

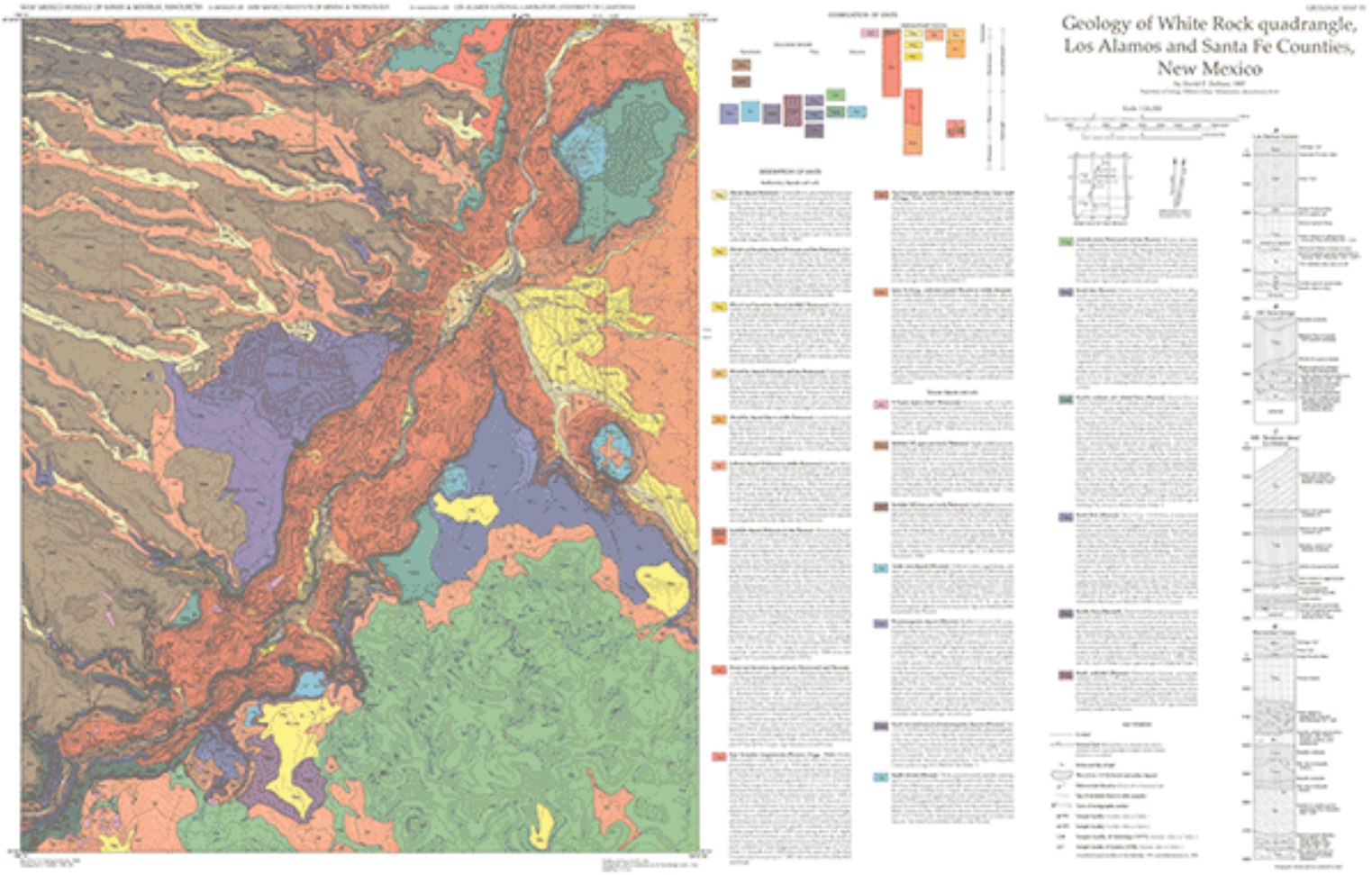
Geological Map of New Mexico



Geology of Los Alamos



Geology of Los Alamos

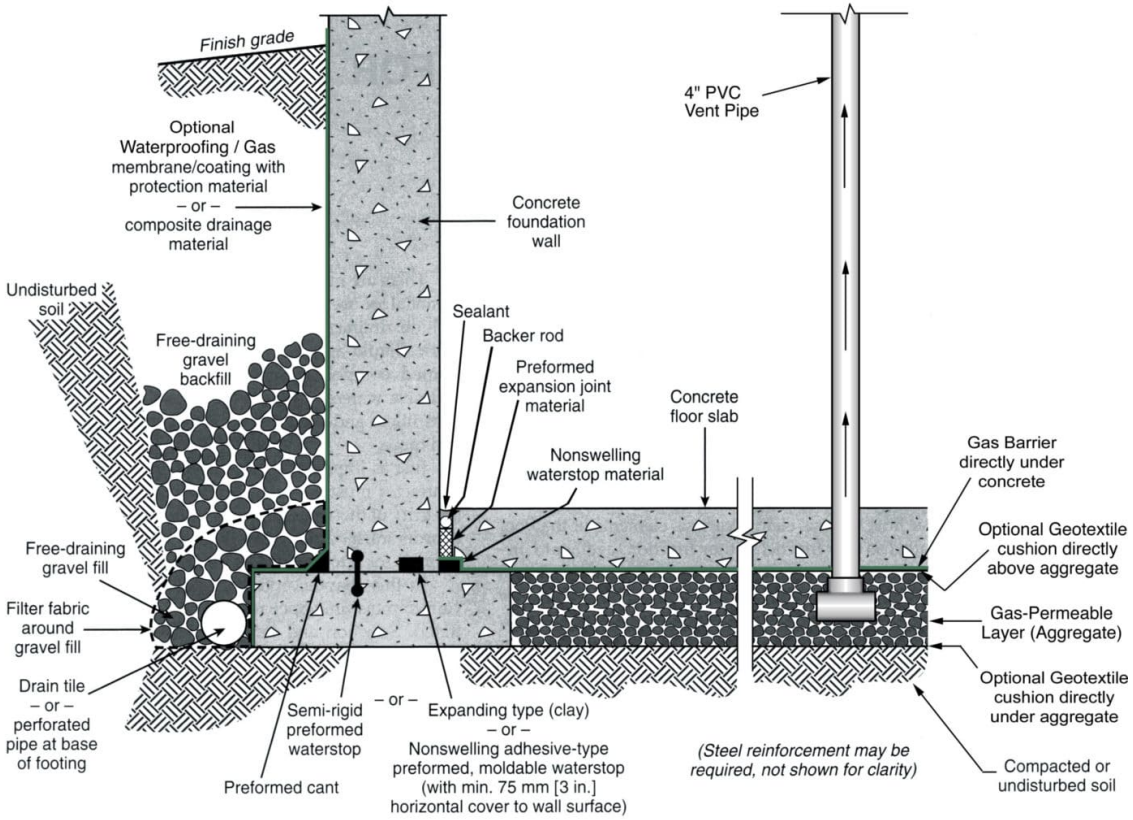


Then You Build…

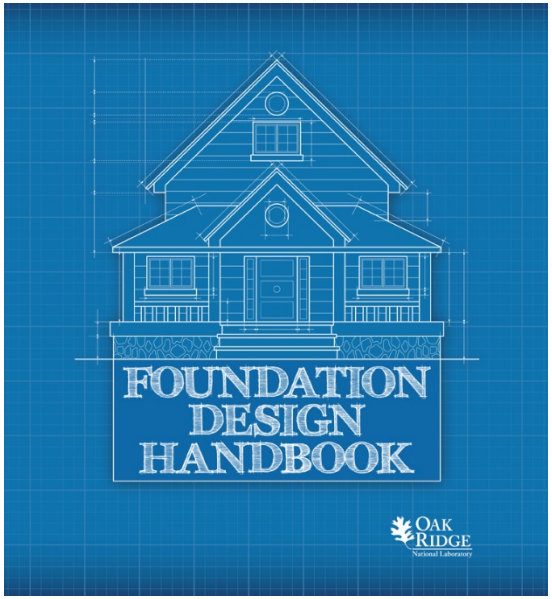
Then You Build…

Then You Build…

…How We Should be Building



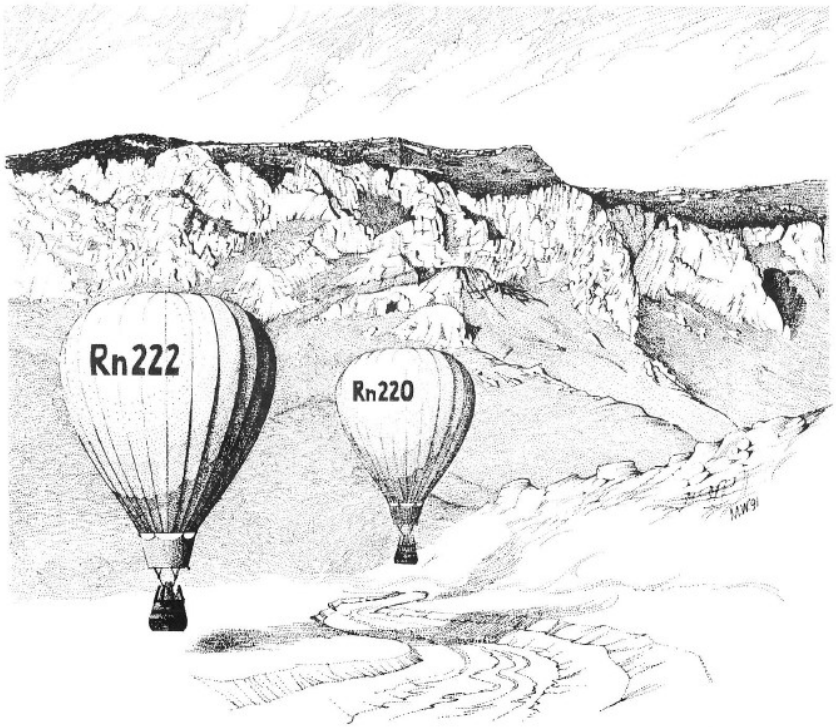
Elements of a moisture/gas-resistant floor system. General illustration only.
(Note: this example shows multiple options for waterstop placement.)



https://foundationhandbook.ornl.gov/handbook/

Radon in New Mexico

NEW MEXICO RADON SURVEY
1987 - 1989



by

Ralph A. Manchego, Virginia T. McLemore and John W. Hawley

Radon in New Mexico

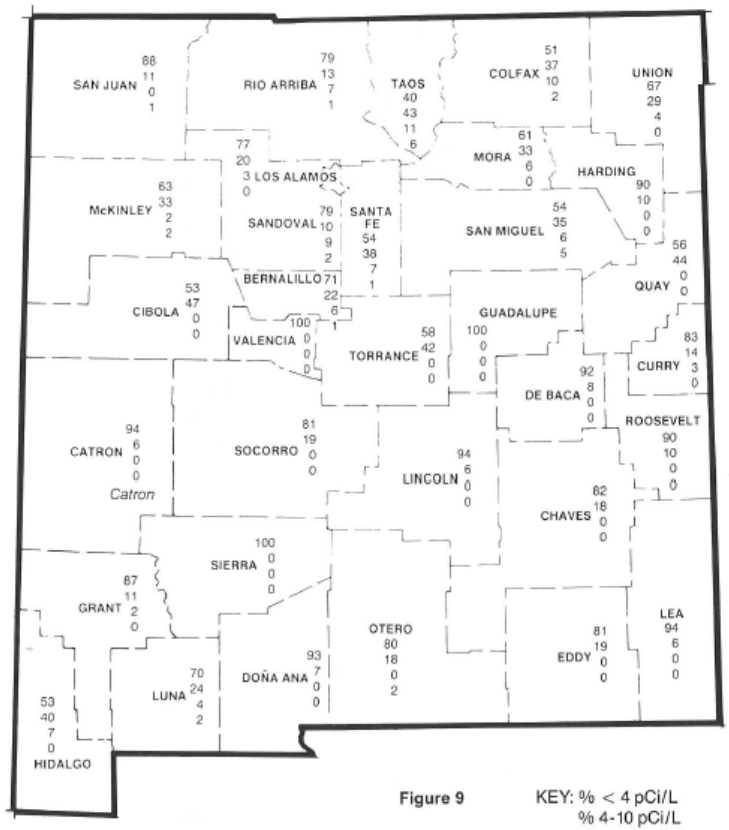


Figure 9

KEY: % < 4 pCi/L
% 4-10 pCi/L
% 10-20 pCi/L
% > 20 pCi/L

Radon in New Mexico

Table 5
NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
Indoor Radon Study—Phase 1—Survey type SR

county	<4 pCi/L		>4, <10 pCi/L		>10, <20 pCi/L		>20 pCi/L		Total cannisters
	no.	%	no.	%	no.	%	no.	%	
01 Bernalillo	267	70.6	85	22.5	22	5.8	4	1.1	378
03 Catron	16	94.1	1	5.9	0	0.0	0	0.0	17
05 Chaves	41	82.0	9	18.0	0	0.0	0	0.0	50
06 Cibola	8	53.3	7	46.7	0	0.0	0	0.0	15
07 Colfax	43	51.2	31	36.9	8	9.5	2	2.4	84
09 Curry	35	83.3	6	14.3	1	2.4	0	0.0	42
11 De Baca	12	92.3	1	7.7	0	0.0	0	0.0	13
13 Doña Ana	75	92.6	6	7.4	0	0.0	0	0.0	81
15 Eddy	39	81.3	9	18.8	0	0.0	0	0.0	48
17 Grant	48	87.3	6	10.9	1	1.8	0	0.0	55
19 Guadalupe	6	100.0	0	0.0	0	0.0	0	0.0	6
21 Harding	9	90.0	1	10.0	0	0.0	0	0.0	10
23 Hidalgo	8	53.3	6	40.0	1	6.7	0	0.0	15
25 Lea	47	94.0	3	6.0	0	0.0	0	0.0	50
27 Lincoln	16	94.1	1	5.9	0	0.0	0	0.0	17
28 Los Alamos	30	76.9	8	20.5	1	2.6	0	0.0	39
29 Luna	35	70.0	12	24.0	2	4.0	1	2.0	50
31 McKinley	29	63.0	15	32.6	1	2.2	1	2.2	46
33 Mora	11	61.1	6	33.3	1	5.6	0	0.0	18
35 Otero	35	79.5	8	18.2	0	0.0	1	2.3	44
37 Quay	5	55.6	4	44.4	0	0.0	0	0.0	9
39 Rio Arriba	55	78.6	9	12.9	5	7.1	1	1.4	70
41 Roosevelt	36	90.0	4	10.0	0	0.0	0	0.0	40
43 Sandoval	55	78.6	7	10.0	6	8.6	2	2.9	70
45 San Juan	158	88.3	20	11.2	0	0.0	1	0.6	179
47 San Miguel	34	54.0	22	34.9	4	6.3	3	4.8	63
49 Santa Fe	40	54.1	28	37.8	5	6.8	1	1.4	74
51 Sierra	39	100.0	0	0.0	0	0.0	0	0.0	39
53 Socorro	30	81.1	7	18.9	0	0.0	0	0.0	37
55 Taos	19	40.4	20	42.6	5	10.6	3	6.4	47
57 Torrance	7	58.3	5	41.7	0	0.0	0	0.0	12
59 Union	18	66.7	8	29.6	1	3.7	0	0.0	27
61 Valencia	27	100.0	0	0.0	0	0.0	0	0.0	27

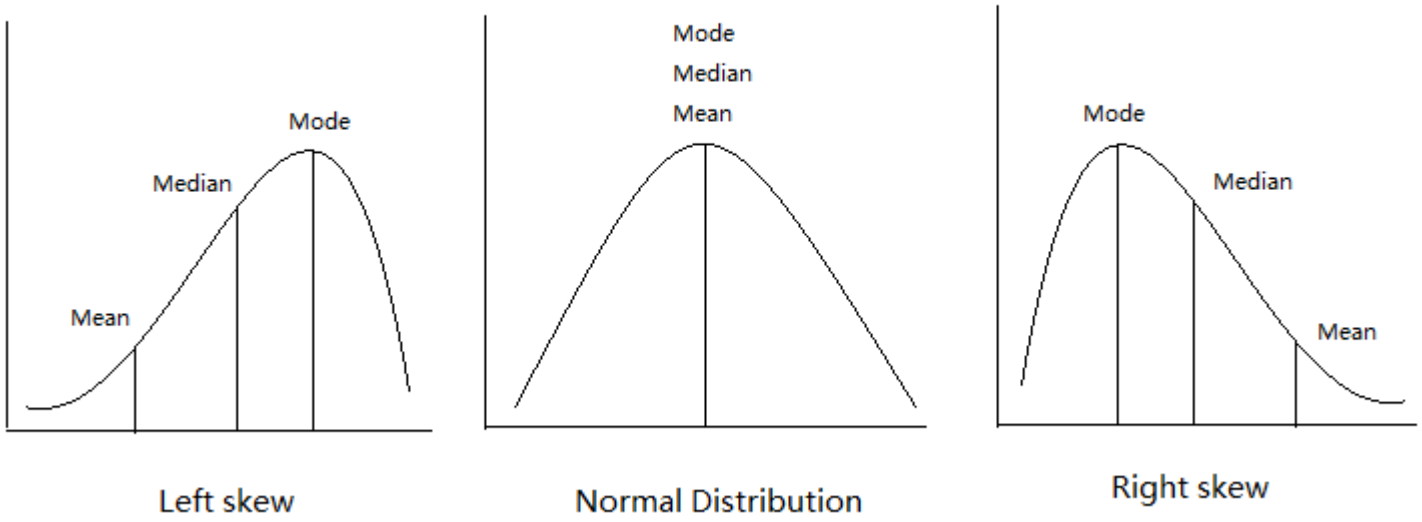
Radon in New Mexico

Table 6
NEW MEXICO ENVIRONMENTAL IMPROVEMENT DIVISION
Community Services Bureau
Indoor Radon Study—Phase 1—1988/1989

	<4 pCi/L		>4, <10 pCi/L		>10, <20 pCi/L		>20 pCi/L		
zipcode	no.	%	no.	%	no.	%	no.	%	Total
0	1	100.0	0	0.0	0	0.0	0	0.0	1
82048	0	*****	0	*****	0	*****	0	*****	0
85722	0	*****	0	*****	0	*****	0	*****	0
87001	2	66.7	1	33.3	0	0.0	0	0.0	3
87002	17	100.0	0	0.0	0	0.0	0	0.0	17
87004	4	80.0	1	20.0	0	0.0	0	0.0	5
87008	1	100.0	0	0.0	0	0.0	0	0.0	1
87010	1	100.0	0	0.0	0	0.0	0	0.0	1
87012	0	0.0	1	100.0	0	0.0	0	0.0	1
87013	2	100.0	0	0.0	0	0.0	0	0.0	2
87015	3	100.0	0	0.0	0	0.0	0	0.0	3
87016	0	0.0	2	100.0	0	0.0	0	0.0	2
87017	1	100.0	0	0.0	0	0.0	0	0.0	1
87018	0	*****	0	*****	0	*****	0	*****	0
87019	0	*****	0	*****	0	*****	0	*****	0
87020	5	62.5	3	37.5	0	0.0	0	0.0	8
87021	1	33.3	2	66.7	0	0.0	0	0.0	3
87024	1	100.0	0	0.0	0	0.0	0	0.0	1
87025	2	33.3	1	16.7	1	16.7	2	33.3	6
87031	2	100.0	0	0.0	0	0.0	0	0.0	2
87032	1	100.0	0	0.0	0	0.0	0	0.0	1
87035	2	66.7	1	33.3	0	0.0	0	0.0	3
87036	0	*****	0	*****	0	*****	0	*****	0
87037	1	100.0	0	0.0	0	0.0	0	0.0	1
87039	0	0.0	1	100.0	0	0.0	0	0.0	1
87041	3	100.0	0	0.0	0	0.0	0	0.0	3
87043	5	55.6	3	33.3	1	11.1	0	0.0	9
87044	1	100.0	0	0.0	0	0.0	0	0.0	1
87047	2	66.7	1	33.3	0	0.0	0	0.0	3
87048	10	76.9	2	15.4	1	7.7	0	0.0	13
87049	0	0.0	0	0.0	1	100.0	0	0.0	1
87053	0	0.0	0	0.0	1	100.0	0	0.0	1
87055	0	*****	0	*****	0	*****	0	*****	0
87056	2	100.0	0	0.0	0	0.0	0	0.0	2
87059	3	42.9	3	42.9	1	14.3	0	0.0	7
87060	1	100.0	0	0.0	0	0.0	0	0.0	1
87063	0	*****	0	*****	0	*****	0	*****	0
87064	2	100.0	0	0.0	0	0.0	0	0.0	2
87067	0	0.0	1	100.0	0	0.0	0	0.0	1
87068	6	100.0	0	0.0	0	0.0	0	0.0	6
87101	0	0.0	1	100.0	0	0.0	0	0.0	1
87102	3	60.0	1	20.0	1	20.0	0	0.0	5
87103	4	100.0	0	0.0	0	0.0	0	0.0	4
87104	10	83.3	1	8.3	1	8.3	0	0.0	12
87105	32	88.9	4	11.1	0	0.0	0	0.0	36
87106	19	95.0	1	5.0	0	0.0	0	0.0	20
87107	22	73.3	6	20.0	2	6.7	0	0.0	30
87108	17	85.0	3	15.0	0	0.0	0	0.0	20
87109	14	51.9	9	33.3	4	14.8	0	0.0	27

Statistics – What's the Average

The mean (average) of a data set is found by adding all numbers in the data set and then dividing by the number of values in the set. The median is the middle value when a data set is ordered from least to greatest. The mode is the number that occurs most often in a data set



Lies, Damn lies and Statistics

12 + 9.5 + 10.1 + 2.3 + 5.4 = Average 7.86

89.2 + 2.3 + 5.4 + 1.3 + 19.5 = Average 23.54

Making recommendations?

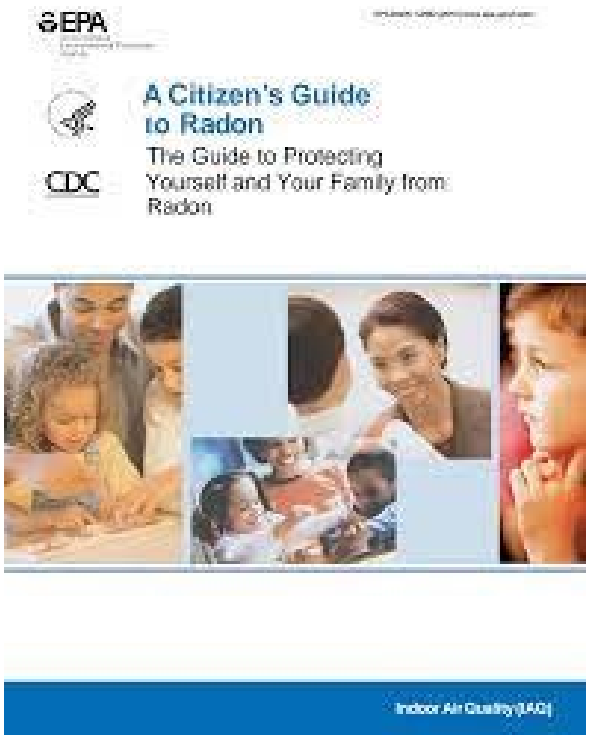
What do the Numbers Mean?

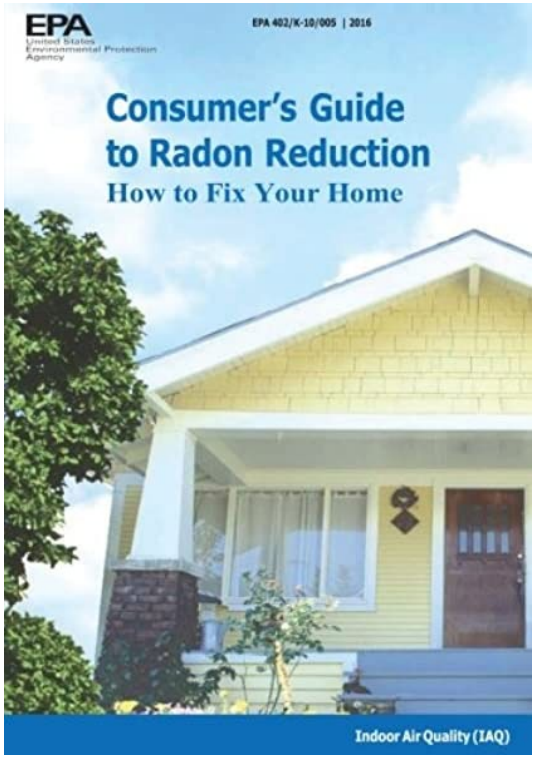
Is 4 pCi/L Safe?

- EPA: “There is no safe level of radon…”
- 4 pCi/L is the recommended "action" limit
- 2 pCi/L "consider action" limit
- The Radon Act 51 passed by the US Congress sets 0.4 pCi/L as the target indoor radon level

When do you Mitigate?

- With reasonable exceptions, a single or even multiple short-term tests should not be the basis for recommending mitigation.
- 4 (as in 4 pCi/l) is not a magic number. Where did it come from?





www.epa.gov/radon

HUD and Radon

- "Currently, HUD does not require radon testing of homes that are being insured under the FHA mortgage insurance program" (December 3, 2001).

- Form HUD-92564-CN (12/03) **For Your Protection: Get a Home Inspection** cites U.S Surgeon General and EPA recommendations

HUD and Radon

- March 3, 2004 the Office of the Inspector General at HUD informed Senators Lugar and Santorum that per their request, an investigation had been opened into HUD's failure to comply with Congressional mandates regarding radon and to determine whether HUD has violated any Federal laws (Case HL-04-0612).

HUD and Radon

- June 21, 2004 -- The U.S. Department of Housing and Urban Development (HUD) began use of Form HUD-9548-E Radon Gas and Mold Notice and Release Agreement

- Indemnifies HUD, their marketing and management contractor, and the sales agent from any and all claims and liabilities resulting from the presence of radon or mold on the property.

HUD and Radon

- The Section 203(k) mortgage financing program allows home buyers to finance the purchase *and* repair or improvement of a home using a single mortgage loan. Reducing radon levels in a home is an improvement that can be financed through a 203(k) mortgage loan.

Radon in Real Estate

- There is ample precedent of liability for misrepresenting oneself as an expert on this subject.
- This course is ONLY an introduction to the subject.
  - Measurement Course 16 hours
  - Mitigation Course 24 hours

- Radon problems can be reasonably addressed
- It's cheaper to mitigate than litigate.

Statement that can come back to Haunt you…

- “There’s no radon problem here.”
- “Radon’s only a problem if you have a basement.”
- “Oh, there’s no need to test this house; it’s brand new.”
- “This house is so old the radon is probably gone by now.”
- “Your neighbors tested and were OK.”
- “Fortunately, this house is not in a high-risk area.”
- “Crack a window and you’ll be OK.”

“We’re Here to Help”

https://www.epa.gov/radon

Radon is a naturally occurring radioactive gas that can cause lung cancer.

You can’t see or smell radon. Testing is the only way to know your level of exposure. Radon can have a big impact on indoor air quality.

Individuals and Families

- Health Risk of Radon
- Citizen's Guide to Radon
- Find a Radon Test Kit or Measurement and Mitigation Professional
- Radon in Drinking Water
- Radon Hotlines and Resources
- Radon Publications (En Español)
- Radon Media Resources for Partners and Stakeholders
- En Español - Acerca del radón

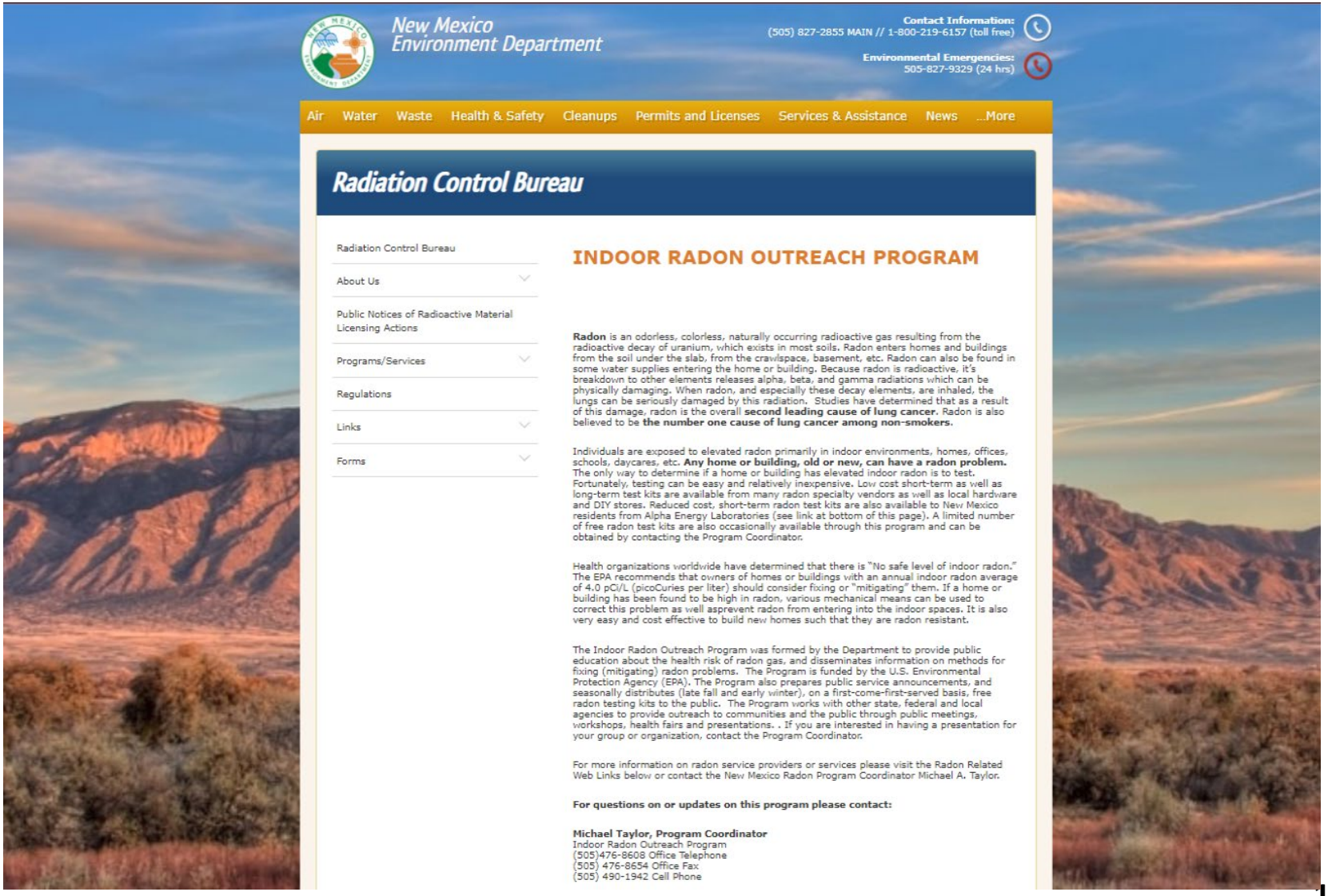
Home Buyers and Sellers

- Radon Protection: Buying a Home
- Radon Protection: Building a Home
- Radon-Resistant New Construction
- Radon and Real Estate Resources
- Home Buyer's/Seller's Guide to Radon
- Consumer's Guide to Radon Reduction: How to Fix your Home
- Who is Qualified to Test or Fix My Home?
- Radon Guide for Tenants

Builders and Contractors

- Radon-Resistant Construction Basics and Techniques
- Resources for Builders and Contractors
- Radon Standards of Practice

NMED - “We’re Here to Help”



New Mexico Environment Department

Contact Information:
(505) 827-2855 MAIN // 1-800-219-6157 (toll free)

Environmental Emergencies:
505-827-9329 (24 hrs)

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- Forms

INDOOR RADON OUTREACH PROGRAM

Radon is an odorless, colorless, naturally occurring radioactive gas resulting from the radioactive decay of uranium, which exists in most soils. Radon enters homes and buildings from the soil under the slab, from the crawlspace, basement, etc. Radon can also be found in some water supplies entering the home or building. Because radon is radioactive, it's breakdown to other elements releases alpha, beta, and gamma radiations which can be physically damaging. When radon, and especially these decay elements, are inhaled, the lungs can be seriously damaged by this radiation. Studies have determined that as a result of this damage, radon is the overall **second leading cause of lung cancer**. Radon is also believed to be **the number one cause of lung cancer among non-smokers**.

Individuals are exposed to elevated radon primarily in indoor environments, homes, offices, schools, daycares, etc. **Any home or building, old or new, can have a radon problem.** The only way to determine if a home or building has elevated indoor radon is to test. Fortunately, testing can be easy and relatively inexpensive. Low cost short-term as well as long-term test kits are available from many radon specialty vendors as well as local hardware and DIY stores. Reduced cost, short-term radon test kits are also available to New Mexico residents from Alpha Energy Laboratories (see link at bottom of this page). A limited number of free radon test kits are also occasionally available through this program and can be obtained by contacting the Program Coordinator.

Health organizations worldwide have determined that there is "No safe level of indoor radon." The EPA recommends that owners of homes or buildings with an annual indoor radon average of 4.0 pCi/L (picoCuries per liter) should consider fixing or "mitigating" them. If a home or building has been found to be high in radon, various mechanical means can be used to correct this problem as well asprevent radon from entering into the indoor spaces. It is also very easy and cost effective to build new homes such that they are radon resistant.

The Indoor Radon Outreach Program was formed by the Department to provide public education about the health risk of radon gas, and disseminates information on methods for fixing (mitigating) radon problems. The Program is funded by the U.S. Environmental Protection Agency (EPA). The Program also prepares public service announcements, and seasonally distributes (late fall and early winter), on a first-come-first-served basis, free radon testing kits to the public. The Program works with other state, federal and local agencies to provide outreach to communities and the public through public meetings, workshops, health fairs and presentations. . If you are interested in having a presentation for your group or organization, contact the Program Coordinator.

For more information on radon service providers or services please visit the Radon Related Web Links below or contact the New Mexico Radon Program Coordinator Michael A. Taylor.

For questions on or updates on this program please contact:

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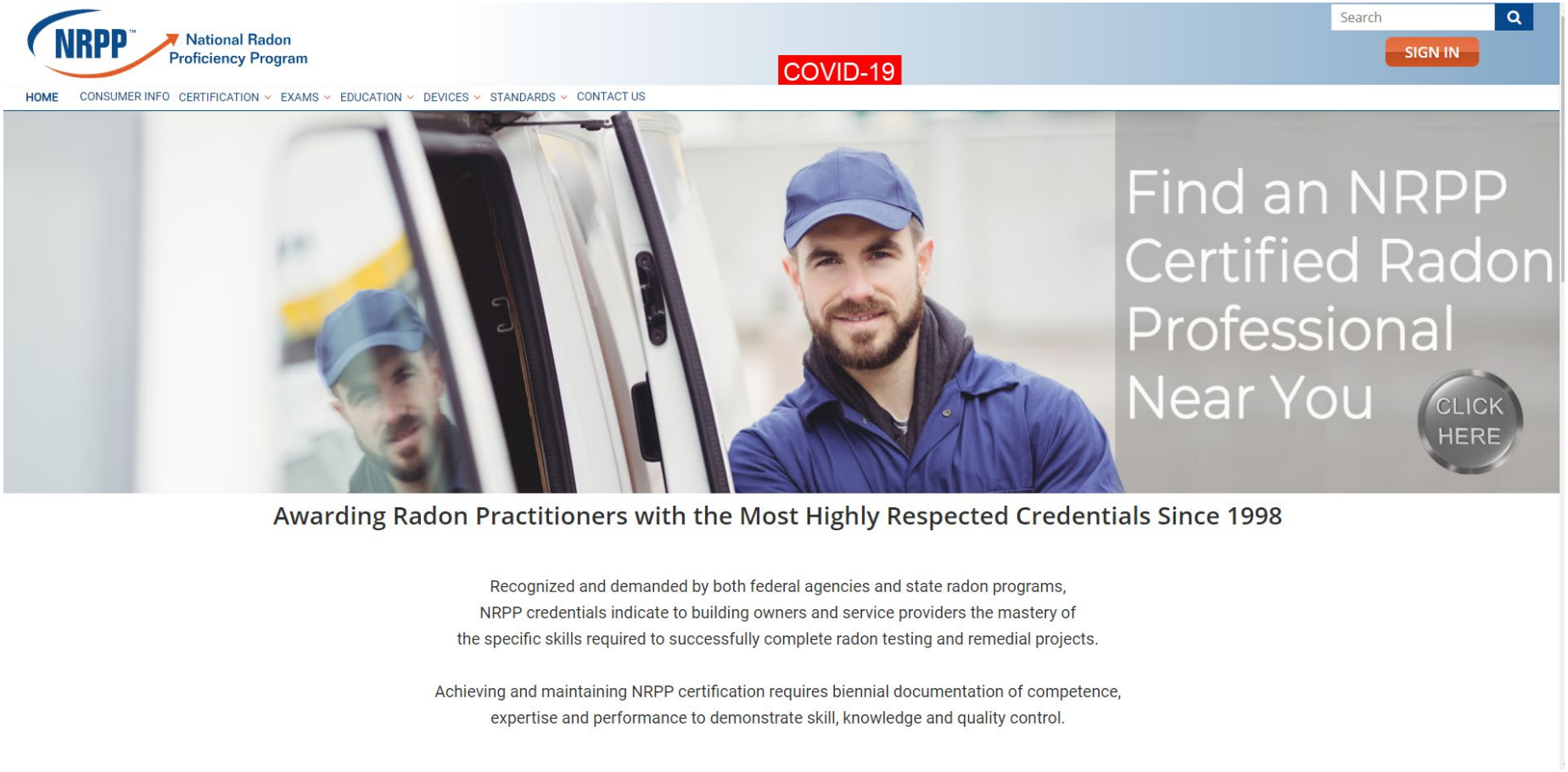
“We’re Here to Help”



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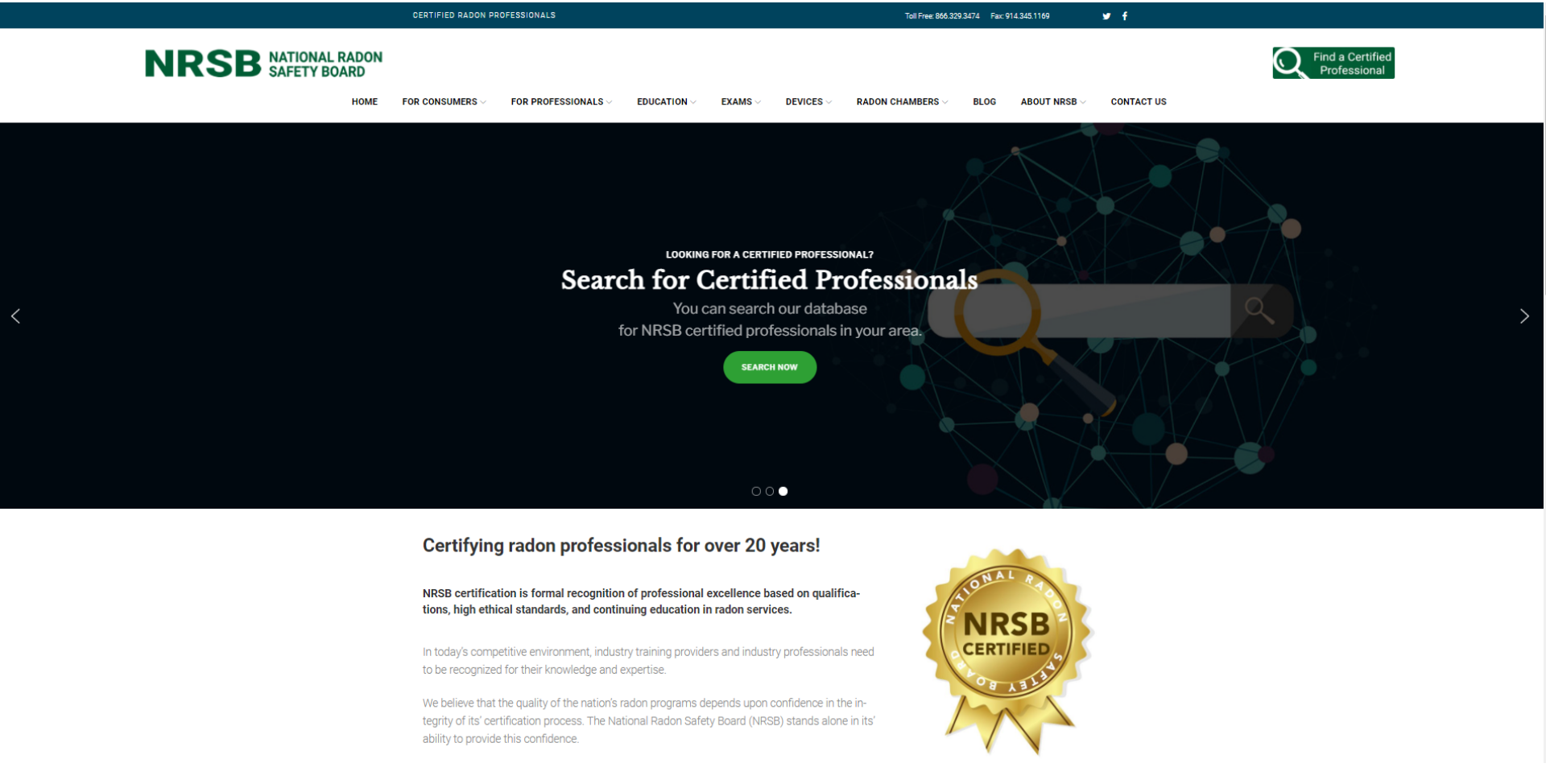
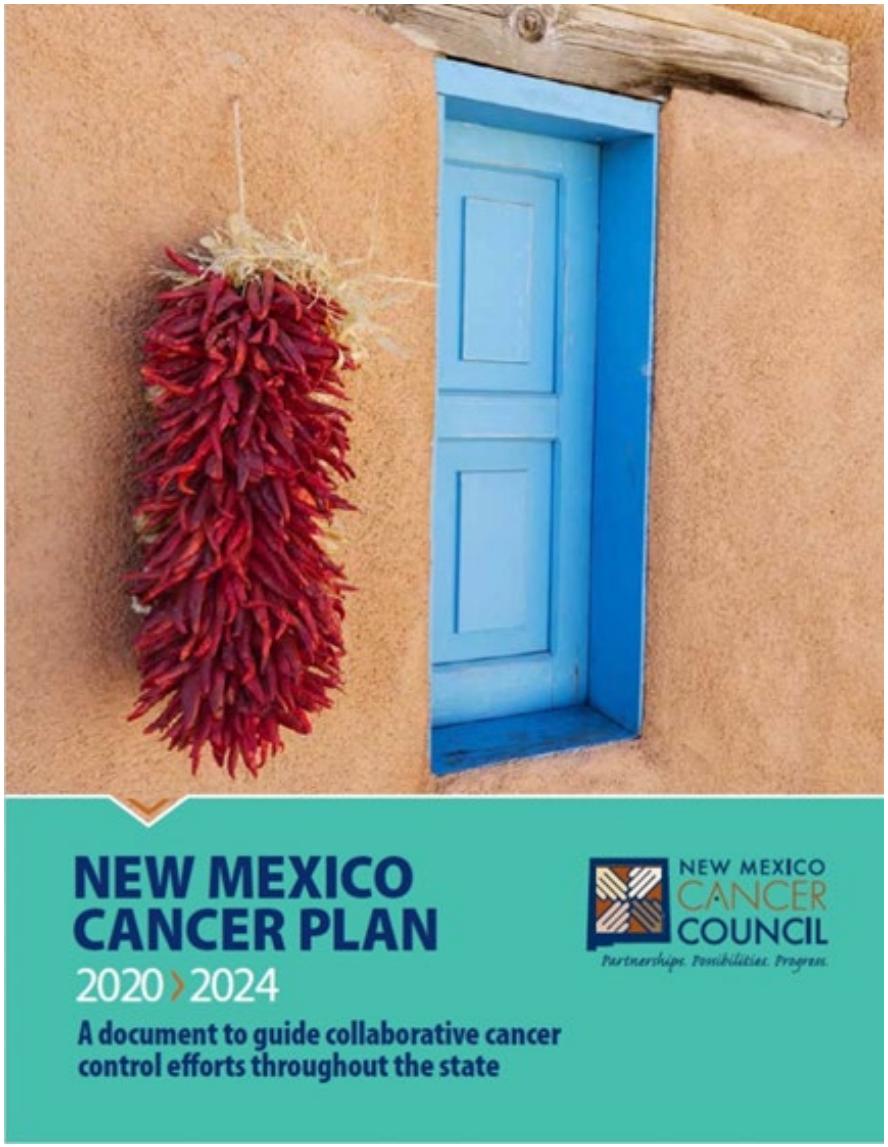


Approximate Costs

New Roof:	$11,209-$17,060
New Furnace (installed):	$2,500-$4,500
NM Mitigation:	$3,000 - $5,000
Natl. Radon Mitigation:	$800 - $2500
Water Heater (installed):	$500-$600
RRNC:	$600 - $1200
Testing Home for Radon:	$0 -$150

2020-2024 NM CANCER PLAN



INTRODUCTION: Radon gas is the second leading cause of lung cancer22 and is thought to be responsible for 10-20 percent of all cases of lung cancer, nationwide.23 Local geologic formations and building materials may emit radon gas into indoor spaces. In-house radon levels can be determined using test kits, and there are ways to renovate buildings with high radon levels to reduce exposure.

GOAL 3: DECREASE ENVIRONMENTAL FACTORS THAT LEAD TO CANCER

Objective 3.1 Support Education and Enhanced Community Infrastructure to Decrease Exposure to Radon

Strategies:

- Support efforts to educate the New Mexico public, homeowners, building owners, sellers, realtors and policymakers about lung cancer risk from radon and the benefits of radon testing and implementing radon-resistant features in new construction
- Promote environmental equity through radon testing and mitigation programs and outreach efforts within underresourced communities
- Educate the public on secondhand smoke combined with radon as an increased cancer risk

The word "radon" mentioned 38 times

Closing on A Positive Note

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