RADON INFORMATION

MARCH 2008

www.uaf.edu/coop-ext/faculty/seifert/publications.html#radon

www.epa.gov/radon/index.html

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The EPA has made most of its radon information publications only available on the Internet at this site address:

www.epa.gov/radon/index.html

Many of these publications can be supplied to you from our office 1(800)478-8324 or 474-7201, if you do not have access to the Internet.

Also our extension energy and housing website has many publications dealing specifically with Alaska radon issues. Its address is:

www.uaf.edu/coop-ext/faculty/seifert/publications.html#radon

As with the EPA radon publications these Alaska-specific radon publication are available in hard copy and can be mailed to you upon request (see previously indicated phone numbers, and call to request any radon information).

Three Month Radon Test Kits Available Through The Cooperative Extension Service

As a result of the concerns about radon levels in some of the areas in Fairbanks and Interior Alaska, the Cooperative Extension Service makes 3-month radon test kits available at the Fairbanks District Office of the Cooperative Extension Service, and at the office of the state specialist at the University of Alaska Fairbanks. The district office is located in the University Park Bldg, 1000 University Avenue, Room 138. For information on radon concerns please call the Cooperative Extension Service district office at 474-1530, or 474-7201, in the Fairbanks area, to reach Rich Seifert, the state radon information specialist.

The radon test kits available through the Cooperative Extension Service cost $25 or $45 for two and are **for three months of testing**. Radon test kits of this type may also be available at your local Cooperative Extension Service office throughout the state. Call them for further information. Other test kits for radon, particularly short-term tests which utilize a form of charcoal for radon adsorption, are available from private companies locally. A list of the companies in the Fairbanks area which provide short-term radon tests or other radon-related services follows:

Radon Testing Services Available in Fairbanks & Anchorage as of March 2008

The following is a list of facilities that offer Radon Testing Service and a brief description of the types they offer. If you or your firm offer Radon Testing Services please contact Richard Seifert with Cooperative Extension Service at 474-7201 so that you can be included on subsequent listings. In addition to these firms, many local contractors are becoming involved and experienced in Radon Mitigation.

Arctic Technical Services
(CC) Energy Conservation Spec
1318 Well St.
Fairbanks, AK 99701
452-8368
FAX - 452-8007

Long Term (AT) Short Term
Radon Gas Testing
Indoor Air Quality Investigating
Home Ventilation Design & Consulting
Heat Recovery Ventilators

Solutions to Healthy Breathing
(located in Fairbanks may serve statewide)
374-6838

Radon Testing, Diagnostics & Mitigation

Cooperative Extension Service
University Park Building, Room 138
1000 University Avenue
Fairbanks, AK 99775-8155
474-1530

Long Term (AT) Screening Kits
(3-12 Month)

or

Rm 215 or 247, 308 Tanana Loop, UAF
Fairbanks, AK 99775-6180
474-6366 or 474-7201

Cooperative Extension Service
2221 E. Northern Lights Blvd. Suite 118
Anchorage, AK 99508
786-6300

Long Term (AT) Screening Kits
(3-12 Month)

AK Radon Engineering Consultants LLC
3417 W. Grand Bay Dr.
Wasilla, AK 99654
376-8378 (Wendy Parsons)

Testing and Inspection
Has National testing certificate
Mitigation Services

For information on obtaining radon test kits outside the Fairbanks-North Pole area, call 1(800)478-8324.

Types of Radon Testing Devices

Type Device	Abbr.	Use	Exposure Type	Exposure Time	Passive or Active	Results	Ease of Use	Cost/Test (Approx.)	Error Sources
Activated Charcoal	AC/LS	IS	Short-term	2-7 days	Passive	by mail	Simple	$10/$20 Time Decay	Hi Moisture
AlphaTrack Detector	AT	F	Long-term	3-12 mo	Passive	by mail	Simple	$25 Electrostatics	Dust
Electret Ion Chamber ground	EC	IS/F	ST/LT	2 dys - 1 yr	Passive	by mail	Simple	$25	Back-
Electret Ion Chamber/Reader Background		EC	IS/F	ST/LT	2 dys - 1 yr	Passive	on-site	Intermed.	$2/$1900
								Operator	
Continuous Radon Monitor	CR	IS/D	ST/Cont	4 hrs-2 wks+	Both	on-site	Complex	$500-$6000+	Operator
Grab-Sample Monitor	GS	D/M	VST/(Cont)	5 min-5hrs	Active	on-site	Complex	$2500-$6000+	Operator

Use: IS-Initial Screening F-Followup D-Diagnostic M-Mitigation

Definitions and Conversion Factors

Radon – A radioactive, noble gas resulting from uranium decay.

Radon daughters – Radioactive elements in decay chain resulting from radon decay and ending with non- radioactive lead.

Radioactive decay – A transformation of one element to another with the release of radiation, usually alpha, beta gamma, or x-ray.

Half-life – The time it takes for half a radioactive element to decay away. The resulting half will decay with the same half life and so on.

pCi – 2.2 radioactive decays or disintegration per minute.

pCi/l – The number of pCi in each litre of air.

pCi/m^3 – The number of pCi in each cubic metre of air.

Bq – The number of radioactive decays per second, 1 Bq = 27.3 pCi.

Bq/m^3 – The number of radioactive decays per second in a cubic metre of air, 1 pCi/l = 37 Bq/m^3.

WL – Working level, a term from the uranium industry indicating the exposure to radon daughters. Under equilibrium conditions 4 wpCi/l = 0.02 WL.

WLM – Working Level Month, the exposure received from a working level for normal work month (170 hrs).

pCi/ld – The exposure received from 1 pCi/l for one-day.

rem – The amount of energy deposited by ionizing radiation in tissue. 1 erg/g or 1 joule/kg.

mrem – millirem, 1/1000 of a rem.

natural background – The radiation from natural causes in the environment. The dose is about 100 mrem per year.

Summer Radon Tests: Not The Best Warning!

UAF, through assistance from USEPA radon research funds, and Alaska Housing Finance Corporation research funds, has been supporting graduate student research on seasonal indoor air quality and radon levels in Interior Alaskan homes. Graduate student, Jack Schmid has focused on learning more about seasonal and pressure dynamics of radon in these houses. Some preliminary observations on summer versus winter radon induction rates were described at a session of the "Cold Comfort 99" conference in Fairbanks on March 12th, 1999. Although not conclusive, indications are that summer radon tests may be a poor indication of what levels could be expected in a home in winter.

When evaluating the risk of exposure to radon in homes, it is important to have some estimate of average indoor radon concentrations. Indoor radon concentrations are variable, affected by factors such as fluctuations in atmospheric pressure, changes in temperature, and the opening of windows and doors. These relatively short-term variations are averaged by doing multi-day tests for indoor radon. Longer-term seasonal variations have been reported which could result in short term tests that do not give a good indication of what the average radon exposures are in a home.

There is evidence that summer indoor radon concentrations in homes may be less than the winter concentrations. In work done by the Lawrence Berkeley Laboratory, a group of five Spokane homes exhibited winter indoor radon concentrations in excess of 15 pCi/l and the summer concentrations were less than 4 pCi/l. (S. Cohen & Associates, 1992). Surveys in Austria indicate that half of homes surveyed had summer indoor radon concentrations less than 10% of the winter concentrations (Ennemoser et al, 1994).

A previous survey of homes in the hills surrounding Fairbanks indicates that there are homes in the area with elevated summer indoor concentrations (Hawkins et al 1987). Preliminary data from recent radon surveys in the Fairbanks area suggest that in some homes a measurement of indoor radon concentrations during the summer may not be representative of average exposure. One home in the Gilmore trail area had average January radon concentrations in excess of 400 pCi/l and between mid-May and mid-September the average indoor concentration was less than 1.5 pC/l. Another home in the Chena Ridge area exhibited average April concentrations of 16 pCi/l and average concentrations for June and September also less than 1.5 pCi/l. This suggests that testing during the summer in some homes may yield a false sense of security.

REFERENCES

Ennemoser O.; Giacomussi S.M.G.; Brunner P.; Schneider, P.; Stingl, V.; Purtscheller, F.; and Ambach W.; Radon Measurements in soil to predict indoor radon concentrations in new buildings in an area with unusually high radon levels, The Science of the Total Environment, Vol.162, pp. 209-213, 1995.

Hawkins, D. B.; Leonard, S. J.; and Kailing S. H.; Radon Survey in the Hills Surrounding Fairbanks Alaska, Technical Note, Alaska State Department of Transportation and Public Facilities, document AK-RD-88-01, 1987.

S. Cohen & Associates, Inc; Final Report, Reducing Radon In Structures, U.S. Environmental Protection Agency, contract 68-D-90170, 1992 (figure 2-17).

A Sample of Alaska Radon Data Derived From The Alaska Home Radon Survey

from a report by
Christopher J. Nye and Jeffrey T. Kline
Alaska Division of Geological and Geophysical Surveys

Radon can accumulate in homes in concentrations which present a substantial health risk. This awareness has precipitated a nationwide effort to investigate and document the magnitude of the household radon problem. Cooperative statewide radon surveys between the Environmental Protection Agency (EPA) and participating states are an essential part of this effort. EPA has conducted statistically valid statewide home radon surveys in cooperation with state agencies. These cooperative surveys have provided estimates of home radon concentrations in 25 of the 50 states. In many states, including Alaska, these surveys have yielded the first reliable estimates of the distribution and relative concentration of homes with elevated radon.

The Alaska/EPA statewide radon survey was planned and conducted during the fall of 1988 and winter of 1989. EPA provided and analyzed the radon detectors and, through their contractor, Research Triangle Institute (RTI), provided the survey design such as questionnaires and sample lists, and statistical consultation and analysis. The State of Alaska, through the Division of Geological and Geophysical Surveys (DGGS), provided demographic, geologic and geographic information; screened prospective households to be included in the survey; and distributed the canisters and the resultant data to qualified residents. DGGS, RTI and EPA jointly designed the general aspects of the survey, including the boundaries of sampling subregions within the state.

The brief synopsis includes the basic data derived from the survey. A more detailed report is available from the state of Alaska's Division of Geological and Geophysical Surveys.

On the following pages is a summary of results of radon screening measurements obtained during the EPA/State indoor radon survey of 1989 for the state of Alaska, listed by community name and zip code of the location where the tested house was receiving its mail (i.e. may or may not be physically near zip code post office).

Region	City	Zip	N	Concentration (picoCuries per liter of air) < 0.5	0.5–2.0	2.1–4.0	4.1–10	10–20	> 20
	Summary of Results								
1	Total Anchorage Region		295	113	147	24	10	1	0
2	Total Interior Region		363	31	183	85	40	13	11
3	Total Southeast Region		287	224	54	5	4	0	0
4	Total Southcentral Region		295	100	107	49	29	9	1
5	Total Western and Northern Region		72	39	27	5	1	0	0
1	Anchorage	99501	18	7	10	1	0	0	0
1	Anchorage	99502	28	16	10	1	1	0	0
1	Anchorage	99503	15	6	7	2	0	0	0
1	Anchorage	99504	52	19	24	6	3	0	0
1	Anchorage	99507	26	9	12	3	1	1	0
1	Anchorage	99508	38	9	22	6	1	0	0
1	Anchorage	99509	3	1	2	0	0	0	0
1	Anchorage	99511	2	0	2	0	0	0	0
1	Anchorage	99514	1	1	0	0	0	0	0
1	Anchorage	99515	34	16	16	2	0	0	0
1	Anchorage	99516	26	5	18	2	1	0	0
1	Anchorage	99517	29	12	17	0	0	0	0
1	Anchorage	99518	14	9	5	0	0	0	0
1	Anchorage	99520	3	2	1	0	0	0	0
1	Anchorage	99523	1	0	1	0	0	0	0
1	*Anchorage Subtotal*		*290*	*112*	*147*	*23*	*7*	*1*	*0*
1	Eklutna	99557	5	1	0	1	3	0	0
2	Anderson	99774	2	0	1	1	0	0	0
2	Central	99730	2	0	1	0	0	0	1
2	Circle	99733	5	5	0	0	0	0	0
2	Delta Junction	99737	29	1	5	10	9	3	1
2	Dot Lake	99737	1	0	0	1	0	0	0
2	Eagle Village	99738	5	2	3	0	0	0	0
2	Ester	99725	6	0	2	1	2	1	0
2	Fairbanks	99701	80	3	57	17	2	0	1
2	Fairbanks	99706	6	0	5	0	1	0	0
2	Fairbanks	99707	15	0	10	2	1	1	1
2	Fairbanks	99708	17	0	7	6	1	2	1
2	Fairbanks	99709	92	13	48	18	9	2	2
2	Fairbanks	99710	8	0	2	2	2	2	0
2	Fairbanks	99711	2	0	1	1	0	0	0
2	Fairbanks	99712	41	1	13	16	8	1	2
2	*Fbks/Ester/ North Pole Subtotal*		*302*	*18*	*167*	*72*	*28*	*9*	*8*

Region	City	Zip	N	Concentration (picoCuries per liter of air)					
				< 0.5	0.5–2.0	2.1–4.0	4.1–10	10–20	> 20
2	Healy	99743	9	1	4	1	2	1	0
2	McKinley Park	99755	3	3	0	0	0	0	0
2	North Pole	99705	35	1	22	9	2	0	1
2	Salcha	99714	2	0	2	0	0	0	0
2	Tetlin	99779	1	1	0	0	0	0	0
2	Tok	99780	3	0	0	1	1	0	1
3	Auke Bay	99821	12	8	4	0	0	0	0
3	Craig	99925	1	1	0	0	0	0	0
3	Douglas	99824	10	7	2	1	0	0	0
3	Haines	99827	13	6	6	1	0	0	0
3	Hoonah	99829	5	5	0	0	0	0	0
3	Juneau	99801	95	69	23	2	1	0	0
3	Juneau	99802	13	10	3	0	0	0	0
3	Juneau	99803	13	13	0	0	0	0	0
3	*Juneau Area Subtotal*		*143*	*107*	*32*	*3*	*1*	*0*	*0*
3	Ketchikan	99901	51	44	6	0	1	0	0
3	Klawock	99925	5	5	0	0	0	0	0
3	Petersburg	99833	17	17	0	0	0	0	0
3	Sitka	99835	25	19	6	0	0	0	0
3	Skagway	99840	3	1	0	0	2	0	0
3	Thorne Bay	99919	1	1	0	0	0	0	0
3	Ward Cove	99928	7	7	0	0	0	0	0
3	Wrangell	99929	17	12	4	1	0	0	0
4	Anchor Point	99556	11	1	6	2	1	1	0
4	Big Lake	99652	6	3	1	1	1	0	0
4	Cooper Landing	99572	5	0	3	0	1	1	0
4	Copper Center	99573	12	7	5	0	0	0	0
4	Gakona	99586	12	8	3	1	0	0	0
4	Glennallen	99588	4	0	2	2	0	0	0
4	Homer	99603	24	17	5	0	2	0	0
4	Kasilof	99610	8	2	3	2	1	0	0
4	Kenai	99611	18	2	9	5	1	1	0
4	Kodiak	99615	27	21	5	1	0	0	0
4	Moose Pass	99631	3	0	2	1	0	0	0
4	Ninilchik	99639	4	0	2	1	1	0	0
4	Old Harbor	99643	4	4	0	0	0	0	0
4	Ouzinkie	99644	5	5	0	0	0	0	0

Region	City	Zip	N	Concentration (picoCuries per liter of air)					
				< 0.5	0.5–2.0	2.1–4.0	4.1–10	10–20	> 20
4	Palmer	99645	33	4	11	10	5	3	0
4	Port Graham	99603	1	1	0	0	0	0	0
4	Seward	99664	24	7	7	3	3	3	1
4	Soldotna	99669	30	5	13	7	5	0	0
4	Sterling	99672	14	2	8	2	2	0	0
4	Sutton	99674	4	2	1	0	1	0	0
4	Talkeetna	99676	2	0	2	0	0	0	0
4	Trapper Creek	99683	1	0	0	0	1	0	0
4	Valdez	99686	21	9	3	7	2	0	0
4	Wasilla	99687	14	1	9	3	1	0	0
4	Willow	99688	4	0	2	1	1	0	0
5	Akhiok	99615	5	4	0	0	0	0	0
5	Alakanuk	99554	4	4	0	0	0	0	0
5	Ambler	99786	4	1	3	0	0	0	0
5	Arctic Village	99722	4	1	3	0	0	0	0
5	Barrow	99723	7	7	0	0	0	0	0
5	Chalkyitsik	99788	4	0	3	1	0	0	0
5	Hughes	99745	5	2	3	0	0	0	0
5	Kaltag	99748	1	1	0	0	0	0	0
5	Kiana	99749	2	1	0	1	0	0	0
5	Kongiganak	99559	3	canisters not analyzed					
5	Manokotak	99628	4	2	1	0	1	0	0
5	Marshall	99585	5	5	0	0	0	0	0
5	Noorvik	99763	3	3	0	0	0	0	0
5	Pilot Point	99649	5	0	5	0	0	0	0
5	Platinum	99651	1	1	0	0	0	0	0
5	Quinhagak	99655	1	canisters not analyzed					
5	Ruby	99768	4	1	3	0	0	0	0
5	Shungnak	99773	5	4	1	0	0	0	0
5	Unalakleet	99684	5	2	2	1	0	0	0
5	Venetie	99781	5	0	3	2	0	0	0