

**A COMPARISON OF NATIONWIDE INDOOR RADON MEASUREMENTS BY
HOME DWELLERS AND BY REAL ESTATE TESTING FIRMS**

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ABSTRACT

A never before presented data base consisting of 60,000 indoor radon measurements by charcoal adsorption devices is described. A variety of statistical parameters summarizing the contents of the data base are presented for each state. Some states are well described due to the large number of measurements performed in them. A data set from the real estate testing industry (8,876 measurements) is included and the results are compared to those tests performed by concerned home dwellers.

The conclusions which may be drawn are: (1) this study repeats earlier findings that there are homes with unacceptably high radon levels in nearly every state; and (2) comparisons should be made to determine if the test results of the two groups studied are biased.

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INTRODUCTION

The concern about health hazards associated with indoor radon in the United States has caused a large number of measurements to be performed. The results of other studies have been presented elsewhere for both long term alpha track tests and short term charcoal tests. (1-7).

The data bank presented in this paper is from measurements performed by purchasers of charcoal canisters which were manufactured and analyzed by Key Technology, Inc. The wide spread use of charcoal detectors has led to the accumulation of over 60,000 indoor radon measurements made as of August 1988 throughout the United States in ordinary homes by both home dwellers and professional testers. This collection of indoor radon measurements and the conclusions that can be drawn from them are the subject of this paper.

INDOOR RADON DATA BASE

GENERAL DESCRIPTION

The set of 60,642 indoor radon measurements consists of 51,766 measurements performed by home dwellers and 8,876 measurements performed by professional testers in ordinary homes. Only measurements in legitimate living spaces are included. Where multiple floors have been measured, only the lowest level (basement) has been included. For example, areas such as crawl spaces, sump and drain measurements have been eliminated.

The data base has been subdivided by state and by the years 1986, 1987 and to August 1988. A few states have several thousand measurements, but some of the states have only a few measurements or none.

Key Technology, Inc. has successfully participated in all five rounds of EPA proficiency testing.

DATA BASE RECORDS

Key Technology, Inc. routinely receives radon detectors from a variety of clients. After processing and analysis, a computer generated report of the results is sent to the client. Each piece of data is formatted into an individual record and added to a file of such records. This U.S. data base contains data going back to 1986. The typical data recorded in this file include: user name and address, test times and dates, location, floor, temperature, canister number, results and pertinent laboratory data.

RESULTS AND DISCUSSION

Data Base Summary

A summary of the data base statistics by state is given in Table 1. The table shows the number of measurements made, the number performed with results: < 4 pCi/l, 4 - 20 pCi/l, >20 -200 pCi/l, and >200 pCi/l. This table also shows the results as performed by home dwellers and by professional testers. Percentages of each category for all tests are shown in parenthesis.

A monthly summary of the type of analysis (home dweller and professional tester) is shown in Table 2.

Limiting Features

Instructions for all tests include the EPA closed house condition criteria; however, the radon concentration statistics may become more meaningful if this study is performed on a seasonal basis. A review of Table 2 indicates that most tests are performed in the winter months. No statement can be made pertaining to actual year round averages from the data presented in this paper. However, those figures can be derived from the computer data banks.

Only a few states have enough tests performed of both types to begin making comparisons of tests performed by concerned home dwellers to those performed by professional testers.

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REFERENCES

Government Publications

1. National Council on Radiation Protection and Measurements (NCRP). Exposures from the uranium series with emphasis on radon and its daughters (NCRP No. 77). Washington, D.C.: NCRP, 1984.
2. National Council on Radiation Protection and Measurements (NCRP). Evaluation of occupational and environmental exposures to radon and radon daughters in the United States (NCRP No. 78). Washington, D.C.:NCRP , 1984.
3. National Academy Press, BEIR IV, Health Risks of Radon and other Internally Deposited Emitters. Washington, D.C. 1988.
4. U.S. Environmental Protection Agency, Summary of State Radon Programs, EPA 520/1-87-19-1, Washington, D.C. August 1987.

Report

5. Indoor Air Quality Environmental Information Handbook: Radon. DOE/PE/72013-2, January, 1986.

Book

6. Lafavore, Michael. Radon : the invisible threat. Rodale Press 1986. 256 pages.

Conference

7. Radon and the Environment - Conference Proceedings. Based upon the conference held at Ramapo College of New Jersey, May 8-10, 1986.

TABLE 1.

SUMMARY OF NATIONWIDE TEST RESULTS

<u>STATE</u>	<u>TESTER*</u>	<u><4 **</u>	<u>4-20 **</u>	<u>>20-200**</u>	<u>>200**</u>	<u>TOTAL</u>
AK	HD	9 (90)		1 (10)		10
	PT	1 (100)				1
AL	HD	13 (68)	5 (26)	1 (5)		19
	PT					0
AR	HD	9 (100)				9
	PT					0
AZ	HD	226 (81)	50 (18)	2 (1)		278
	PT					0
CA	HD	165 (95)	9 (5)			174
	PT	49 (50)	39 (40)	10 (10)		98
CO	HD	540 (51)	474 (45)	42 (4)	1 (<1)	1057
	PT	5 (56)	4 (44)			9
CT	HD	1129 (77)	314 (21)	26 (2)	1 (<1)	1470
	PT	484 (80)	115 (19)	3 (1)		602
DC	HD	143 (90)	16 (10)			159
	PT	3 (100)				3
DE	HD	55 (92)	5 (8)			60
	PT	2 (100)				2
FL	HD	775 (85)	132 (14)	9 (1)		916
	PT	352 (79)	73 (16)	17 (4)	1 (<1)	443
GA	HD	203 (85)	36 (15)	1 (<1)		240
	PT	48 (89)	6 (11)			54

<u>STATE</u>	<u>TESTER</u>	<u><4</u>	<u>4-20</u>	<u>>20-200</u>	<u>>200</u>	<u>TOTAL</u>
IA	HD PT	328 (63)	179 (35)	10 (2)		517 0
ID	HD PT	61 (76) 10 (67)	19 (24) 2 (13)	3 (20)		80 15
IL	HD PT	255 (68) 10 (83)	117 (31) 2 (8)	4 (1)		376 12
IN	HD PT	119 (60) 6 (67)	70 (35) 1 (11)	9 (5) 2 (22)		198 9
KS	HD PT	452 (63) 63 (79)	251 (35) 15 (19)	13 (2) 2 (2)		716 80
KY	HD PT	55 (60) 6 (100)	29 (32)	8 (9)		92 6
LA	HD PT	123 (98)	3 (2)			126 0
MA	HD PT	425 (78) 21 (88)	118 (21) 3 (22)	4 (1)		547 24
MD	HD PT	2636 (66) 174 (76)	1157 (29) 48 (21)	205 (5) 8 (3)	2 (1)	4000 230
ME	HD PT	75 (55) 4 (44)	58 (43) 5 (56)	3 (2)		136 9
MI	HD PT	143 (78)	37 (20)	4 (2)		184 0
MN	HD PT	51 (65)	23 (29)	3 (4)	1 (1)	78 0

<u>STATE</u>	<u>TESTER</u>	<u><4</u>	<u>4-20</u>	<u>>20-200</u>	<u>>200</u>	<u>TOTAL</u>
MO	HD PT	292 (59)	199 (40)	3 (<1)		494 0
MS	HD PT	1 (100) 2 (100)				1 2
MT	HD PT	23 (52) 1 (33)	19 (43) 2 (66)	2 (5)		44 3
NC	HD PT	65 (84) 4 (100)	11 (14)	1 (1)		77 4
ND	HD PT	229 (45)	62 (51)	18 (4)		509 0
NE	HD PT	5 (26) 57 (45)	14 (74) 71 (55)			19 128
NH	HD PT	108 (57) 30 (66)	68 (35) 8 (18)	13 (7) 6 (13)	1 (2)	189 45
NJ	HD PT	1757 (70) 3324 (84)	657 (26) 577 (15)	96 (4) 71 (2)	1 (<1)	2511 3972
NM	HD PT	435 (77) 62 (90)	133 (23) 6 (9)	5 (1)	1 (<1)	568 69
NV	HD PT	9 (100)				9 0
NY	HD PT	5657 (76) 175 (65)	1368 (18) 48 (18)	380 (5) 45 (17)	4 (1)	7409 268
OH	HD PT	733 (60) 35 (65)	423 (34) 17 (31)	72 (6) 2 (4)	1 (<1)	1229 54

<u>STATE</u>	<u>TESTER</u>	<u><4</u>	<u>4-20</u>	<u>>20-200</u>	<u>>200</u>	<u>TOTAL</u>
OK	HD PT	4 (67)	2 (33)			6 0
OR	HD PT	16 (84)	3 (16)			19 0
PA	HD PT	9538 (44) 1243 (63)	8557 (40) 554 (28)	3427 (16) 153 (8)	74 (<1) 9 (<1)	21596 1959
RI	HD PT	48 (73) 9 (47)	16 (24) 10 (53)	2 (3)		66 19
SC	HD PT	41 (91)	4 (9)			45 0
SD	HD PT	15 (42)	21 (58)			36 0
TN	HD PT	220 (65) 10 (71)	107 (32) 4 (29)	10 (3)		337 14
TX	HD PT	209 (94) 1 (100)	11 (5)	2 (1)		222 1
UT	HD PT	7 (88)	1 (22)			8 0
VA	HD PT	3677 (84) 608 (82)	681 (16) 115 (16)	21 (<1) 13 (2)	2 (<1) 1 (<1)	4381 737
VT	HD PT	9 (75)	3 (25)			12 0
WA	HD PT	16 (84)	3 (16)			19 0

<u>STATE</u>	<u>TESTER</u>	<u><4</u>	<u>4-20</u>	<u>>20-200</u>	<u>>200</u>	<u>TOTAL</u>
WI	HD	139 (62)	69 (31)	15 (7)		223
	PT					0
WV	HD	173 (64)	80 (30)	16 (6)		269
	PT	2 (67)	1 (33)			3
WY	HD	18 (69)	8 (31)			26
	PT	1 (100)				1
TOTAL	HD					51766
	PT					8876
GRAND TOTAL						60642

* HD represents tests performed by home dwellers
PT represents tests performed by professional testers.

** testing results in picocuries per liter.

TABLE 2.

MONTHLY SUMMARY OF TYPE OF ANALYSIS

YEAR	MONTH	HOME DWELLERS	PROFESSIONALS
1987	OCT	1974	947
	NOV	2009	1093
	DEC	1663	1006
1988	JAN	3091	1222
	FEB	4469	1970
	MAR	5130	1921
	APR	3281	1807
	MAY	2788	2120
	JUN	1801	1712
	JUL	1483	1277
	AUG	1436	1446