

**GAO**

United States General Accounting Office

Report to the Chairman, Committee on  
Science, Space, and Technology, House  
of Representatives

August 1990

# AIR POLLUTION

## Changes Needed in EPA's Program That Assesses Radon Measurement Firms





United States  
General Accounting Office  
Washington, D.C. 20548

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**Resources, Community, and  
Economic Development Division**

B-239005.3

August 31, 1990

The Honorable Robert A. Roe  
Chairman, Committee on Science,  
Space, and Technology  
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we review the Environmental Protection Agency's program that assesses the proficiency of radon measurement companies. The report discusses changes that are needed at the federal level to provide homeowners with greater assurance that radon measurements are accurate. In addition, it discusses the status of state programs that accredit, certify, or license radon measurement companies.

We are sending copies of the report to appropriate congressional committees; the Administrator, EPA; and other interested parties. We will make copies available to others upon request.

If you have any questions regarding this report, please contact me on (202) 275-6111. Major contributors to this report are listed in appendix III.

Sincerely yours,

A handwritten signature in cursive script, appearing to read 'Richard L. Hembra'. The signature is written in black ink and is positioned above the printed name.

Richard L. Hembra  
Director, Environmental Protection  
Issues

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the RMP program that would increase homeowners' assurance are (1) requiring measurement firms to pass the RMP program before marketing their devices, and (2) requiring radon measurement firms to demonstrate the existence of adequate quality assurance programs as a condition for participating in the RMP program.

Most states have not developed programs that would help to ensure the reliability, consistency, and quality of radon test data that companies provide homeowners. Also, without federal guidelines, the requirements differ in those states that accredit, license, or certify radon measurement companies, thus providing homeowners with differing levels of assurance.

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## Principal Findings

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### Firms Market Devices Without Meeting RMP Requirements

In October 1989 GAO reported cases illustrating why homeowners do not have assurance that radon measurements are accurate and why there is a need for additional controls over measurement companies. For example, in a review of EPA's 1988 testing of radon measurement firms, GAO found that one large measurement company and a few small companies were marketing devices that had not been tested in the RMP program; one device that was being marketed by one of the large companies did not meet the RMP program's requirements; several small companies that failed the 1988 testing were marketing devices; and a few small companies that tested some of their devices in the RMP program had been marketing other devices that had not been tested in the program. In a few of these incidences, it appeared the companies may have been providing homeowners with inaccurate measurements.

Officials from a sample of the radon testing industry support requiring measurement companies to participate in the RMP program. Of the 32 officials GAO interviewed, 27 said participation should be mandatory. Reasons cited for such a requirement included the severity of health effects of radon and the public's need to have assurance that they are dealing with reputable firms.

Finally, the nine states that have established programs that accredit, certify, or license radon measurement companies have differing requirements, which provide different levels of assurance to the homeowner. For example, as mentioned above, five states, have quality assurance requirements while four do not. Seven states require measurement companies to meet minimum educational requirements for critical personnel. GAO believes that one reason state requirements differ is that EPA has not defined the degree of control it wants states to exercise over radon measurement companies.

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## Recommendations

In testimony at hearings held by the House Subcommittee on Natural Resources, Agriculture Research, and Environment, Committee on Science, Space, and Technology, on May 16, 1990, GAO recommended that the Congress provide EPA with the authority to require radon measurement companies to successfully pass the RMP program before marketing their devices to the public (GAO/T-RCED-90-54). In addition, GAO recommended that EPA (1) establish minimum quality assurance requirements for the different radon measurement devices, and, as a condition for participating in the RMP program, require measurement firms to demonstrate that they have developed and implemented programs that will meet the requirements and (2) issue specific guidance on the type of program and level of control over radon measurement companies it believes is needed at the state level to provide homeowners with adequate assurance that radon measurements are accurate.

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## Agency Comments

As requested, GAO did not obtain official agency comments on a draft of this report. However, GAO discussed the factual material in the report with EPA officials, who generally agreed that it was accurate, and incorporated their comments where appropriate. In addition, at the May 16, 1990, hearings mentioned above, the Deputy Administrator of EPA testified that EPA was strengthening the RMP program in several ways, one of which is to require participants to implement quality assurance programs. Also, the Deputy Administrator testified that EPA would be designing a model state certification program to assist states in their efforts. EPA did not take a position on requiring firms to pass the RMP program before marketing their instruments.

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**Contents**

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**Abbreviations**

EPA	Environmental Protection Agency
GAO	General Accounting Office
RMP	Radon Measurement Proficiency

found. In October 1989 EPA released the results of radon screening measurements in eight additional states—Alaska, Georgia, Iowa, Maine, New Mexico, Ohio, Vermont, and West Virginia—and on Indian lands in North and South Dakota, Iowa, Nebraska, and New Mexico. EPA stated that the measurement results continue to show elevated radon levels in housing across the country.

While EPA maintains that there is no safe level of radon, it recommends action whenever annual average radon levels are greater than about 4 picoCuries per liter of air.<sup>2</sup> EPA estimates that the risk of being exposed to annual radon levels of 4 picoCuries over a lifetime of 70 years is comparable to smoking half a pack of cigarettes each day.

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## Sources of Indoor Radon

Radon can enter a home from several sources (see fig. 1.1). A major source of indoor radon is the soil and rocks surrounding a home. The radon gas seeps easily into a home through cracks and openings in foundation walls and floors and, more slowly, through concrete walls and floors. The amount of radon entering a home depends on a variety of factors, including the amount of radium in the soil surrounding or beneath a house, the soil's permeability, the type of house construction (e.g., house with basement versus house with crawl space), and the condition of the home's foundation. Because of these factors, homes on the same block or beside each other can have different radon levels.

Radon can also enter a home in other ways. For example, it may enter via water supplied by private underground wells. As water comes in contact with the soil and rocks, it picks up radon. The churning of the water in washers, showers, and sinks releases the radon into the indoor air. Usually, radon is not a problem with large community water supplies, where it would likely be released into the outside air before the water reaches a home. Radon can also enter a house from building materials, although generally not a major source, that contain uranium and radium.

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<sup>2</sup>The concentration of radon in air is measured in units of picoCuries per liter of air; 1 picoCurie per liter represents the decay of about two radon atoms per minute in a liter of air.

require skilled operators, such as the continuous radon monitor, can measure radon and provide more immediate results without laboratory analysis. Companies that provide the laboratory analysis results or the results through the use of instruments by a skilled operator are tested through the RMP program and are called primary companies.<sup>3</sup>

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## RMP Program

EPA established the RMP program in 1986 to assess the capabilities of companies providing measurement services to the homeowner. The objectives of the program are to (1) assist the states and the public in selecting companies that have demonstrated competence in measuring indoor radon, and in the long run (2) assure the public through the use of standardized measurements and quality assurance procedures, that companies' radon measurements are accurate.

To achieve these objectives, EPA envisioned a federal/state approach. EPA would be responsible for testing the proficiency of firms, whose participation in the program would be voluntary, and would encourage firms to adopt quality assurance procedures. The states, according to EPA officials, would determine any additional regulation of firms, such as mandatory participation in the RMP program and mandatory adoption of quality assurance programs.

To pass the RMP program, EPA requires a primary company to (1) follow the appropriate measurement protocols,<sup>4</sup> (2) demonstrate the ability to get test results to the proper homeowner, and (3) demonstrate the ability to measure radon to within 25 percent of actual levels. To meet the first requirement, EPA generally relies on a company's statement in the application that it follows the protocols. To meet the second and third requirements, companies must pass a proficiency test, which includes correctly analyzing devices exposed to known levels of radon and reporting the results to EPA for verification. EPA publishes a list of

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<sup>3</sup>Primary companies either have laboratory capabilities to analyze radon measurement devices after they have been exposed to radon or measure the radon levels and analyze the results with their own instrumentation and operators. Secondary companies provide services ranging from distribution of radon devices to home inspection and consultation. EPA does not evaluate secondary companies but suggests that consumers only use secondary companies that are affiliated with primary companies that have passed the RMP program. This report addresses EPA's assessment of primary companies only.

<sup>4</sup>Protocols outline procedures for taking radon measurements, specify the standardized house conditions that should exist at the time of the measurement, and describe the appropriate steps to follow and the equipment to use for each EPA-approved measurement method. To date, the following protocols have been issued: "Interim Indoor Radon and Radon Decay Product Measurement Protocols," (February 1986) (revised and issued in final form, Feb. 1989); and "Interim Protocols for Screening and Followup Radon and Radon Decay Product Measurements" (February 1987).

To determine changes that can be made in the RMP program we: relied on the results of our prior work to demonstrate the need for changes; identified common elements in other government accreditation programs; obtained industry's views, through a telephone survey, on the need to require certain elements in a proficiency program to provide assurance that measurement results are accurate; and conducted a survey of the status of state radon programs.

To obtain industry's views, we interviewed a sample of representatives from the 843 radon measurement companies and/or laboratories that had applied to participate in EPA's measurement proficiency test round held in 1989. In this round, EPA tested devices using one of nine measurement methods—activated charcoal, liquid scintillation, alpha track, electret ion chamber and radon integrated sampling unit (called passive devices because they do not require a skilled operator in the field and can be sent through the mail), continuous radon monitor, continuous working level monitor, grab radon monitor, and grab working level monitor (called active devices because they do require a skilled operator).

To make sure that we obtained the views of various segments of the industry, we divided the applicants into four groups. The first group included all government- and university-affiliated laboratories. The second group included all large primary companies. We defined a large primary company as one that provides laboratory analysis for 30 or more secondary companies. This is the same criterion that we used in our previous work, as reported in October 1989. The small primary companies (i.e. companies with fewer than 30 secondary companies) were then placed into one of the remaining two groups. The third group included any small primary company that applied to test any one of four popular passive devices—activated charcoal, liquid scintillation, alpha track, and electret ion chamber. Finally, the fourth group included any small primary company that applied to test only one or more of the four active devices or the passive radon progeny integrated sampling unit. This latter device is not widely used. Only 9 of the 843 applicants, or about 1 percent, applied to participate in the RMP program using the radon progeny integrated sampling unit.

The interview instrument used to obtain the information was pretested with three applicants. After the pretests were completed, we randomly selected a total of 30 applicants from the four groups. One applicant in the sample had been interviewed during the pretesting; therefore 29

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# RMP Program Does Not Provide Adequate Assurance That Radon Measurements Are Accurate

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Even with the increased number of firms demonstrating proficiency in measuring radon, EPA and the public still cannot be assured that all companies meet proficiency standards because the voluntary nature of the RMP program allows firms to market measurement devices that have not been tested or that have failed a test. Industry officials generally agreed that participation in the RMP program needs to be mandatory because of the severity of health effects of radon and because of the public's need to have assurance that they are dealing with reputable firms.

Furthermore, the RMP program does not require measurement firms to implement quality assurance programs that ensure quality measurements on a day-to-day basis and, consequently, companies may be providing homeowners with inaccurate results. Not requiring firms to implement quality assurance programs seems inconsistent with agency policy, science advisory board recommendations, and other laboratory accreditation programs. Radon industry officials believe quality assurance should be required as a condition for participating in the RMP program.

We made recommendations for addressing these problems in our May 16, 1990, testimony before the House Subcommittee on Natural Resources, Agriculture Research, and Environment, Committee on Science, Space and Technology. At the hearings the Deputy Administrator of EPA also testified that EPA was enhancing the RMP program in several ways.

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## Firms Market Devices Without Meeting RMP Requirements

In October 1989 we reported that 87 percent of the devices companies had tested in the RMP program in 1988 met the RMP requirements.<sup>1</sup> However, we also reported that the voluntary nature of the program allows firms to market devices that fail the program or that have not been tested in the program. When companies are allowed to market devices without demonstrating a minimum level of competency in measuring radon, consumers have no assurance that they are receiving accurate

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<sup>1</sup>Results for the 1989 RMP testing round show that about 80 percent of the devices that companies submitted for testing passed. These figures do not include the double-blind results from the 1989 testing round.

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## RMP Program Does Not Require Measurement Companies to Have Quality Assurance Programs

A radon measurement company needs a quality assurance program to ensure that its performance in producing accurate measurements meets a minimum level of competence. In fact, our work shows that without such programs, a company may be providing homeowners with inaccurate results.

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## Quality Assurance Procedures Help Ensure Accurate Measurement Results

An effective quality assurance program is EPA's best guarantee that radon measurement firms are performing quality testing on a day-to-day basis. In its protocol, EPA states that the objective of quality assurance is to ensure that data are scientifically sound, precise, and accurate.

Although EPA recommends certain quality assurance procedures for radon measurement companies, the agency does not require companies to develop and implement such procedures as a condition for program participation. Procedures EPA recommends include: controlled calibrations of measurement devices in an environment in which radon levels are known, such as in a radon calibration chamber; background and duplicate measurements; written procedures for attaining quality assurance objectives; a system for recording and monitoring the results of quality assurance measurements; and maintenance of control charts and related statistical data.

If measurement companies do not develop and implement adequate quality assurance programs, they may be providing homeowners with inaccurate results. For example, in our prior work, we found that only 12 of 21 interviewed companies that participated in 1988 testing were calibrating their equipment. One of the nine companies that did not calibrate its equipment failed the 1988 testing with a 100-percent error but had been marketing its equipment for a full year before testing. After calibrating its equipment, the company retested and passed.

The primary purpose of documented quality control, according to the former Chief, Office of Radiation Measurement, National Institute of Standards and Technology, is to ensure that the capability demonstrated during performance testing is maintained until the next periodic evaluation. The recent results of EPA's double-blind testing of radon measurement companies indicate that some firms are having difficulty

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## Industry Officials Believe RMP Program Should Require Quality Assurance

Of the 32 radon testing company officials interviewed, 31 said quality assurance should be required as a condition for participating in the RMP program. One official said quality assurance should only be required after a company passes the RMP program. Some of the reasons officials gave for requiring quality assurance included the ones below.

- The radon measurement area is wide open to abuse because homeowners cannot see, taste, or smell radon.
- Quality assurance requirements would force industry to develop good quality control systems and standardize industry practices.
- A quality control system is needed as a link between a company's performance on the proficiency test and its everyday work.

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## EPA Task Force Is Developing a Proposal to Implement Quality Assurance Requirements

EPA recently established a task force to assess changes that are needed in the RMP program. In an April 1990 meeting, program officials told us the task force was developing a proposal for changes in the RMP program that would include requiring measurement companies to have quality assurance programs as a condition for participating in the RMP program. In addition, as authorized by the 1988 radon legislation, EPA is developing a user-fee proposal to cover costs of the RMP program.

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## House Radon Hearings Address Need for More Quality Assurance

On May 16, 1990, the House Subcommittee on Natural Resources, Agriculture Research, and Environment, Committee on Science, Space, and Technology, held hearings on federal radon testing efforts. In testimony at those hearings we recommended, on the basis of our work, that the Congress provide EPA with the authority to require radon measurement companies to participate in the RMP program and successfully meet its requirements before marketing their devices to the public.<sup>6</sup> In addition, we recommended that EPA establish minimum quality assurance requirements for the different radon measurement devices and, as a condition for participating in the RMP program, require measurement firms to demonstrate that they have developed and implemented programs that will meet the requirements.

At the hearings the Deputy Administrator of EPA testified that EPA was strengthening the quality control aspects of the RMP program in several ways. The changes include expanding double-blind testing, requiring

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<sup>6</sup>Improvements Needed in the Environmental Protection Agency's Testing Programs for Radon Measurement Companies (GAO/T-RCED-90-54, May 16, 1990).

# States' Monitoring of Radon Measurement Firms Is Limited and Inconsistent

In designing the RMP program, EPA envisioned that states, through accreditation or certification programs, would exercise some degree of control over the reliability, consistency, and quality of the measurement data companies provide homeowners. According to EPA officials, the agency expected that states would make participation in the RMP program mandatory and establish and enforce quality control requirements through state programs.

However, we found that EPA's expectations about the states' role in controlling measurement companies have not been met. From our nationwide survey of radon coordinators in 50 states and the District of Columbia, we learned that few states have established programs that accredit, certify, or license measurement companies. Furthermore, the differing requirements among those states with programs provide varying levels of assurance. (Appendix II presents a summary of the responses to the questions in our telephone survey.)

In our May 16, 1990, testimony before the House Subcommittee on Natural Resources, Agriculture Research, and Environment, Committee on Science, Space, and Technology, we recommended that EPA issue guidance on the type of program and level of control it believes is needed at the state level to provide homeowners with adequate assurance that radon measurements are accurate. At these same hearings the Deputy Administrator, EPA, testified that the agency planned to design a model state certification program to assist states in their efforts.

## Few States Establish Programs That Accredit, Certify, or License Measurement Companies

Our nationwide survey of state radon coordinators indicates that state action to (1) make participation in the RMP program mandatory and (2) establish and enforce quality assurance requirements could take years to occur and may never occur in some states. For example, although the coordinators in 35 states viewed radon levels in homes as a problem in their states, only nine states have programs that certify, license, or accredit radon measurement companies. All nine programs have a requirement that radon measurement companies participate in EPA's RMP program or in a similar state-run program. However, only five of the programs (those of Delaware, Florida, Iowa, Pennsylvania, and Virginia) are mandatory. Three of the states with voluntary programs (Kentucky, Nebraska, and New Jersey) are attempting to get legislation passed or regulations implemented that would make their programs mandatory. The fourth state (North Dakota) has no plans to change its voluntary program. Of the nine states that have programs, only five have quality assurance requirements.

and that each state needed flexibility to design a program that addressed its own particular problem, according to EPA officials. In a May 1988 report, EPA stated such control could include registration, certification, and licensing.<sup>1</sup> According to the report, registration, certification, and licensing differences center around whether the control process is mandatory, whether nonparticipating (e.g., noncertified or nonlicensed) firms are excluded from the market, and whether a fee is charged by the state for the process. Licensing is viewed as the most restrictive form of "quality control," while registration is the least restrictive. The report noted that the RMP program illustrates a form of registration with no fee—the least restrictive form.

Industry representatives we contacted during the review also expressed concern about the effect of state requirements on radon measurement firms. For example, representatives of 3 of the 14 firms marketing their services nationwide indicated that they did not market their devices in one or more states because of existing requirements in those states. In addition, a majority (19) of the industry representatives we interviewed favored federal regulation of any quality assurance requirements that might be imposed. The remaining representatives were divided, with six favoring state regulation, and five favoring industry regulation. One representative indicated a combination of federal and state regulation. One representative did not have a position. The primary reason they gave for preferring federal regulation was the need for uniformity in the requirements. Among the problems associated with state regulation mentioned by individual representatives were overlapping state jurisdictions, inconsistencies and conflicts between state requirements, and general confusion for the industry.

In an April 1990 meeting, EPA program officials told us that the radon task force was proposing that a model state certification program document be developed for guidance to states.

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## House Radon Hearings Address Need for More Uniformity Among States

In our May 1990 testimony, we recommended that EPA develop and issue specific guidance on the type of state programs and level of control it believes is needed to provide homeowners with adequate assurance that their radon measurements are accurate.

At these same hearings the Deputy Administrator, EPA, testified that EPA plans to design a model state certification program to assist states in

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<sup>1</sup>Key Elements of a State Radon Program, EPA 520/1-88-006, Office of Radiation Programs.

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# Summary of Responses to Questions Asked in GAO's Telephone Survey of State Radon Programs

1. Please enter your name:

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2. Please enter state ID:

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3. Please enter respondent's name:

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4. Hello, my name is #1 of the U.S. General Accounting Office. GAO is an independent audit agency that works for Congress. We have been asked by the House Committee on Science, Space, and Technology to examine the accuracy of radon measurements. As part of that effort, we are surveying state radon program coordinators to determine the status of state radon programs. I would like to ask you some questions about your state's program. The questions generally take about 20 minutes to answer. Is this a convenient time for you?

5. The following questions refer to the status of your state radon program.

6. Has your state passed any radon legislation? (Check only one answer.)

- a. Yes 14 (FL, IL, IN, IA, MD, NB, NH, NJ, NY, PA, RI, TN, VA, WI)
- b. No 37

7. Does your state have any pending radon legislation? (Check only one answer.)

- a. Yes 10 (CA, DE, DC, GA, ME, MA, NJ, OH, PA, WA)
- b. No 41

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**Appendix II  
Summary of Responses to Questions Asked in  
GAO's Telephone Survey of State  
Radon Programs**

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15. Please describe other distribution techniques:

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16. Does your state currently provide a list of proficient radon measurement companies to consumers? (Check only one answer.)

a. Yes 48  
b. No 3  
c. Had in the past 0

17. Does your state currently distribute any other radon brochures/publications to homeowners? (Prompt for what kinds.) (Check only one answer.)

a. Yes 49  
b. No 2  
c. Had in the past 0

18. Is your state currently running TV, radio, or print ads on radon? (Check only one answer.)

a. Yes 3  
b. No 41  
c. Had in the past 7

19. Is your state currently using any other outreach methods to provide consumers with information about radon? (Check only one answer.)

a. Yes (Go to question 20.) 32  
b. No (Go to question 21.) 19

20. Please explain:

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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25. Does your program for radon measurement firms include on-site inspection of primary measurement companies? (Check only one answer.)

a. Yes	<u>4</u>
b. No	<u>5</u>
c. Not applicable	<u>42</u>

26. Does your program for radon measurement firms include blind-testing of companies? (Check only one answer.)

a. Yes	<u>1</u>
b. No	<u>8</u>
c. Not applicable	<u>42</u>

27. Does your program include radon training for measurement companies? (Check only one answer.)

a. Yes	<u>5</u>
b. No	<u>4</u>
c. Not applicable	<u>42</u>

28. Does your state require radon measurement firms to participate in EPA's RMP testing program and/or a state-run testing program? (Check only one answer.)

a. EPA's RMP only	<u>6</u>
b. State program only	<u>0</u>
c. Either EPA or state program	<u>3</u>
d. Both EPA and state programs	<u>0</u>
e. Not applicable	<u>42</u>

29. Are radon measurement companies participating in your program required to calibrate their equipment periodically? (Check only one answer.)

a. Yes	<u>5</u>
b. No	<u>4</u>
c. Not applicable	<u>42</u>

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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35. Does your program have any other requirements? (Check only one answer.)

a. Yes 4  
b. No 5  
c. Not applicable 42

36. Please explain:

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37. Are radon measurement companies required to pay a fee to participate in your state program? (Check only one answer.)

a. Yes (Go to question 38) 3  
b. No (Go to question 40) 6  
c. Not applicable 42

38. What is the fee?

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39. What time period does that cover? (Enter in months.)

40. Are radon measurement technicians and/or specialists required to pay a fee to participate in your state program? (Check only one answer.)

a. Yes (Go to question 41.) 3  
b. No (Go to question 43.) 6  
c. Not applicable 42

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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47. How satisfied or dissatisfied are you with the technical guidance you received from EPA? Would you say that you are:

a. Very satisfied	<u>28</u>
b. Somewhat satisfied	<u>11</u>
c. Neither satisfied nor dissatisfied	<u>2</u>
d. Somewhat dissatisfied	<u>2</u>
e. Very dissatisfied	<u>0</u>
f. Not applicable	<u>8</u>

(Check only one answer.)

48. Are there any other types of assistance your state has received from EPA? (Check only one answer.)

a. No (Go to question 50.)	<u>10</u>
b. Yes (Please explain.)	<u>41</u>

49. How satisfied or dissatisfied were you with that assistance? (Check only one answer.)

a. Very satisfied	<u>32</u>
b. Somewhat satisfied	<u>7</u>
c. Neither satisfied nor dissatisfied	<u>0</u>
d. Somewhat dissatisfied	<u>1</u>
e. Very dissatisfied	<u>1</u>
f. Not applicable	<u>10</u>

50. Overall, how satisfied or dissatisfied are you with the assistance you have received from EPA? (Check only one answer.)

a. Very satisfied	<u>28</u>
b. Somewhat satisfied	<u>19</u>
c. Neither satisfied nor dissatisfied	<u>3</u>
d. Somewhat dissatisfied	<u>0</u>
e. Very dissatisfied	<u>0</u>
f. Not applicable (If no assistance provided)	<u>1</u>

51. Are there any types of assistance not currently provided by EPA that would be helpful to your state? (Check only one answer.)

a. No	<u>19</u>
b. Yes (Please explain.)	<u>32</u>

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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56. How important do you believe it is for a program to include blind testing of radon companies by outside parties? (Check only one answer.)

a. Very important	<u>41</u>
b. Somewhat important	<u>9</u>
c. Neither important nor unimportant	<u>1</u>
d. Somewhat unimportant	<u>0</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>0</u>

57. How important do you believe it is for a program to include on-site inspections of radon measurement companies? (Check only one answer.)

a. Very important	<u>15</u>
b. Somewhat important	<u>28</u>
c. Neither important nor unimportant	<u>7</u>
d. Somewhat unimportant	<u>1</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>0</u>

58. How important do you believe it is for a program to make proficiency testing of new primary companies available year round? (Check only one answer.)

a. Very important	<u>22</u>
b. Somewhat important	<u>19</u>
c. Neither important nor unimportant	<u>3</u>
d. Somewhat unimportant	<u>6</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>1</u>

59. How important do you believe it is for a program to require periodic retesting of proficient primary companies? (Check only one answer.)

a. Very important	<u>35</u>
b. Somewhat important	<u>15</u>
c. Neither important nor unimportant	<u>1</u>
d. Somewhat unimportant	<u>0</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>0</u>

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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64. Are there any other elements that you believe are important to include in a radon certification program? (Check only one answer.)

- a. No (Go to question 66.) 32
- b. Yes 19

65. Please describe any elements you believe should be included:

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66. Next, I want to ask a few questions about some other areas that might be a part of a radon program.

67. How important do you believe it is that EPA act as a radon information clearinghouse for the states? (Check only one answer.)

- a. Very important 36
- b. Somewhat important 13
- c. Neither important nor unimportant 1
- d. Somewhat unimportant 0
- e. Very unimportant 1
- f. Don't know 0

68. How important do you believe it is to have guidelines for radon measurement in real estate transactions? (Check only one answer.)

- a. Very important 33
- b. Somewhat important 12
- c. Neither important nor unimportant 0
- d. Somewhat unimportant 3
- e. Very unimportant 2
- f. Don't know 1

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
**GAO's Telephone Survey of State**  
**Radon Programs**

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69. How important do you believe it is to limit a company's ability to perform both testing and mitigation? (Check only one answer.)

a. Very important	<u>11</u>
b. Somewhat important	<u>13</u>
c. Neither important nor unimportant	<u>13</u>
d. Somewhat unimportant	<u>10</u>
e. Very unimportant	<u>3</u>
f. Don't know	<u>1</u>

70. Are there any other topics or issues regarding radon that you would like to discuss?

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**Appendix II  
Summary of Responses to Questions Asked in  
GAO's Telephone Survey of State  
Radon Programs**

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60. How often do you think this retesting should occur? (Short answer—  
enter in months.)

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61. How important do you believe it is for a program to require critical  
radon measurement personnel to meet minimum educational require-  
ments? (Check only one answer.)

a. Very important	<u>32</u>
b. Somewhat important	<u>13</u>
c. Neither important nor unimportant	<u>4</u>
d. Somewhat unimportant	<u>1</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>1</u>

62. How important do you believe it is for a program to require critical  
radon measurement company personnel to meet minimum experience  
requirements? (Check only one answer.)

a. Very important	<u>25</u>
b. Somewhat important	<u>22</u>
c. Neither important nor unimportant	<u>2</u>
d. Somewhat unimportant	<u>2</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>0</u>

63. How important do you believe it is for a program to require radon  
measurement companies to report homeowner test results to a govern-  
ment office? (Check only one answer.)

a. Very important	<u>27</u>
b. Somewhat important	<u>18</u>
c. Neither important nor unimportant	<u>3</u>
d. Somewhat unimportant	<u>3</u>
e. Very unimportant	<u>0</u>
f. Don't know	<u>0</u>

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
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52. Next, I'd like to read to you a list of elements for a certification program for companies providing radon measurement services. For each element, please tell me if you believe this element is important or unimportant in establishing a program to assure homeowners that radon test results are accurate.

53. How important do you believe it is that radon measurement companies be tested for accuracy? (Check only one answer.)

a. Very important	48
b. Somewhat important	2
c. Neither important nor unimportant	0
d. Somewhat unimportant	1
e. Very unimportant	0
f. Don't know	0

54. How important do you believe it is to require companies to periodically calibrate their equipment using an independent laboratory? (Check only one answer.)

a. Very important	44
b. Somewhat important	3
c. Neither important nor unimportant	3
d. Somewhat unimportant	1
e. Very unimportant	0
f. Don't know	0

55. How important do you believe it is for a program to have other quality assurance requirements for testing companies? For example:

- Routine checks of equipment accuracy
- Record keeping, etc.
- Procedures to ensure that measurement equipment is operating properly, etc.

(Check only one answer.)

a. Very important	45
b. Somewhat important	6
c. Neither important nor unimportant	0
d. Somewhat unimportant	0
e. Very unimportant	0
f. Don't know	0

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
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41. What is the fee?

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42. What time period does that cover? (Enter in months.)

43. Next, I'd like to ask you a few questions about assistance your state might have received from EPA.

44. Has your state received any assistance from EPA to provide public information, for example, Citizen's Guide? (If no, ask: Did you request any?) (Check only one answer.)

a. No, not requested	<u>1</u>
b. No, requested but not received	<u>0</u>
c. Yes	<u>50</u>

45. How satisfied or dissatisfied are you with the assistance you received from EPA with public information? Would you say that you are:

a. Very satisfied	<u>27</u>
b. Somewhat satisfied	<u>19</u>
c. Neither satisfied nor dissatisfied	<u>4</u>
d. Somewhat dissatisfied	<u>0</u>
e. Very dissatisfied	<u>0</u>
f. Not applicable	<u>1</u>

(Check only one answer.)

46. Has your state received any technical guidance from EPA, for example, providing standardized measurement protocols, etc.? (If no, ask: Did you request any?) (Check only one answer.)

a. No, not requested	<u>7</u>
b. No, requested but not received	<u>1</u>
c. Yes	<u>43</u>

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
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30. Are radon measurement companies required to follow any other quality assurance procedures? For example:

- Routine checks of equipment accuracy
- Procedures to ensure that measurement equipment is operating properly
- Record keeping (Check only one answer.)

a. Yes  $\frac{5}{}$   
b. No  $\frac{4}{}$   
c. Not applicable  $\frac{42}{}$

31. Are radon measurement companies required to meet minimum radon experience qualifications for critical personnel? (Check only one answer.)

a. Yes  $\frac{7}{}$   
b. No  $\frac{2}{}$   
c. Not applicable  $\frac{42}{}$

32. Are radon measurement companies required to meet minimum educational requirements for critical personnel? (Check only one answer.)

a. Yes  $\frac{7}{}$   
b. No  $\frac{2}{}$   
c. Not applicable  $\frac{42}{}$

33. Are radon measurement companies participating in your program required to post a bond? (Check only one answer.)

a. Yes  $\frac{1}{}$   
b. No  $\frac{8}{}$   
c. Not applicable  $\frac{42}{}$

34. Are radon measurement companies participating in your program required to submit radon test results to the state? (Check only one answer.)

a. Yes (Request copy of reporting requirements)  $\frac{6}{}$   
b. No  $\frac{3}{}$   
c. Not applicable  $\frac{42}{}$

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**Appendix II**  
**Summary of Responses to Questions Asked in**  
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21. Does your state currently certify, license, or accredit companies which perform radon measurements in the state? (Check only one answer.)

a. Yes (Go to question 23.) 9  
b. No 42

22. Do you foresee that your state will establish a radon certification program for radon measurement firms in the near future? (Check only one answer.)

a. Yes/within 1 year 6 (CT, IN, ME, NY, WV, WY)  
b. Yes/within next 2 years 4 (AZ, DC, IL, OH)  
c. Yes/within next 3 years 0  
d. Yes/don't know when 10 (GA, KS, MA, MN, MS, NH, NM,  
OK, UT, VT)  
e. No 22  
f. Not applicable 9

Please skip to question 43

23. Is your program:

a. Mandatory (Go to question 25.) 5  
b. Voluntary (Go to question 25.) 4  
c. Other 0  
d. Not applicable 42  
(Check only one answer.)

24. Please explain:

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Appendix II  
Summary of Responses to Questions Asked in  
GAO's Telephone Survey of State  
Radon Programs

8. Has your state designated any funds in this fiscal year to be spent on a radon program? (Check only one answer.)

- a. Yes 18
- b. No/part of department budget 14
- c. No/no money spent on radon 19

9. What is the current funding level?

\$ \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

10. In your opinion, are radon levels in homes a problem in your state? (Check only one answer.)

- a. Yes 35
- b. No 12 (AK, AR, AZ, DC, HI, IN, LA, MS, NC, OK, SC, TX)
- c. Do not know 4 (CA, NV, NH, SD)

11. I would like to ask you a few questions about some ways your state might communicate with homeowners about radon.

12. Does your state currently have a radon hotline? (Check only one answer.)

- a. Yes 19
- b. No 30
- c. Had in the past 2

13. Does your state currently distribute EPA's Citizen's Guide for Radon? (Check only one answer.)

- a. Yes 50
- b. No 1

14. Does your state distribute the Citizen's Guide upon request or do you do direct mailings? (Check only one answer.)

- a. Request only (Go to question 16.) 44
- b. Direct mailing only (Go to question 16.) 0
- c. Both (Go to question 16.) 6
- d. Other 0
- e. Not applicable 1

# Confidence Intervals for Estimates in Chapter 2

This information is reprinted from our October 1989 report. For a fuller explanation of our methodology see pages 12 and 13 of that report. Because we reviewed a statistical sample of companies, each estimate developed from the sample has a measurable precision. The precision of our statistical estimates are developed at the 95-percent confidence level and are shown as the lower and upper bounds of the 95-percent confidence interval (see table I.1). This means that if we reviewed all of the companies in our universe, the results of such a review would lie between the lower and upper bounds of the confidence interval about 19 times out of 20.

We reviewed all eleven large primary companies in round-5 testing; therefore, no confidence interval is associated with our results for large companies. We reviewed a sample of small primary companies. Our sample estimates represent the 347 small primary companies in round 5.

**Table I.1: Confidence Intervals for Estimates of Results for Small Companies**

Description	Estimate	Confidence limit (at 95-percent level)	
		Lower bound	Upper bound
Small companies that were marketing devices that had not been tested	7	2	22
Small companies that were marketing devices that had failed round-5 testing	24	11	45
Small companies that tested some of their devices in the RMP program and marketed other devices that had not been tested in the RMP program	3	1	17

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their efforts. EPA expects to complete a draft of this document in the fall of 1990.

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## **Conclusions**

As we recommended, states need guidance on the type of program and level of control EPA believes is needed at the state level. It appears EPA has begun to meet this need with its plans to develop guidance on a model state certification program.

Coordinators in 20 states said a program may be established in the future. The remaining 22 coordinators said a program would probably not be established. Two reasons coordinators gave for not having a program were: a lack of funding or resources for indoor air problems in general, including radon, and a lack of legislative authority for such programs.

## Requirements Among State Programs Differ

Not only do states vary in whether or not they require mandatory participation in their programs, but they also vary in the number and type of requirements in their programs. The result is that each program gives a different level of assurance to homeowners regarding the accuracy of measurements. For example, as table 3.1 shows, five of the nine programs require companies to calibrate their equipment periodically and follow other quality assurance procedures. Four of nine programs provide on-site inspection of measurement companies. The only requirement common to all nine programs is for companies to participate in EPA's RMP testing program and/or a similar state-run testing program.

**Table 3.1: Comparison of State Program Requirements**

State program requirements	Mandatory program					Voluntary program				Total
	FL	PA	DE	VA	IA	NJ	NB	ND	KY	
Companies required to participate in EPA's RMP testing program and/or state-run testing program	X	X	X	X	X	X	X	X	X	9
Minimum education required for critical company personnel	X		X		X	X	X	X	X	7
Minimum radon experience required for critical personnel	X	X	X		X	X	X		X	7
Companies required to submit radon test results	X	X	X		X	X			X	6
State program includes radon training for measurement companies	X				X	X	X	X		5
Companies required to calibrate their equipment periodically	X	X			X	X			X	5
Other quality assurance procedures required: (1) routine checking of equipment accuracy, (2) procedures to ensure that measurement equipment is operating properly, and (3) record keeping	X	X			X	X			X	5
State program calls for on-site inspection	X	X			X				X	4
Companies and radon specialists required to pay a fee	X	X			X					3
State program includes blind-testing of companies		X								1
Companies required to post a bond					X					1

Although in the survey we did not attempt to establish why some states had certain requirements and others did not, one reason may be the lack of guidance from EPA. For the most part, EPA has not defined the degree of control it wants states to exercise over measurement companies. EPA believed that the nature of the radon problem varied from state to state

participants in the RMP program to implement quality assurance programs, and examining the feasibility of enrolling firms in the RMP program more than once a year. EPA did not take a position on requiring firms to pass the RMP program before marketing their instruments.

EPA expects to begin to implement some quality assurance requirements and expand the double-blind testing in the fall of 1990 as part of the round 7 RMP testing. In a July 1990 meeting, EPA officials expressed concern about the costs associated with implementing effective quality assurance requirements. Officials noted that initial implementation may require extensive resources to carry out such activities as reviewing quality assurance plans and/or performing on-site inspection of companies' facilities. According to officials in order to manage these costs, it may be necessary to phase in quality assurance requirements over a 2- to 3-year period.

Finally, legislation was introduced in the House (H.R. 5138) on June 21, 1990, that would require EPA to establish a mandatory radon measurement proficiency program as well as quality assurance requirements for those participating in the program.

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## Conclusions

Homeowners need assurance that companies have demonstrated a minimum level of competency in measuring radon and that the measurement results provided to them have some degree of accuracy. That assurance does not exist, however, because firms are not required to participate in the RMP program before marketing radon measurement devices, and firms are not required to demonstrate the existence of adequate quality assurance programs. EPA's plans to begin implementing quality assurance requirements for firms participating in the RMP testing is the first step in providing the necessary assurance. Further, authorizing EPA to require companies to pass the RMP program before marketing their devices would provide greater assurance to the public that radon measurements are accurate.

maintaining this performance and need to improve quality assurance.<sup>3</sup> In 1989, 14 or about 25 percent of the 55 company methods EPA double-blind tested failed. Fifty-two of the 55 had demonstrated proficiency in the announced test in 1988 or 1989. About 7 or 20 percent of those firms that had demonstrated proficiency in 1988 and were providing radon measurement services failed.

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**Not Requiring Quality Assurance Is Inconsistent With Agency Policy, Science Advisory Board Recommendation, and Other Laboratory Accreditation Programs**

EPA's policy of not requiring measurement companies to implement quality assurance programs as a condition to participating in the RMP program seems inconsistent with EPA's agencywide quality assurance policy for EPA-sponsored environmental monitoring and measurement efforts. This policy requires every measurement project to have a written and approved quality assurance plan and applies to all EPA program offices, regional offices, laboratories, contractors, and grantees.

In addition, EPA's own Science Advisory Board has also recommended that the agency require radon measurement companies to maintain documented quality assurance and measurement procedures for measurement devices.<sup>4</sup> Specifically, the Board recommended that both detailed descriptions of calibration procedures and calibration data for certain types of measurement devices be submitted with the application for admission to the proficiency testing program.

Finally, other government accreditation programs generally require some quality assurance procedures. For example, 19 out of 20 laboratory accreditation programs discussed in our March 1989 report required equipment calibration, and 12 of the 20 programs included record-keeping requirements.<sup>5</sup>

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<sup>3</sup>In double blind-testing EPA acquires devices without a company's knowledge, exposes the devices to known levels of radon and returns the devices to the company for analysis. If the company's analysis is accurate (within 25-percent of the known radon levels) it passes the proficiency test.

<sup>4</sup>The Science Advisory Board is a group of independent scientists who review the quality and sufficiency of scientific data underlying regulatory development of some EPA actions.

<sup>5</sup>Laboratory Accreditation: Requirements Vary Throughout the Federal Government (GAO/RCED-89-102, Mar. 28, 1989).

results. In fact, in a few of the cases cited below it appeared the companies may have been providing homeowners with inaccurate measurements. The following are cases we reported that illustrate the lack of controls in the RMP program.<sup>2</sup>

- One large company and an estimated seven small companies were marketing devices that had not been tested in the RMP program.
- One device that was being marketed by one of the large radon measurement companies did not meet the RMP program's requirements.
- An estimated 24 small companies that failed the 1988 testing were marketing devices.
- An estimated three small companies that tested some of their devices in the RMP program had been marketing other devices that had not been tested in the program.

We also identified a company, not in our sample, that was analyzing devices in its laboratory under another name after it failed the proficiency test.

---

### **Industry Officials Agree That Measurement Firms Should Be Required to Demonstrate Proficiency**

Officials from a sample of the radon testing industry generally agreed that all measurement companies should be required to demonstrate proficiency in testing radon. Of the 32 officials we interviewed, 27 said participation in the RMP program should be mandatory. Below are some of the reasons industry gave for making participation mandatory.

- Radon health effects are severe enough to warrant obtaining assurance from companies that they are meeting the RMP requirements. Without mandatory participation, companies will not meet requirements.
- The public needs assurance that they are dealing with reputable firms, and the RMP program is the only means available to companies for demonstrating competence in measuring radon.
- The RMP program is the only independent check on a company's ability to measure radon.

Five officials said the program should remain voluntary. Their reasons included these two: the existing program is sufficient, and a mandatory program would make it more difficult to implement changes.

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<sup>2</sup>In our prior review, we sampled all 11 large primary companies (having 30 or more secondary companies) and 100 of the 347 small primary companies (having fewer than 30 secondary companies) that participated in the 1988 testing (small company sample results are given as estimates to the universe of 347). The sampling errors for the specific estimates are given in app. I.

new interviews were conducted and added to the three pretest interviews. Thus, we obtained information from a total of 32 industry representatives, including representatives of 3 government-affiliated laboratories, 3 university-affiliated laboratories, and 26 commercial firms. Because our sample was small, the information obtained from our interviews reflects only the views of those interviewed and should not be considered representative of the entire universe. Although no attempt was made to include users of all nine measurement methods, the sample did include primary laboratories representing all nine EPA-approved measurement methods.

To determine the status of state radon programs, we conducted a telephone survey of radon coordinators from all 50 states and the District of Columbia. The survey obtained information on (1) the state radon programs that accredit, certify, or license companies and their requirements; (2) the coordinators' views on the importance of elements in a radon measurement certification program in providing homeowners with assurance that radon measurements are accurate; and (3) states' efforts to inform the public. Our survey instrument was pretested in three states.

Our work was conducted at EPA's headquarters, Washington, D.C.; and at EPA's RMP program contractor, the Research Triangle Institute, in Research Triangle Park, North Carolina. The audit work was performed between June 1989 and March 1990 and followed generally accepted government auditing standards. We discussed the factual material in the report with agency officials, who generally agreed that it was accurate, and have included their comments where appropriate. However, as requested, we did not obtain official agency comments on the report.

firms passing its proficiency test in national reports that are distributed throughout the country and in individual state reports that states distribute.

Since 1986 EPA has assessed companies' competency in measuring radon on six occasions. The number of firms demonstrating proficiency through the RMP program has grown dramatically. For example, about 24 firms demonstrated proficiency in EPA's first test, held in 1986, while about 660 firms were listed in EPA's latest proficiency report, issued in January 1990. Of the 660 firms, EPA lists about 260 as national companies.

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## Radon Legislation

In 1985, when EPA began designing its programs for radon, it did not have specific legislative authority. Since that time, two pertinent laws have been enacted. The Superfund Amendments and Reauthorization Act of 1986 requires EPA to (1) conduct a national assessment of radon to determine the extent of the problem and (2) establish a research and development program that will address indoor pollution problems. EPA expects to complete the national assessment in fiscal year 1991. EPA's research supports activities such as radon mitigation and prevention in schools and workplaces, radon mitigation techniques for existing housing, and radon mitigation techniques for new construction.

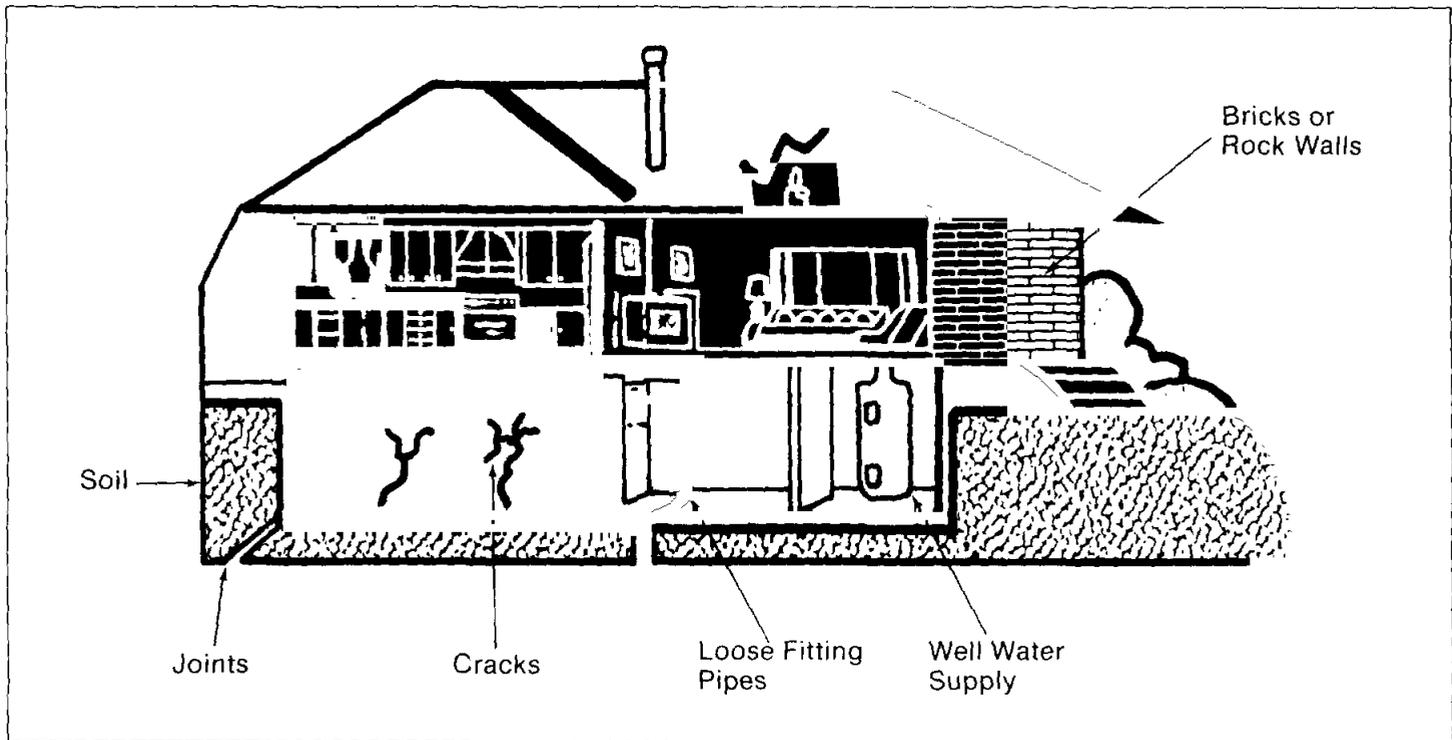
More recently, the Congress passed Public Law 100-551, commonly referred to as the Indoor Radon Abatement Act of 1988, which established a national goal "that the air within buildings in the United States should be as free of radon as the ambient air outside of buildings." The act directs EPA to undertake a variety of activities to address the radon problem. A number of the activities, including the RMP program, were already underway as part of EPA's radon efforts. The act also authorized EPA to develop a user-fee system to defray costs of certain activities, including operating the proficiency program.

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## Objectives, Scope, and Methodology

At the request of the Chairman, House Committee on Science, Space, and Technology, we reported in October 1989 on the uncertainty in radon measurements. On the basis of our findings the Chairman requested that we conduct a follow-up review to determine (1) changes that can be made in EPA's RMP program to provide more assurance to homeowners that radon measurements are accurate and (2) the status of state radon programs that certify, license, or accredit radon measurement companies.

Figure 1.1: Sources and Entry Routes of Indoor Radon



Source: Adapted from a report entitled *Issue Background: Energy Efficient New Homes & Indoor Air Pollutants*, Bonneville Power Administration (July 1995)

## Measuring Radon Levels

Radon occurs naturally almost everywhere. Current estimates are that the average radon level in U.S. homes is about 1.5 picoCuries of radon. On the basis of its short-term screening surveys, EPA estimates that eight million, or about 10 percent, of the homes in the United States have annual radon levels above 4 picoCuries. EPA recommends that everyone living in detached houses (including trailer homes with permanent foundations), townhouses or rowhouses, and first- or second-floor apartments should test for radon. EPA estimates that about 1.8 million homes have been tested for radon.

Several different devices are available to measure radon in the home. Some, such as the popular charcoal canister, measure radon over 2 to 7 days. Another popular device, the alpha track detector, measures radon for longer periods such as 3 months to a year. Both devices, which can be purchased from various retail outlets, must be sent to laboratories for analysis after being exposed to radon. Some more costly devices that

# Introduction

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Radon is a colorless, odorless gas formed by the decay of radium and uranium. Radon is second only to smoking as a cause of lung cancer, according to the Environmental Protection Agency (EPA). EPA and the Public Health Service have advised residents to test their homes for radon and take action when elevated levels are found. To help ensure that the radon measurements homeowners obtain are accurate, EPA issued procedures for taking such measurements and established a voluntary program for assessing the proficiency of radon measurement devices and the capabilities of the companies that analyze these devices after they have been exposed to radon.

In December 1988 the Chairman, House Committee on Science, Space, and Technology asked us to examine the accuracy of the current methods and practices used to measure radon and the assurance homeowners have that measurements are accurate. In October 1989 we reported that radon measurements contained uncertainty because (1) radon devices and the companies analyzing the devices vary in their levels of accuracy and (2) homeowners may not be following EPA's recommended testing procedures. However, we said opportunities existed through the RMP program to reduce some of the uncertainties and provide more assurance to homeowners that measurements are accurate.<sup>1</sup>

On the basis of our findings, the Chairman requested that we conduct a follow-up review to determine (1) changes that can be made in the RMP program to provide more assurance to homeowners that radon measurements are accurate and (2) the status of state radon programs that certify, license, or accredit radon measurement companies.

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## Radon—A National Health Concern

Radon is a health concern because of the increased risk of lung cancer associated with exposure to it. Radon briefly remains a gas, and then it breaks down, or decays, into radioactive products that tend to adhere to dust and other tiny particles floating in the air. When inhaled, these radioactive particles can damage lung tissue. EPA estimates that about 20,000 lung cancer deaths each year in this country may be attributed to radon.

In September 1988, on the basis of the results of radon screening measurements in 17 states, the EPA Administrator and the Assistant Surgeon General issued a national health advisory on radon, recommending that most homes be tested and action be taken when elevated levels are

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<sup>1</sup>Air pollution: Uncertainty Exists in Radon Measurements (GAO/RCED-90-25, Oct. 16, 1989).

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## RMP Program Does Not Require Measurement Companies to Have Quality Assurance Programs

Although EPA recommends certain quality assurance procedures for radon measurement companies, the agency does not require companies to develop and implement such procedures as a condition for participating in the RMP program. As a result, GAO found that only 12 of 21 interviewed companies that participated in the 1988 testing were calibrating their equipment (an EPA recommended quality assurance procedure). One of the nine companies that did not calibrate its equipment failed the 1988 test with a 100-percent error but had been marketing its equipment for a full year before the test. Also, EPA's first efforts to test radon measurement companies without their knowledge, called double-blind testing, indicate that some firms are having difficulty providing consistent and accurate measurements. For example, GAO found that 7 out of 36, or about 20 percent, of those firms that had demonstrated proficiency in 1988 and were double-blind tested in 1989 failed.

In addition, not requiring measurement companies to implement quality assurance programs as a condition for participating in the RMP program seems inconsistent with EPA's own agencywide quality assurance policy for EPA-sponsored environmental monitoring and measurement efforts. This policy requires every measurement project to have a written and approved quality assurance plan and applies to all EPA program offices, regional offices, laboratories, contractors and grantees.

As in the case of mandatory participation, industry officials who test radon also believe quality assurance should be required as a condition for participating in the RMP program. Thirty-one of the 32 officials GAO interviewed said some quality assurance needs to be required as a condition for participating in the RMP program.

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## States Monitoring of Radon Measurement Companies Is Limited and Inconsistent

It could take years for states to develop programs that help to ensure the reliability, consistency, and quality of radon test data that companies provide to homeowners, according to GAO's nationwide survey of radon coordinators in 50 states and the District of Columbia. In some states, there are no plans to develop such programs. Only nine states have programs that either certify, license, or accredit radon measurement companies, and only five of those have mandatory programs. An additional 20 states may establish a program in the future, while the remaining 22 state coordinators said their states probably would not have a program. Two reasons given for not having a program were lack of funding and lack of legislative authority. In addition, only five of the nine states that have implemented programs have quality assurance requirements for firms measuring radon.

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# Executive Summary

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## Purpose

The Environmental Protection Agency (EPA) estimates that 20,000 lung cancer deaths each year may be attributed to indoor radon. In 1986, to help ensure that homeowners obtain accurate radon measurements, EPA published procedures for taking radon measurements and established the voluntary Radon Measurement Proficiency (RMP) program.

However, in October 1989, GAO reported to the Chairman, House Committee on Science, Space, and Technology that uncertainties exist in the radon measurements homeowners use to make health-based decisions (GAO/RCED-90-25). Because of GAO's findings, the Chairman asked GAO to conduct a follow-up review to determine (1) changes that can be made in the RMP program to better assure homeowners that radon measurements are accurate, and (2) the status of state radon programs that certify, license, or accredit radon measurement companies.

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## Background

Radon, a colorless, odorless gas formed by the decay of radium and uranium, occurs naturally almost everywhere, including in the average U.S. home. Several different devices can be used to measure radon in the home over extended periods of time. Some of the devices, after being exposed to radon, must be analyzed in laboratories to determine the radon levels. Some more costly devices that require skilled operators, such as the continuous radon monitor, can measure radon and provide more immediate results without laboratory analysis. Companies that provide the laboratory analysis or the more costly instruments and a skilled operator are tested through the RMP program.

In establishing the RMP program EPA envisioned that it would be responsible for testing the proficiency of firms, whose participation in the program would be voluntary, and would encourage firms to adopt procedures that would ensure the quality of measurement results. The states, according to EPA officials, would determine any additional regulation of firms, such as mandatory participation in the RMP program and mandatory adoption of quality assurance programs.

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## Results in Brief

Homeowners do not have adequate assurance that companies have demonstrated a minimum level of competency in measuring radon and that the test results provided to them have some degree of accuracy. This is because the voluntary nature of the RMP program allows firms to market devices that have not been tested or that failed the test. In addition, the RMP program does not require measurement companies to implement quality assurance programs. GAO believes that two changes in

