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Radon Testing in Federal Buildings
Needs Improvement and HUD's Radon
Policy Needs Strengthening

Statement of
Richard L. Hembra, Director
Environmental Protection Issues
Resources, Community, and Economic
Development Division

Before the
Subcommittee on Superfund, Ocean and Water
Protection
Committee on Environment and Public Works
United States Senate



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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to testify on federal efforts to reduce the hazard of radon gas. My testimony today addresses two federal activities in particular: agencies' efforts to test their buildings for radon contamination and the Department of Housing and Urban Development's (HUD) radon policy for HUD-assisted housing. As agreed with your office, this statement closes out our work and completes our reporting on these issues.

As you are aware, radon is a naturally occurring, colorless, odorless gas that has been shown to cause lung cancer. The Environmental Protection Agency (EPA) estimates that around 20,000 lung cancer deaths each year can be attributed to indoor radon. For these reasons, EPA and the Public Health Service have advised residents to test their homes for radon and take action when elevated levels are found.

In addition to this outreach effort, federal agencies were required to test federally owned buildings in high risk areas for radon by Public Law 100-551--commonly referred to as the Indoor Radon Abatement Act of 1988. To assist agencies in this effort, the legislation called for EPA to identify high risk areas, approve each agency's study design, provide technical assistance, and report the results to the Congress. In addition, the Stewart B. McKinney Homeless Assistance Amendments Act of 1988 required HUD to develop and recommend to the Congress a policy that would protect residents of certain federally assisted housing from radon.

In summary, we found that over half of the federal agencies implementing testing programs for radon have completed their initial tests. Several agencies have found elevated radon levels and are following up with additional tests and in some cases taking mitigation action to protect federal workers. Later this year EPA

plans to report to the Congress on the progress federal agencies are making.

Despite this progress, we are concerned about a portion of the federal agency tests because:

- At least one agency used radon detectors and measurement firms that were not approved by EPA as meeting minimum proficiency standards.
- A significant number of radon detectors were lost at some agencies, and thus, retesting may be required.
- Some agencies did not use or fully implement EPA's recommended quality assurance procedures.
- Delays in retrieving detectors at one agency raise questions about the accuracy of its tests.

Even though EPA has been recommending that each agency follow test plans and use quality assurance procedures, EPA was not given the role of overseeing the quality of federal agency testing, for which each agency is now responsible. Additional attention is needed to resolve questions about the quality assurance employed by the agencies and problems that they have encountered as testing proceeds.

This brings us to our second area of concern--HUD's recommended radon policy. In our view, HUD's recommended policy does not meet the basic requirements of the McKinney amendments that call for a HUD policy that includes testing and mitigation programs to protect the residents of HUD-assisted housing. Instead of the testing and mitigation programs specified in the amendments, HUD is recommending a 4-year research program as a prelude to determining an appropriate policy. We believe that

HUD's policy falls short of recognizing that EPA has, in fact, already established testing and mitigation procedures that are being applied in a variety of circumstances by the public and the federal government.

RADON TESTING IN FEDERAL BUILDINGS

Section 309 of the Indoor Radon Abatement Act required federal agencies to study radon contamination in federally owned buildings and addressed the quality of the testing that was to be done. For example, the act called for EPA to provide technical guidance and to approve agencies' study designs. In March 1989 EPA notified federal agencies about the requirement for radon testing. Since it did not believe high risk radon areas could be identified with accuracy, EPA recommended that agencies test all federally owned buildings. Twenty-three agencies responded that they owned buildings and are now implementing programs. Some of these agencies included leased buildings in their testing programs.

EPA's guidance called for (1) the testing of occupied ground floor rooms, (2) the use of EPA-approved radon measurement firms and radon detectors, (3) timely shipment of detectors after use, and (4) quality assurance programs at both the laboratory supplying and analyzing the detectors and the user implementing the testing to ensure the accuracy of the radon testing. As part of the quality assurance, EPA recommended that each agency usually obtain duplicate measurements for 10 percent of the number of detectors placed; use blank detectors equal to 5 percent of the detectors placed; and use a small number of spiked detectors. Blank detectors are control devices used to monitor shipping and storage problems that could cause measurement error, and spiked detectors are devices exposed to known radon levels to determine the accuracy of the entire measurement system. (See App. I.)

Federal agencies were to report their results to EPA by June 1990, and EPA was to summarize the federal results by October 1990. As of April 1991, 22 agencies had reported to EPA, including 10 that had submitted partial results and were continuing to test buildings.¹ EPA is currently planning to report to the Congress within 4 months.

CERTAIN AGENCIES'
TESTS MAY NOT BE RELIABLE

We reviewed the quality of testing efforts at several agencies including the General Services Administration (GSA); the Departments of Army, Energy, and Navy; and selected agencies within the Departments of Agriculture, Interior, and Transportation. Using EPA's testing guidance as a basis for our review, we found instances when agencies did not use EPA-approved radon detectors, had significant detector losses, and did not follow EPA's recommended testing procedures. (Table II.1 provides information on the radon testing programs of those agencies included in our review.)

Use of Radon Detectors
Not Approved by EPA

Federal agencies were advised by EPA to use radon detectors and measurement firms approved through EPA's Radon Measurement Proficiency Program. This program assesses the proficiency of radon measurement devices and the capabilities of the companies that analyze the devices after they have been exposed to radon.

We found that GSA required its regions to use companies and detectors approved by EPA, but both GSA regions we contacted

¹The Department of Veterans Affairs has not submitted any results to EPA.

inadvertently used detectors that had not been approved. In one instance the company supplying the detectors had been approved by EPA, but changed the detector design shortly after approval and provided the redesigned detectors to both regions. When this redesigned detector was later tested by EPA, it failed.² The second GSA region we contacted purchased detectors from an EPA-approved company, however, the company provided detectors that were not approved.

We previously addressed the proficiency of radon measurement companies in testimony before the House Subcommittee on Natural Resources, Agriculture Research, and Environment, Committee on Science, Space and Technology.³ Specifically, we recommended that the Congress provide EPA with the authority to require radon measurement companies to participate in EPA's Radon Measurement Proficiency Program and meet the program's requirements before marketing their devices. Without this action, the public would continue to purchase detectors from companies that have not demonstrated the ability to meet minimum measurement standards. The Subcommittee is currently considering Senate bill 791 that would implement our recommendation. Passage of legislation such as this is a needed first step for addressing this problem.

Lost Radon Detectors May Affect Reliability
of Results and Require Retesting

Lost radon detectors may also affect the results of the federal testing programs. For example, in one GSA region that tested 132 federally owned buildings, 48 buildings--or 36 percent of the buildings tested--experienced detector losses ranging from

²We were also informed that the Coast Guard used this same company in some of its testing.

³Improvements Needed in the Environmental Protection Agency's Testing Programs for Radon Measurement Companies (GAO/T-RCED-90-54, May 16, 1990).

10 percent of all detectors placed in some buildings to over 50 percent in other buildings. The second GSA region we contacted did not have records adequate for determining the total number of lost detectors or the buildings in which detectors were lost.

Lost detectors may also be a problem in the Army's program. As of April 10, 1991, about 278,000 detectors had been shipped to Army installations, according to the measurement firm's records. However, only 131,000, or about 47 percent of those shipped, have been returned to the measurement firm for analysis. While most of the detectors were to be deployed for only 90 days, our analysis shows that 80,889, or 55 percent of those not returned, are over 2 years old. Another 42,793, or 29 percent of the detectors not returned, are over 1 year old but less than 2 years old; the remaining detectors were shipped less than 1 year ago.

In December 1990 the Army requested reports on the status of purchased detectors. According to these reports, as of February 1991, about 268,000 detectors had been purchased. Of these, 119,000 had been returned to the measurement firm; 52,000 were deployed but had not been retrieved; 51,000 were waiting to be deployed; and 13,000 were listed as lost. Finally, 33,000 were not accounted for.

A significant number of lost detectors may affect the overall reliability of an agency's radon study. The possibility of lost detectors was not anticipated and, as a result, was not covered by EPA's guidance or the two agencies' testing procedures. At this time, the agencies do not have procedures calling for retesting as a result of lost detectors.

Some Agencies Did Not Follow EPA's
Testing Procedures

As I mentioned earlier, EPA recommended specific testing procedures, including the use of blanks, duplicates, and spiked detectors to verify the accuracy of the testing firms' measurement systems. However, not all agencies followed the procedures as the examples of GSA, Agriculture and Army demonstrate. (See table II.2 for information on the quality assurance procedures use by the agencies we reviewed.)

General Services Administration

Although GSA's policy did not require it, the two regional office programs we reviewed attempted to implement some quality assurance procedures. In doing so, however, these regions did not follow EPA's guidance. For example, at one of the regions, only 6 of 13,377 detectors deployed were duplicates. This number is well below EPA's recommendation of 10 percent. While this region did use spiked detectors, half were never read by the testing firm's laboratory. Also, this region did not handle the blank detectors in accordance with EPA's procedures, thus limiting their usefulness. The second region did not use spiked samples and did not handle blanks and duplicates in accordance with EPA's procedures.

Department of Agriculture

The Department of Agriculture only recently approved its regulation for radon testing.⁴ In terms of quality assurance the Department plans to rely on the measurement firms it hires to do the testing. EPA officials told us this approach is acceptable if

⁴ Forest Service is the only agency within the Department of Agriculture that has tested its buildings for radon. It implemented its radon testing program without Department guidance.

(1) the firms have independent quality assurance departments and
(2) Agriculture arranges to verify that adequate quality assurance procedures are used. However, an Agriculture official told us that the agency had no plans to verify the measurement firms' use of the quality assurance procedures.

We also identified weaknesses in procedures used by the Forest Service, which performed testing prior to the 1988 legislation. The Forest Service policy has been to rely on EPA-approved measurement firms for quality assurance. Because agency officials thought that reliance on EPA-approved firms was sufficient, the Forest Service did not require the use of blanks, duplicates, or spikes in its testing program. We confirmed that at one region, blanks, duplicates, and spiked detectors were not used. At the second region we contacted, an EPA radiation laboratory was used, and it supplied the detectors including these control devices.

Department of the Army

The Department of the Army began its testing in 1989. Its quality assurance plan calls for using 2 percent blank detectors, 10 percent duplicate detectors, and 3 percent spiked detectors. In addition, the Army requires that the difference between the measurement firm's readings of the spiked detectors and the known exposure levels not exceed 15 percent. The Army's analysis of the spiked and blank detectors as well as problems in handling its detectors, raises significant questions about the reliability of its measurement results. For example:

-- The Army's quality assurance contractor's analysis shows that the laboratory's readings of 2,419 spiked detectors in 1989 met the 15-percent criterion only 58 percent of the time. Likewise, the laboratory's readings of 2,280 spiked

detectors in 1990 met the criterion only 59 percent of the time.

- The contractor's analysis of the blank detectors indicated that high background radon levels were occurring in 46 percent of blanks. High background levels may mean the measurement results are overstated.

On this latter point, EPA's measurement protocol outlining procedures for handling the type of detectors used by the Army states that the detectors should be shipped as soon as possible after retrieval.⁵ This is to ensure that the detectors do not accumulate additional levels of radon while awaiting shipment. Officials of the measurement firm supplying the Army's detectors told us they want the detectors returned to the measurement laboratory within 30 days of their retrieval.

Generally, the Army's detectors are not being returned within 30 days. For example, the measurement firm's analysis of the 121,000 detectors shows that approximately 39,200, or only 33 percent, were returned to the laboratory within 30 days of the retrieval date. According to the firm's quality control officer, the remaining 81,800 detectors' measurements may have been compromised because the detectors may have been accumulating additional radon while awaiting shipment. This situation can result in the measurements being overstated.

To date, the Army, its quality assurance contractor, and the measurement firm have not been able to agree on the reason for the differences between the spiked detector's exposure levels and the measurement firms' laboratory readings, or for the high readings on the blanks. The Army and its quality assurance contractor are questioning the measurement firms' laboratory procedures while

⁵Indoor Radon and Radon Decay Product Measurement Protocols, Feb. 1989.

officials at the measurement firm believe the problems are due primarily to the way detectors, including spikes, were handled.

EPA Cannot Ensure
Report Data is Reliable

EPA does not have information on the quality assurance procedures followed by the agencies or on the other problems we identified in the testing programs. Therefore, as EPA prepares to report to the Congress on federal agencies' testing, it is not in a position to determine the quality or reliability of the agency test data it is receiving. EPA views its role as limited to reporting the data provided by other agencies. Nevertheless, EPA officials stated that if quality assurance procedures have not been followed, agencies cannot be assured about the accuracy of results and do not have a good basis for decision-making.

Conclusions and Recommendations

We believe that the purpose of section 309 of the Indoor Radon Abatement Act, which was to identify radon contamination in federally owned buildings, may not be fully achieved because some federal agencies have not followed EPA's testing procedures. In addition, detector losses in certain cases may be significant enough to affect the reliability of the test data.

The quality of the testing process is important because these tests determine when action is needed to protect federal employees. Without reliable data, the agencies may not take mitigating action where there are elevated levels of radon, and employees may be exposed to unnecessary risk. Moreover, it is important to avoid unnecessary cost that may be incurred for retesting or mitigation. Although EPA views its role as limited, we believe that the agency is the recognized federal expert on radon. Accordingly, it needs to play a more active role in working with other federal agencies

to determine the reliability of the test results, and to address implementation problems in the federal buildings radon testing programs.

Therefore, we are recommending that EPA address the quality of the federal agencies' radon testing in its report to the Congress. In addition, we recommend that EPA work with all federal agencies to assess the adequacy of their testing procedures and advise the agencies on the aspects of their testing programs that need to be improved. In addition, in keeping with the legislative requirement to provide technical guidance to the agencies, we recommend that EPA develop guidance to resolve the issue of lost detectors.

HUD'S POLICY DOES NOT MEET
LEGISLATIVE REQUIREMENTS

Mr. Chairman, this brings us to the second issue of our testimony today, HUD's policy to protect residents of certain federally assisted housing from radon.

There are about 3 million housing units covered by the radon provisions of the McKinney amendments. These units include single family houses, rowhouses, two- and three-story walk-up apartment buildings, and high-rise apartment buildings.⁶ While HUD decides how to address radon, some residents of these housing units may continue to be exposed to hazardous radon levels.

⁶ The amendments cover multifamily housing owned by HUD, public housing and Indian housing assisted under the U.S. Housing Act of 1937, housing receiving project-based assistance under Section 8 of the Housing Act of 1937, housing assisted under Section 236 of the National Housing Act, and housing assisted under Section 221(d) (3) of the National Housing Act. HUD could not provide a breakdown on the number of units under the different housing types, but did state there are about 68,000 single family Indian housing units.

HUD was directed by the McKinney amendments to develop and recommend to the Congress an effective policy to protect residents of assisted housing from hazardous levels of radon. HUD was to specify appropriate education, research, testing, and mitigation programs in its policy.

HUD'S Policy

HUD's April 1991 report with recommendations to the Congress concludes that a 4-year research program is needed before a cost effective policy for testing and mitigation can be designed because there are significant gaps in the information on radon. HUD states that most information on radon--its incidence, how to test for it, and how to mitigate it--pertains to single family detached, owner occupied homes. HUD states that the lack of information on testing and mitigating radon in multifamily housing, particularly in rowhouses and high-rise buildings, precludes it from giving advice to the housing community at this time.

To address its concerns, HUD recommends a two-phased research effort. The first phase is an ongoing radon testing study in four multistory buildings in the Washington, D.C. area. This study, done in cooperation with EPA, is an attempt to determine specifically how and why radon levels vary among floors and, in particular, whether radon levels are higher on upper level floors. Based on this study, a second phase would be designed to develop testing guidance and cost estimates for testing multifamily buildings. In both efforts, HUD plans to study radon mitigation techniques. HUD would also address its concern that some landlords may be uncooperative until their responsibility for protecting residents from radon exposure is defined.

EPA and HUD Differ
On Availability of Testing
and Mitigation Procedures

We found that the views of EPA radon program officials contrast with the views of HUD officials. EPA officials said that existing testing guidance is applicable to HUD's single-family structures, rowhouses, and multistory apartment buildings with only a few floors.⁷ EPA also said that these guidelines, along with guidelines on schools and federal buildings, could be used to develop a testing protocol for HUD's high-rise buildings that would provide reasonable assurance of identifying high radon levels. EPA suggested that, in the interim, HUD's concern about testing in high-rise buildings could be addressed by placing detectors on the upper floors of these buildings.

EPA officials also said that mitigation actions could proceed in most instances and that concepts for mitigating radon in large buildings are essentially the same as those used in single-family structures. These techniques would also apply to multistory family housing--according to EPA officials and two radon mitigation contractors. For these officials the key issue in mitigation is identifying the most appropriate technique for each building.

Even though EPA experts are confident that appropriate testing and mitigation methods are available for many multifamily buildings, we noted that, EPA's guidance to date was developed primarily for testing and mitigation in single family homes. Although the guidance does have one example of appropriate detector placement in a multistory apartment, it does not specifically address rowhouses or high-rise buildings.

⁷Interim Protocols for Screening and Followup Radon and Radon Decay Product Measurements, February 1987. These protocols include an example of where to place radon testing devices in multistory apartment buildings.

Conclusions and Recommendations

The McKinney amendments require that HUD's policy specify programs for testing and mitigating radon in federally assisted housing. HUD believes that it cannot implement such programs until additional research is completed, primarily because of potential problems in testing and mitigation in high-rise buildings. HUD's inventory of housing covered by the McKinney amendments, however, includes single family homes, rowhouses, and two- and three-story apartment buildings which EPA states can be tested and mitigated based on existing guidance. EPA officials are confident that testing and mitigation can proceed in this multifamily housing now. They recognize, however, that existing guidance could be better tailored to the different types of buildings in this housing.

Because radon is recognized as presenting a significant health risk and because EPA has stated that testing and mitigation can begin now, we believe that HUD needs to move forward to develop a policy that addresses testing and mitigation for the housing covered by the McKinney amendments. To do so, EPA and HUD will need to develop a cooperative approach.

Accordingly, we recommend that HUD redesign its policy to provide for testing and mitigation programs for HUD-assisted housing as required by the McKinney amendments. Initially, the programs could be directed toward those buildings with only a few floors since EPA believes testing and mitigating procedures and techniques are well understood for such buildings. To assist HUD in this effort, we also recommend that EPA begin immediately to develop specific guidance outlining testing and mitigation procedures for the multifamily buildings in HUD's inventory. Finally, upon completion of the ongoing HUD/EPA research project that addresses radon distribution in four high-rise buildings, we recommend that HUD and EPA jointly assess the need for additional

research and the need to revise the guidance for testing and mitigating in multifamily high-rise buildings in particular.

Mr. Chairman, this concludes my remarks. I would be pleased to answer any questions.

INFORMATION ON EPA'S QUALITY ASSURANCE PROCEDURES

According to EPA's 1989 Indoor Radon and Radon Decay Product Measurement Protocols, "The objective of quality assurance is to ensure that data are scientifically sound and of known precision and accuracy." Elaborating, the document says that "commercial users of radon and radon decay product measurement devices should establish and maintain quality assurance programs. These programs should include written procedures for attaining quality assurance objectives and a system for recording and monitoring the results of the quality assurance measurements." EPA recommends that these quality assurance programs include the use of duplicate, blank, and spiked detectors.

Duplicate detectors are placed side-by-side to determine the quality and precision of the measurement results. Commercial users should usually provide duplicates for 10 percent of their samples. The samples selected for duplication should be systematically distributed throughout the entire population of samples.

Blank detectors are control devices used to monitor whether there is a problem during the manufacture, shipping, storage or processing of the detectors that would cause error in the measurements. Blanks also determine the background exposure of the instruments. Commercial users should provide blanks equal to approximately 5 percent of the detectors that are deployed. These detectors should be set aside, kept sealed in a low radon environment, labeled in the same manner as the field samples to preclude special processing, and returned to the analysis laboratory along with the regular samples.

Spiked detectors are given known exposures in radon calibration chambers to determine the accuracy of the entire measurement system. They are labeled and submitted to the

laboratory in the same manner as ordinary samples to preclude special processing. Commercial users should arrange for the introduction of spiked samples in their routine shipments and monitor the results in their quality assurance programs. The EPA protocols did not specify a number or percentage of spiked samples, as they did for duplicates and blanks.

Table II.1 Summary Information on Agency Testing Programs^a

<u>Department^b or agency</u>	<u>Buildings tested Number</u>	<u>Testing status</u>	<u>Positive results^c</u>	<u>Followup testing</u>	<u>Mitigation initiated</u>
Energy	3,100	Complete	126	Planned	Planned
GSA					
NCR	396	Complete	37	Yes	No ^d
Region 7	1,453	Complete	286	Yes	Yes
Interior					
BIA	e	e	e	e	e
NPS	3,519	Ongoing	371	Yes	Yes
FWS	371	Ongoing	55	Yes	Yes
Transportation					
FAA	f	Initiated	f	No	No
USCG	355	Ongoing	60	Yes	yes
Agriculture					
FS Region 2	486	Complete	147	Yes	Yes
FS Region 8	g	Complete	48	Yes	Yes
Army	g	Ongoing	786	Yes	Yes
Navy	g	Ongoing	467	Yes	Yes

^aTest data represent the most current information available from the agencies. GSA data include both owned and leased buildings.

^bSee footnote a, p. 19, for abbreviations used.

^cNumber of tests above 4 picoCuries per liter of air, the level at which EPA advises followup testing and mitigation action to be taken. Results from Army and Navy represent the number of detectors. Results from other agencies represent the number of buildings.

^dTest results provided to building occupants for mitigation action.

^eBIA has not begun a program to test for radon.

^fFAA commenced its initial testing program in late March 1991 and has no results or other data currently available.

^gInformation on buildings not available.

Table II.2. Agency Quality Assurance Procedures

<u>Department^a or agency</u>	<u>Quality assurance procedures used^b</u>			<u>Approved detectors used</u>
	<u>Blanks</u>	<u>Duplicates</u>	<u>Spikes</u>	
Energy	Yes	Yes	Yes	Yes
GSA:				
NCR	Yes	Yes	No	No
Region 7	Yes ^c	Yes ^c	Yes ^c	No
Interior:				
BIA	See footnote ^e , page 18.			
NPS	Yes	Yes	Yes	^d
FWS	Yes ^e	Yes ^e	No	Yes
Transportation:				
FAA	Planned	Planned	Planned	Yes
USCG	Yes	Yes	Yes	No
Agriculture:				
FS Region 2	No	No	No	Yes ^d
FS Region 8	Yes	Yes	Yes	^d
Army	Yes	Yes	Yes	Yes
Navy	Yes	Yes	Yes	Yes

^aAbbreviations used: GSA--General Services Administration; NCR--National Capital Region; BIA--Bureau of Indian Affairs; NPS--National Park Service; FWS--Fish and Wildlife Service; FAA--Federal Aviation Administration; USCG--US Coast Guard; FS--Forest Service.

^bThis table provides agencies' perspectives on the quality assurance procedures each used in radon testing. However, as our testimony indicates, we found that there are problems with the agencies' implementation of quality assurance procedures.

^cBlanks, duplicates, and spikes were not used in accordance with EPA procedures.

^dEPA provided the detectors for these agencies.

^eFWS, although it used blank and duplicate detectors, was not able to determine the number deployed in testing.