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Radon: Pinpointing a Mystery

Tom Kelly, The Mercury

John Strickler, The Mercury

Top: The home of Stanley Watras and his family in Boyertown, PA. Discovery of high radon levels in this home has activated a national examination of the radon problem. Bottom: Mr. and Mrs. Stanley Watras attend a press conference in Pottstown, PA, in April 1985. Philadelphia Electric Co. and the Pennsylvania Department of Environmental Resources announced at the conference that they would cooperate to radon-proof the Watras home.

Radon: Pinpointing a Mystery

All pollution isn't man-made. EPA's experience with the colorless, odorless gas, radon, demonstrates that fact. This issue of *EPA Journal* includes articles on the radon situation.

The magazine leads off its report with a brief explanation of the radon problem. The Agency's Deputy Administrator, A. James Barnes, discusses strategies to deal with this unusual, nonregulatory challenge. The specifics of EPA's Radon Action Program are spelled out by Richard J. Guimond, director of the Agency's efforts to deal with radon.

Pennsylvania's 18-month battle against a radon threat is chronicled by Nicholas DeBenedictis, Secretary of the state's Department of Environmental Resources. The story of how one television series focused attention on the radon problem is related by Roberta Baskin, a reporter for WJLA-TV in Washington, DC.

The personal experience of an EPA Region 3 official working directly with people who have high radon levels in their homes is described. Excerpts from EPA guidance to homeowners about radon are featured.

In a related story, Congresswoman Claudine Schneider (R-RI) argues that indoor air pollution is putting an increasing burden on the modern home.

Other stories discuss EPA's role in answering questions that emerged following the accident at the Chernobyl nuclear power plant, and asbestos in the home.

The issue concludes with two features—Update and Appointments/Awards. □

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EPA is charged by Congress to protect the nation's land, air, and water systems. Under a mandate of national environmental laws, the agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

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Front Cover: Homes on an American landscape. Discovery of high radon levels in some homes has been a surprise. Photo by Skip Brown for Folio. Inc.

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The Radon Problem: An Overview

EPA has traditionally been concerned with man-made pollutants—smog, toxic chemicals, misapplied pesticides, contaminated water, and abandoned hazardous waste dumps. Now it seems we have still another problem to worry about, namely, a colorless, odorless, completely imperceptible gas, radon, generated from the natural radioactive decay of radium. Radium can be found in ordinary topsoil all around the country, but, like uranium, its parent element, it also concentrates in granite and black shale.

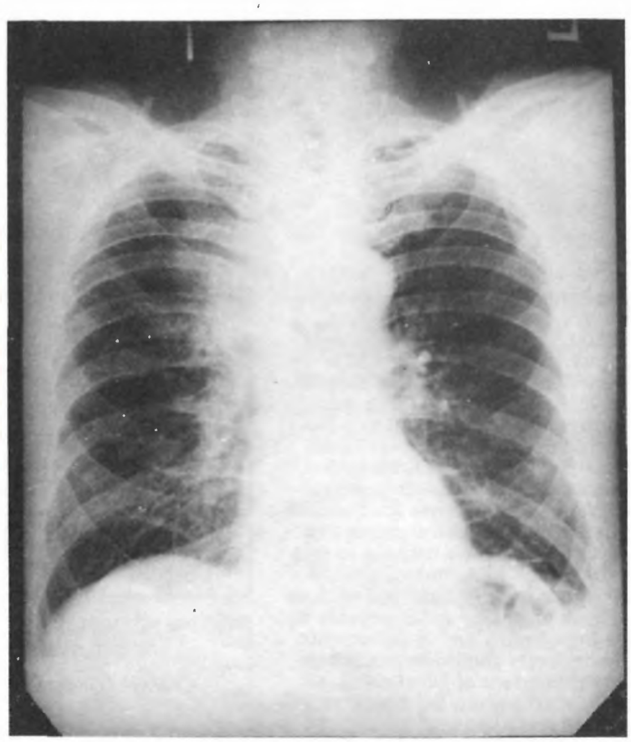
When radon gas is released it percolates up through the earth into the atmosphere, where it is thought to dissipate innocuously. However, it can also find its way into and concentrate in dwelling places through cracks in foundations, wells, drainpipes, and cinderblock walls. As radon decays, radioactive byproducts are formed and attach themselves electrostatically to dust particles in the air. These particles emit ionizing energy that can damage lung tissue and produce cancer. The problem is often less severe in schools and commercial buildings, which are usually designed for high rates of exchange between inside and outside air.

No one knows exactly how many homes in America may have seriously elevated levels of indoor radon. The Argonne National Laboratory thinks 5-10 percent of homes are contaminated. EPA believes that from one to five million private residences may be impacted. The reason for the wide variance in estimates is that the danger cannot simply be calculated by looking for uranium or radium-bearing rocks and then assuming that everyone living on the surface above them is at risk. As we have seen in eastern Pennsylvania, one house in a given neighborhood may be heavily contaminated because it sits on porous soil, while another two doors away may lie well within the acceptable range of risk for an entire lifetime of exposure because it rests on a bed of clay. But many other variables may also account for these differences. Ironically, energy conservation attempts, such as caulking and insulating, may contribute somewhat to the problem by slowing air exchange rates.

It is not clear as yet how many additional cases of cancer may be attributed to radon. Estimates have run from 5,000 per year to as high as 30,000. Most experts say that radon is a leading or even the leading cause of lung cancer among nonsmokers. EPA plans to conduct a survey to determine the true extent of the risk. If we can predict which locations are at greatest hazard, then the public can be warned away from those sites, or houses can be built with air control systems to ensure that radon does not accumulate to intolerable levels. Such measures should be inexpensive if incorporated into a home while it is under construction, but retroactive measures can be costly.

This issue of the Journal describes the federal role in addressing the radon challenge, includes an article from a state with radon problems, reports on a media experience in making the radon problem understandable to the public, features an expert's front line experience in dealing with radon, and provides tips to homeowners to help them understand radon and what they can do about it.

EPA is working vigorously to put an effective radon program in place. Such a program cannot be created overnight, but with an appropriate investment of time and management effort, the Agency expects to make substantial progress over the coming months. □



X-ray showing diseased tissue due to cancer of the lung. Next to smoking, radon exposure may be one of the leading contributors to lung cancer in the U.S.

American Cancer Society

A Nonregulatory Challenge

by A. James Barnes

National Association of Home Builders

A new home under construction. Building techniques now being developed may minimize indoor radon levels in the future.

When Stanley Watras of Boyertown, PA, tripped the radiation monitor going *into* work at a nuclear power plant in 1984, he did more than set off lights and horns there. He also triggered alarm within the scientific and regulatory community.

Investigators discovered that Watras' home was being contaminated by radioactivity from natural, radon-bearing rock formations known as the Reading Prong. The radon levels were so high that Watras was clearly safer at work in a nuclear power plant than at home asleep in his own bed.

Radon is not a new problem. Early studies showed that radon could cause lung cancer and other health problems in miners, and it was also known that private homes could be contaminated in certain instances. For example, the use of byproducts from Western uranium and phosphate mining in construction often resulted in radon contamination in private houses.

But until Watras' experience, we had no idea that radon posed a threat to the population at large. Further studies now show that radon contamination may be a problem in many parts of the country.

Health experts estimate that radon could contribute to or cause anywhere from 5,000 to 20,000 cases of lung cancer every year. That's around 16 percent of all known lung cancers in the United States. After smoking, in fact, radon exposure may be one of the leading contributors to lung cancer. Clearly, indoor radon has the potential for being an enormous environmental health problem, and one that would require a unique approach.

Generally, EPA addresses new environmental problems either by issuing regulations or by helping states meet regulatory responsibilities. The indoor radon problem, however, does not lend itself to a regulatory approach.

(Barnes is the Deputy Administrator of EPA.)

First of all, radon is a naturally occurring substance. It unmistakably poses a risk, but a blameless risk. There is no one at whom we can point an accusatory finger and say, "You did this, now you fix it."

Another feature inhibiting a regulatory approach is the diversity of the radon problem. Radon levels vary from region to region, even from home to home. They depend on a building's location, style of construction, and air-tightness, as well as the amount of radon beneath it, and numerous other factors. The Watras family, for example, was exposed to radiation levels equal to about 200,000 chest X-rays a year, while radon levels in the house right next door were normal. By contrast, outdoor air pollution is shared evenly by everyone in a particular area.

The situation poses an exceptional public health issue. We now know that radon represents one of the more serious health threats facing the American public today. And we are convinced that EPA has a role to play—but we don't see it as a regulatory one. Instead, we've worked out a unique partnership with the state and local governments—unique in the sense that we are not merely cooperating, consulting, or even collaborating with the other governments. Rather, we are working in a *true* partnership with them, where they perform certain functions and we perform others. We have several levels of government working hand in hand to jointly address a problem.

We believe EPA's knowledge and specialized abilities can complement local efforts. For instance, EPA has provided survey equipment and personnel to help take measurements in the Reading Prong area. But the states retain actual responsibility for the surveys and for follow-up. We are also training state and federal personnel to diagnose and recommend remedies. But, other than for experimental mitigation projects, the federal government will not do the actual work.

Several other agencies, including the Department of Energy, the Centers for Disease Control, the U.S. Geological Survey, and the Department of Housing and Urban Development, have capabilities and expertise to contribute, too. We are working closely with them to build a comprehensive federal approach.

But while EPA will help in assessing radon hazards, demonstrating remedial techniques, and coordinating abatement efforts, perhaps our most important challenge is appropriately communicating radon risks and what can be done about them.

Our overall goal is to alleviate the potential threat that radon poses to millions of Americans. Since we're taking a nonregulatory approach to that goal, we must depend on the public to act on its own behalf. But first it needs information. The public has to know there is a threat, how large that threat may be, and how that threat can be lessened.

We at the Environmental Protection Agency must help communicate that information as accurately, honestly, and understandably as possible. We must let people know what risk radon poses to them and what they can do about it. Then we must leave the decision up to them.

It's a fine line we have to tread. On one hand, we don't want to alarm people unduly or produce stress and anxiety that could in itself be damaging to their health. On the other hand, we do believe radon is a significant hazard to public health.

If we do our job well, people will have enough information to take the vital first step of having their homes tested, where there's reason to suspect radon problems. Our information will also help them judge the risks and decide for themselves what they will do to lessen those risks. We're not going to pay for the work, but we will help inform people what options they have.

In a sense, our entire radon strategy is a means toward this end.

We're working on ways of standardizing measurement procedures and of providing quality assurance programs, so that we all speak the same language, so a reading taken in New Jersey means the same thing in California. We're working on surveys and epidemiological studies to tell us what and how much of a hazard radon actually poses to human health. And our geological studies help us pinpoint the high-risk areas of the country.

We must let people know what risk radon poses to them and what they can do about it.

But we don't feel it's enough to just point out a danger; we want to offer some solutions. We want to let people know that there are steps they can take to lessen indoor radon concentrations and what those steps are. That's where the second aspect of our approach comes in. We are conducting a program in Boyertown, PA, Clinton, NJ, and other areas to demonstrate ways of reducing radon levels in houses. The experience we gain from this program can be applied throughout the country. We are also working with the states and the housing industry to develop techniques of new home construction that might minimize radon levels in the future.

Finally, we are pursuing what we call "Capabilities Development." As the name implies, this is an effort to help local governments and industry groups develop the expertise to handle the problem themselves.

Together with some of our regional offices and the states, we are designing a program to train federal and state employees to diagnose radon problems and give homeowners proper information on remedial actions. We're also working with those who manufacture radon measurement devices, urging them to enter the residential market, and with those who make heat exchangers and air cleaners to encourage them to test their products properly, so that homeowners can select devices that are effective in reducing health risks.

In a nutshell, we are all learning what we can about radon and are jointly taking steps to make sure that knowledge is presented to the public. We'll do that with brochures, public service announcements on radio and TV, and with a special videotape made available for community groups and other interested parties.

We are confident that the extraordinary state/federal partnership we've formed will enable us to effectively communicate the danger of indoor radon to the public. We're also confident that, armed with accurate, timely, and appropriate information, people will make informed decisions. □

Indoor Radon: The Federal Approach

by Richard J. Guimond

In September 1985, EPA Administrator Lee M. Thomas created a Radon Action Program to assist the states in dealing with radon problems in homes. Activities included in the EPA program can be grouped into four general categories:

Problem Assessment: EPA plans to conduct a national survey to evaluate the distribution of indoor radon levels across the country. In addition, EPA will provide technical assistance to states for surveys designed to identify specific areas that have a potential for significantly elevated levels of radon. To ensure that radon measurements are comparable and accurate, EPA has issued standardized measurement protocols and established a measurement proficiency program open to both governmental and private organizations.

Mitigation and Prevention: In this area, EPA is addressing the need for technology that is effective and inexpensive. The program includes demonstrations and evaluations of techniques to reduce radon levels in existing homes and identification and evaluation of ways to prevent radon problems from occurring in new homes.

Capability Development: The Radon Action Program includes efforts to help states and the private sector develop the technical capabilities needed: number one, to assess radon problems in homes and, number two, to help people reduce high radon levels.

Public Information: EPA is developing materials which provide information and guidance for citizens: to help them understand how to have measurements made, how to evaluate the health risks associated with high radon levels, and how to reduce those levels.

Indoor radon is too broad an issue to be addressed by any one agency. Many state and federal agencies are involved, as is a variety of private sector organizations. EPA recognizes that a coordinated approach to the problem must be taken and has designed the Radon Action Program as a partnership among its regional offices, the states, and the private sector, as well as other federal agencies.

Within the federal government, a number of agencies are participating in joint activities to address radon problems from a variety of perspectives. The primary vehicle to coordinate research efforts among these agencies is the Committee on Indoor Air Quality's Radon Work Group. The members include representatives from the Department of Energy, the Department of Housing and Urban Development, the Centers for Disease Control, the U.S. Geological Survey, the Tennessee Valley Authority, the National Institutes of Health, and the National Bureau of Standards. Participants plan and develop projects, prepare and review public information documents, and are developing a joint research strategy.

Another group which contributes to the federal effort on indoor radon is the Committee for Inter-agency Radiation Research and Policy Coordination. Through this committee, federal agencies are able to maintain a dialogue on overall research needs and long-range policy for radon-related activities.

Only through a cooperative effort involving many agencies working together can the problem of indoor radon be addressed successfully. EPA's Radon Action Program, as well as the activities of other federal agencies, helps to ensure that the radon problem is dealt with in the most thorough and effective way possible. □

(Guimond is the director of EPA's effort to help deal with radon.)

To prevent radon entry, pipe (at top of picture) draws radon-containing soil gas from wall and vents it outdoors by means of an outside fan. Sealing up cracks in wall and top row of blocks enables fan to draw suction. The work in this Boyertown, PA, basement was done as part of an EPA program to demonstrate and evaluate radon reduction techniques.

Richard Prill, Lawrence Berkeley Laboratory

Manning the Radon Front in Pennsylvania

by Nicholas DeBenedictis

Pennsylvania has just taken what is a giant step for the Commonwealth, but a small step for a nation just becoming aware of the danger of indoor radon gas.

After testing over 22,000 homes in the last 18 months for radon and finding nearly 60 percent with high levels, the Commonwealth is now providing $3 million in low-interest loans to help owners rid their homes of natural radioactive radon. The loan program may be just the first hurdle cleared in what is assuredly a long commitment to test and help all Pennsylvanians threatened by the risk of lung cancer from radon, but it is also the culmination of 18 months of discovery, excitement, expansion, exhaustion, and, finally, achievement in fighting a very new and hard-to-believe threat.

Radon is a colorless, odorless, tasteless gas that has been produced from the radioactive decay of trace amounts of uranium since time began. Normally, the radioactive gas dissipates into the atmosphere, where its more dangerous decay products, so-called radon daughters, pose no threat.

In today's well-weatherized homes, however, that normal process is interrupted: radon gets in, but it doesn't get out. The gas and its short-lived decay products build up, creating a greater risk of lung cancer the longer the exposure.

The lack of data on natural indoor radon and its health consequences has led most experts to rely on standards, known as working levels (WL), set for uranium miners. But these standards, which measure the level of activity of radon daughters in a liter of air, are very hard to explain to people whose homes are being endangered by a colorless, odorless, tasteless gas.

How much danger it poses is not yet known, but we in Pennsylvania have by necessity taken 0.02 WL as our action guideline. I say by necessity because we did not choose 0.02 WL after studied consideration, but under an urgent need to take action.

Let me explain. Eighteen months ago, in December 1984, an engineer working on a nuclear power plant under construction near Philadelphia kept setting off portal monitors. He wasn't contaminated by anything at the uncompleted plant, so tests were taken of his home in nearby Berks County.

The result was unheard of—the engineer's home was 13.5 WL, 675 times our soon-to-be-developed action guideline. The week after New Year's, I had to advise Stanley Watras and his wife and two small children to leave their home immediately, minus even their newly opened Christmas presents, which were too contaminated to take with them.

They moved to a motel, and the Department of Environmental Resources moved into the neighborhood. The level of the Watras home was too high to be an anomaly, so we started testing neighbors' homes. Some had radon problems; others had none.

We suspected the problem lay with the Reading Prong, a granite rock formation stretching from eastern Pennsylvania to New England, first noted by the U.S. Departmnt of Energy in its national search for uranium resources in the early 1970s. In fact, the Department of Energy had been funding a survey of the Prong in Pennsylvania over the last few years.

We were confronted by a problem that stretched 45 miles from Reading to the New Jersey border, was six to eight miles wide, and included over 20,000 homes in four counties.

A major radon program was obviously not part of DER's planned initiatives, but we knew we had to react immediately with as many resources as we could muster. We started with the Watras neighbors, then called a public meeting to explain radon and offer free testing. This procedure has been repeated again and again in the last year and a half as we have moved further out into the Prong.

Initially, we had no equipment, no program, nothing except our responsibility to address the problem. EPA's Radiation Laboratory from Montgomery, AL, loaned equipment and crews to help with the testing during those first crucial weeks of 1985. DOE brought in its helicopter to search for radon "hot spots" from the air.

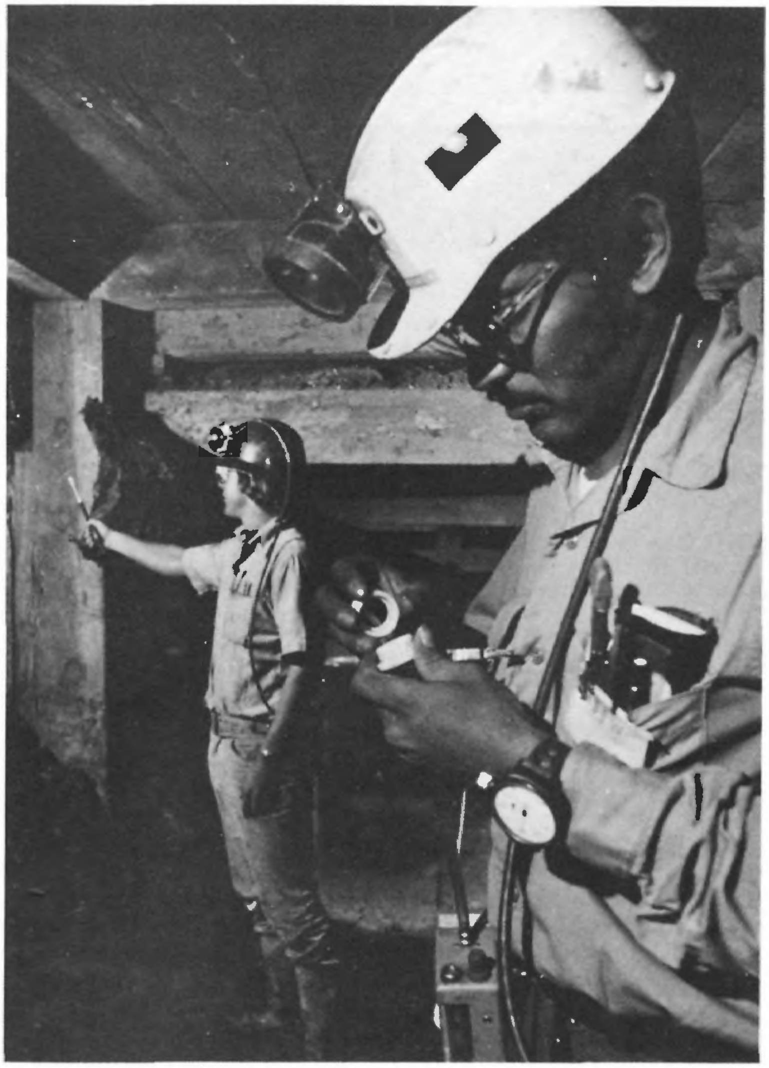
And we tested, day after day, week after week. From the beginning, we have found that a fairly constant percentage of 50 to 60 percent of the homes surveyed have radon above .02 WL.

An office was established in Gilbertsville, near the Watras home, with staff from DER's Bureau of Radiation Protection. Working from the back of a dairy store, their early struggles included just getting telephones, typewriters, and finally a computer to store the test results. Nevertheless, we were soon able to begin returning lives to normal. The Watras family, for example, was able to return home after the Philadelphia Electric Co., in cooperation with DER, had paid for remediation work by ARIX Engineers of Grand Junction, CO. This work, which cost over $32,000, involved installing a radon barrier on exterior basement foundation walls, sealing and ventilating the interior foundation wall, sealing all floor slab openings and joints, and installing a subfloor ventilation system. Radon levels in the Watras home dropped from 13.5 WL to .009 WL.

Although levels rose again last fall, adjustments, including the addition of fans, were able to bring radon in the Watras home below .02 WL.

Bob Lewis, radiation health physicist with the Pennsylvania Department of Environmental Resources, unloads monitoring equipment from a van. A combination mobile field office and lab, the van serves as a sort of "mother ship" for field workers from the state's Bureau of Radiation Protection office in Gilbertsville, PA.

(DeBenedictis is Secretary of the Pennsylvania Department of Environmental Resources.)



American Mining Congress

Workers check radon levels and ventilation in an underground mine. Estimates of the risk of lung cancer due to radon exposure are based on studies of miners.

ARIX also diagnosed 25 other radon-plagued homes for DER, and the results were collected into an advisory booklet on various building types and remedies. Residents, already unnerved by this unexpected threat, were impatient for remedies and for financial help from the government.

Our job was cut out for us when the state legislature approved $1 million to develop a testing program for the entire Prong. We had already spent nearly $1 million in unbudgeted money for testing, but had concentrated in southern Berks County where radon was initially found.

Faced with offering free radon testing to over 40,000 residences in four counties, we sought a new approach. With a press conference by Governor Dick Thornburgh and full-page, repeat advertising in five newspapers and over a dozen radio stations serving the Prong, we offered mail-in radon tests to residents in the four counties. The task was made no easier by a large Hispanic population in the Prong area that required translating all our radon materials into Spanish and hiring a bilingual community relations coordinator.

Over 20,000 testing requests came in, many in the immediate weeks after the Governor's announcement, which had also unveiled a $3 million loan program to help homeowners rid their homes of radon. Whether it was the anonymity of the mail-in testing or the light at the end of the financial tunnel, over 50 percent of all those eligible for the free testing have responded.

Radon has been a most difficult issue with which to deal. At first, Pennsylvania was the only state to know much of anything, and our basic problem was trying to communicate the risks of radon gas without raising undue panic. Now, everybody seems to know about radon and the problem is why don't we, state and federal government, know more.

We welcome this dialogue, this attention, because that's how answers are found. We think Pennsylvania has contributed and will continue to contribute as more is learned about this *national* problem called radon. But ours is not just scientific curiosity; we feel great sympathy for the many citizens whose lives have been disturbed by this unseen threat. We feel great sympathy for the parents who worry that their children may develop lung cancer in 20 years. We feel sympathy for the young homeowners who struggle to meet a mortgage each month for a home that could cost thousands of dollars more to make safe from radon.

We do not feel helpless, however. We have acted, to the extent of our state resources and to the best of our abilities. And even though the battle is just begun, we take a moment to savor conquering that first hurdle. □

Jason Gaertner

Making Sense of Radon for the News

by Roberta Baskin

It's not easy to focus attention on something you can't see or smell, taste or feel, so making sense of radon for television news was a special challenge. In TV, we're at our best when there is something to show. "Covering" an invisible gas defies the imagination.

What eventually captured the media's attention was a dramatic incident. Stanley Watras of Boyertown, PA, kept setting off alarms at the nuclear power plant where he worked. When the experts finally traced the problem to fantastically high levels of radon gas in his home, the media had something tangible—a family of victims living in a radioactive cloud. That revelation led to a flurry of media attention and radon testing in the Reading Prong area, a radon-bearing geological formation that stretches through Pennsylvania. But the issue's coverage was represented as a local problem. In the nation's capital, we could pity those poor families in Boyertown without being touched by the problem directly. We were safe at home in our beds. Or so we thought.

Radiation experts seemed to agree that, as serious as the radon problem is along the Reading Prong, it is not confined to that geographic area. In fact, there seemed to be acknowledgment that, as more homes are tested nationwide, radon at even higher levels would be discovered. It left us wondering what we might find in the Washington, DC area.

Checking with the Department of Energy about that possibility was not encouraging. DOE officials felt radon testing here would be uneventful, certainly not a high priority. But, since there's no way to know without doing the tests, they decided to help us out, providing we followed their guidelines and standards. If it turned out there was no radon hazard in the Washington area, we could at least give people an added measure of peace of mind.

The ground rules DOE set up for us involved coming up with a random sample of some fifty single-family homes with basements. We would test them in the basements and living areas, first in the fall, then following up in the winter when homes are "tightened up." We came up with our volunteers in the District of Columbia, Maryland, and Virginia, and arranged to place carbon cannisters in the homes to take air samples. These were all sent to DOE's Environmental Management Laboratory in New York City for analysis.

It's not easy to focus attention on something you can't see or smell, taste or feel.

The results surprised all of us. In simple terms, the radon levels were about three times higher than the known national average. Nearly half the homes tested were above the Environmental Protection Agency's suggested action level. Although our levels didn't approach the Reading Prong problem, they were definitely cause for concern. A few of the homes had radon levels exceeding the Bureau of Mines safety standard for uranium workers. We had opened a Pandora's Box. The five months of preparation that went into our series of radon reports did not prepare us for the public's reaction.

The station received hundreds of calls from homeowners who wanted to find out how to get their homes radon-tested. But our phones weren't the only ones ringing off the hook. The state health departments in Maryland and Virginia were each getting thousands of calls. Officials complained they couldn't get their coats off, much less handle anything else but radon calls. All state resources for radiation issues were channelled into handling endless radon questions from the public. The EPA got its fair share of the spillover. And one person, WJLA-TV's sports anchor Frank Herzog, got more than his fair share of calls.

Herzog was one of the volunteers in our radon survey. He had given up smoking three years ago, but radon tests in his home revealed he was getting a dose similar to that from smoking a pack and a half of cigarettes a day. It was not cheery news, but he was a good sport about it. He was an even better sport about the calls he started getting at all kinds of hours from people who wanted to know what they should do about radon because they figured he was an expert. Fortunately, he was able to lower his home's radon levels by following some simple recommendations.

As hundreds more homes were tested, we started to get new data. Unlike the volunteers in our radon survey, many of the homeowners were eager to keep the problem quiet. In fact, the majority of callers were far more concerned about their property values than any possible health hazard. They were anxious to find out what they could do about it, and equally anxious that no one else learn of their problem. In many cases, this made it difficult to do follow-up reports. For example, one woman who called was outraged about how high her radon levels were and how she couldn't get anyone to do anything for her. Indeed they were high: 20 times higher than the EPA's

(Roberta Baskin is a reporter for WJLA-TV in Washington, DC.)

WJLA-TV

On the air: TV newswoman Roberta Baskin reports on the results of radon tests in the Washington, DC, metropolitan area.

recommended action level. She was particularly concerned because she lived in a new house and the developer was building hundreds more homes up the street from her. On her first call, she wanted the world to know about the potential hazard. By the second call, she wanted to keep it very, very quiet. She said she'd found someone to do the remedial work on her home, providing she not talk to any journalists. That case was not unique.

Occasionally we heard from families who wanted to share their experiences in the hope others would benefit. In one of those cases, the family was building a bedroom in the basement for their eight year-old son. Radon testing showed a level of radon equal to getting a chest X-ray every passing hour. Although most of the renovation was complete, the parents decided not to move their son downstairs until they found a way to bring down the radon levels. But, as a benefit of the publicity, they were contacted by an engineering company that specializes in radon-proofing homes. The company is doing the work at no charge in the hopes it can publicize its success later on.

In the aftermath of our radon reports, the Maryland and Virginia health departments have put more resources into their radon efforts. In Virginia, the state is now radon-testing about 600 homes to get a better notion of how serious the problm is there. An "800 number" was installed to help answer questions, and a booklet was produced to explain more about radon, along with basic advice about what to do about it. Both Virginia and Maryland joined EPA in encouraging homeowners to get their homes tested. We took a cue from that advice to try and persuade officials to radon-test the White House. The officials we were referred to were delighted to hear from us because they wanted to get their own homes tested. But our calls did lead to dozens of detectors being placed around the White House, all of which turned up low readings, according to a spokesman.

It was rewarding to get people in high places and near places and far away places to become aware of the radon gas problem and how it may affect them directly. The fact that dozens of television, radio, and newspaper reporters contacted us from all around the country is a hopeful sign that the story will continue to unfold everywhere. That's important since there is a temptation to ignore a problem like radon because it's unseen. Another temptation is for homeowners to cover it up. The media really have a responsibility to stop that from happening. The problem won't go away by itself. And the consequences will only grow worse. In fact, hiding the issue only raises the specter of future litigation. The developers, the builders, the home sellers who conceal a radon hazard today are likely to be the subject of tomorrow's stories. There will also be future stories about fly-by-night radon-testing companies . . . the sort preying on old ladies. The mind reels at the entrepreneurial possibilities. Mayonnaise jars could be used to test for radon, and who knows what else. But the more attention radon gets, the more enlightened the public will be, meaning the more responsibly it will be dealt with. An important role for reporters is to keep radon from being relegated to the obscurity of the basement. People need to be reminded that it's there . . . and that they *can* do something about it. □

Beginning with a Phone Call

by Michael J. Chern

Janet Luffy, EPA

"When the lady you're speaking to breaks down crying because she's worried that she and her family may die of lung cancer, you feel like dropping everything else and spending a month helping this one person until her problem is solved," says Bill Belanger, EPA Region 3's radiation expert for the last five years. Belanger is talking about his first-hand experience working directly with people who have high radon levels in their homes.

Until a year and a half ago, Belanger spent much of his time working on emergency drills for nuclear power plants. His only experience with radiation in houses was in a Lansdowne, PA, home which had been used by a university professor in the 1940s to refine radium for use in hospitals. The house is now so contaminated with radioactivity that it was evacuated under the emergency provisions of Superfund and added to the Superfund National Priorities List for remedial cleanup.

Now, with the discovery of high radon levels in the Reading Prong area of Pennsylvania, Belanger spends almost all his time on this problem.

First Word

Belanger's serious involvement with naturally occurring radon began on December 19, 1984, with a phone call from Charles Porter, Director of EPA's Eastern Environmental Radiation Facility in Montgomery, AL.

Belanger remembers that the conversation began with Porter saying, "Bill, you better sit down. There's a house in your region that has 13 working levels (WL)!" ("Working level" is one of the measures used to express radon exposure.)

Belanger replied, "Are you sure you didn't slip the decimal a couple of places?" Until that time, everyone's experience with natural radon had indicated that a high indoor reading was 0.1 WL; Belanger had taken readings of 0.3 WL in the Lansdowne house and had considered that extraordinarily high.

(Chern is a former Public Information Officer for EPA Region 3.)

Porter's 13 WL referred to radon levels found in the home of Stanley Watras of Boyertown, PA. Watras, a construction engineer, had set off radiation monitors while entering the Limerick nuclear power plant where he worked, and the source of the radiation had been identified as his house.

Early Actions

EPA's radiation experts quickly realized that the discovery of radon in the Watras house probably would mean an extensive monitoring program in the Reading Prong. "It would have been too much of a coincidence to expect that the only homeowner with high radon readings was an employee at a nuclear power plant," says Belanger. "If it was a naturally occurring problem, there had to be more houses with it."

One of the first concerns of state and federal officials in the monitoring program was whether to use protective equipment for the monitoring team. Normally, workers who knowingly go into areas with high contaminant levels wear such equipment, and homes with 10 to 20 WL are considered to have very high levels.

"But if you were a homeowner, what would you think if we showed up at your door in gas masks and said we wanted to take radon readings in your home?" asks Belanger. The EPA field staff finally decided to work without protective equipment. They reasoned that, even if they entered a few houses with high radon readings, their length of exposure would be too brief to have a significant health effect.

Working in the Reading Prong

At the request of Pennsylvania environmental officials, Belanger joined the field monitoring effort in April 1985 to take radon measurements in the Reading Prong.

The first step in measuring radon is to take a screening measurement to determine the highest level in the house. EPA recommends that this reading be taken in the basement or the lowest part of the house during the heating season or some other time when the house is closed. If this reading is low, radon can usually be dismissed as a problem.

If a high level is found, however, further measurements are taken in the most frequently occupied parts of the house. Only after these additional readings are completed is it possible to tell the extent of the radon problem.

"But it's up to the homeowner to decide what will be done," says Belanger. "We can make a recommendation as to what level the homeowner should shoot for. We have been recommending the .02 WL, but the homeowner doesn't have to accept that. He may not be willing to spend the amount of money needed to reach that level. Or, perhaps he is not satisfied that .02 WL is safe enough, and he wants to go lower. He may decide he is willing to give up regular use of his basement. All these things are alternatives that only the homeowner can and should decide."

Remediation Research

Helping homeowners decide what to do is another part of EPA's Radon Action Program. The Agency has embarked on an intensive research project in the

Hole in the floor of a house under construction is an entry point for radon. The hole—a result of standard construction practices—will probably be hidden by floor covering when the house is complete. Other common radon entry points are sump pump holes, crawl spaces, and cracks in foundation slabs. "If we can easily find the entry places of radon," says EPA expert Bill Belanger, "the control costs are usually reasonable."

Checking his watch, Bill Belanger times a five-minute indoor air sample for radon testing.

Reading Prong to try various radon reduction methods in a variety of houses representative of those found most often in the area. The project is designed to find affordable as well as effective radon reduction techniques.

According to Belanger, the costs of radon removal can vary greatly. "If we can easily find the entry places of radon, the control costs are usually reasonable," he says. "The job can often be done for a thousand dollars or less."

"On the other hand," he warns, "if the house already has a finished basement or there is nothing obvious to do, it may cost many thousands of dollars because you may have to make major structural changes."

EPA also has found that the higher the level of radon in a house, the higher the costs of control. "If you have 0.2 WL in the house and you want to get down to .02, that's a 90 percent reduction," says Belanger. "That's not too hard to do. But if you have 2 WL and want to get to .02, that's a 99 percent reduction."

EPA has looked at many reduction techniques that reduce radon by about 90 percent. But it is difficult to predict exact costs until the construction of the house is determined. It's also difficult to be sure that control measures work all the time. Take, for example, Belanger's October 1985 visit to Boyertown, PA, with a U.S. Senator who was inspecting one of the homes in EPA's remediation research program. It turned out to be a classic example of Murphy's law that anything that can go wrong, will.

Belanger recalls that, after explaining to the Senator some of the things that had been done to the house, he was asked to take a radon measurement.

"This home originally had a concentration of 7 WL," says Belanger, "and my own measurements taken soon after the house was fixed showed only a little above 0.02 WL. But this day, I got a measurement of 3 WL!"

"All of us there—the Senator, the homeowner, and I—realized something was very wrong," Belanger continues. "Since the highest reading was previously in the basement, I went down there to take a reading. It was 15; more than twice as high as the house had been before we did anything to it."

"At this point, the homeowner was at the point of tears," says Belanger.

After the Senator left, Belanger spent some time looking around the house and found a bedroom window open on the downwind side of the house. No other windows were open, yet air was rushing out of that window.

"I figured that, since the rest of the house was sealed, the air going out must be coming in through the foundation, bringing radon with it." Belanger closed the window, went down to the basement, and opened up one of the basement windows on the upwind side, allowing fresh air to enter the house. Within an hour, the level of radon had been reduced by a factor of two.

That afternoon state officials took more measurements, and the level had dropped to under 0.1 WL. They returned the next day and took readings under .01 WL—well within the state and proposed federal guidelines.

Says Belanger of the experience, "We learned a lot that day. And not just that things can go wrong at inopportune moments. Most importantly, we learned that open windows and air currents can have a dramatic effect on radon control systems."

Working with Citizens

Despite occasional events like the Boyertown visit, Belanger has nothing but positive things to say about his experiences working with people who have radon problems.

"All of us from EPA working there have an enormous amount of sympathy for the people we meet with high radon levels in their homes." says Belanger. "We would like to help every one of them individually. But we just can't. There aren't enough of us. Our primary job must be to provide advice and assistance to the states so that they can help everyone with a problem."

The most important thing in providing help, he believes, is getting the people's trust. "They believe you and accept your help if you give it to them straight," he says.

"If you try to mislead them in any way, if you try to minimize the problem or make it sound more serious than it is, they pick it up right away. People living up there (in the Reading Prong) have spoken to others about the problem. They know the background. So, you can't throw bull at them.

"I feel very good about my work there," says Belanger. "It's like working as a medic in an ambulance. You can point to the people you've helped. This is what drives you. You feel like you're saving lives. That's the real motivation in a job like this." □

Guidance for Dealing with Radon

To help people understand radon, EPA and the U.S. Centers for Disease Control recently published A Citizen's Guide to Radon: What It Is and What to Do About It. *Following are excerpts from this booklet.*

How is radon detected?

Since you cannot see or smell radon, special equipment is needed to detect it. The two most popular, commercially-available radon detectors are the charcoal canister and the alpha track detector. Both of these devices are exposed to the air in your home for a specified period of time and sent to a laboratory for analysis.

There are other techniques—requiring operation by trained personnel—which can be used to measure radon levels, but such techniques may be more expensive.

Your measurement result will be reported to you in one of two ways. Results from devices which measure radon decay products are reported as "Working Levels" (WL). Results from devices which measure concentrations of radon gas are reported as "picocuries per liter" (pCi/l).

How can I get a radon detector?

Homeowners in some areas are being provided with detectors by their state or local government. In many areas, private firms offer radon testing. Your state radiation protection office may be able to provide you with information on the availability of detection devices or services.

The U.S. Environmental Protection Agency conducts a Radon Measurement Proficiency Program. This voluntary program allows laboratories and businesses to demonstrate their capabilities in measuring indoor radon. The names of firms participating in this program can be obtained from your state radiation protection office or from your EPA regional office.

How should radon detectors be used?

. . . have a short-term "screening" measurement made to give you an idea of the highest radon level in your home. Thus, you can find out quickly and inexpensively whether or not you have a potential radon problem.

The screening measurement should be made in the lowest livable area of your home (the basement, if you have one). All windows and doors should be closed for at least 12 hours prior to the start of the test, and kept closed as much as possible throughout the testing period . . .

Depending upon the result of your screening measurement, you may need to have follow-up measurements made to give you a better idea of the *average* radon level in your home . . .

We strongly recommend that you make follow-up measurements before you make any final decisions about whether to undertake major efforts to permanently correct the problem.

Follow-up measurements should be made in at least two lived-in areas of your home. If your home has lived-in areas on more than one floor, you should make measurements in a room on each of the floors. The results of the follow-up measurements should be averaged together.

What do my test results mean?

The results of your follow-up measurements provide you with an idea of the average concentration throughout your home. The actual risk you face depends upon the amount of time you are exposed to this concentration.

One way to think about the risk associated with radon exposure is to compare it with the risk from other activities. Figure 1 gives an idea of how exposure to various radon levels over a lifetime compares to the risk of developing lung cancer from smoking and from chest x-rays. Figure 1 also compares these levels to the average indoor and outdoor radon concentrations.

Radon Risk Evaluation Chart

pCi/l	WL	Estimated number of lung cancer deaths due to radon exposure (out of 1000)	Comparable exposure levels	Comparable risk
200	1	440—770	1000 times average outdoor level	More than 60 times non-smoker risk; 4 pack-a-day smoker
100	0.5	270—630	100 times average indoor level	20,000 chest x-rays per year
40	0.2	120—380		
20	0.1	60—210	100 times average outdoor level	2 pack-a-day smoker
10	0.05	30—120	10 times average indoor level	1 pack-a-day smoker
4	0.02	13—50		5 times non-smoker risk
2	0.01	7—30	10 times average outdoor level	200 chest x-rays per year
1	0.005	3—13	Average indoor level	Non-smoker risk of dying from lung cancer
0.2	0.001	1—3	Average outdoor level	20 chest x-rays per year

Figure 1

How quickly should I take action?

In considering whether and how quickly to take action based on your test results, you may find the following guidelines useful. EPA believes that you should try to permanently reduce your radon levels as much as possible. Based on currently available infromation, EPA believes that levels in most homes can be reduced to about 0.02 WL (4 pCi/l).

If your results are about 1.0 WL or higher, *or* **about 200 pCi/l or higher:**

Exposures in this range are among the highest observed in homes. Residents should undertake action to reduce levels as far below 1.0 WL (200 pCi/l) as possible. We recommend that you take action within several weeks. If this is not possible, you should determine, in consultation with appropriate state or local health or radiation protection officials, if temporary relocation is appropriate until the levels can be reduced.

If your results are about 0.1 to about 1.0 WL, *or* **about 20 to about 200 pCi/l:**

Exposures in this range are considered greatly above average for residential structures. You should undertake action to reduce levels as far below 0.1 WL (20 pCi/l) as possible. We recommend that you take action within several months.

If your results are about 0.02 to about 0.1 WL, *or* **about 4 pCi/l to about 20 pCi/l:**

Exposures in this range are considered above average for residential structures. You should undertake action to lower levels to about 0.02 WL (4 pCi/l) or below. We recommend that you take action within a few years, sooner if levels are at the upper end of this range.

If your results are about 0.02 WL or lower, *or* **about 4 pCi/l or lower:**

Exposures in this range are considered average or slightly above average for residential structures. Although exposures in this range do present some risk of lung cancer, reductions of levels this low may be difficult, and sometimes impossible, to achieve.

Remember: There is increasing urgency for action at higher concentrations of radon. The higher the radon level in your home, the faster you should take action to reduce your exposure.

How can I reduce my risk from radon?

Your risk of lung cancer from exposure to radon depends upon the amount of radon entering your home and the length of time it remains in your living areas. Listed below are some actions you might take to immediately reduce your risk from radon.

- Stop smoking and discourage smoking in your home.
- Spend less time in areas with higher concentrations of radon, such as the basement.
- Whenever practical, open all windows and turn on fans to increase the air flow into and through the house. This is especially important in the basement.
- If your home has a crawl space beneath, keep the crawl space vents on all sides of the house fully open all year.

The booklet from which the above text is excerpted is available from state radiation protection offices. Also available from these sources is another new EPA publication Radon Reduction Methods: A Homeowner's Guide, *with information on methods which might be used to reduce the level of radon in homes.*

The Indoor Pollution Burden

by Claudine Schneider

"Your home is your castle," goes the old saying, and most Americans are still convinced that home is one of the last refuges left from the many ills of modern living. Unfortunately, this belief may be far from reality as the evidence mounts regarding the harmful effects of indoor pollution.

EPA spends $230 million to control air pollution outside, but only $2 million on indoor air pollution. Based on the amount of time Americans spend in buildings, federal research spending on indoor air quality amounts to only two cents per person-year of exposure, compared to about six dollars per person-year of exposure outdoors. Yet indoor air is more polluted on the average than outdoor air, and we spend more than 75 percent of our time in it. (Infants and the elderly, the groups most sensitive to pollutants, spend 90 percent of their time indoors.) Through indoor air, we're exposed daily to known carcinogens such as asbestos, as well as to pesticides, cleaning supplies, and other chemicals whose effects are yet unknown. The tobacco smoke inhaled by active and passive smokers includes over 2,000 chemicals, many of which are known toxins and carcinogens. And now we've learned that radon—a naturally occurring radioactive gas that causes lung cancer—is present in millions of American homes at exposure levels greater than those regulated in uranium mines.

Indoor air is more polluted on the average than outdoor air.

(Congresswoman Schneider (R-RI) is a member of the U.S. House Committee on Science and Technology where she is ranking minority member of the Subcommittee on Natural Resources, Agricultural Research and Environment. She is also a member of the House Merchant Marine and Fisheries Committee.)

In fact, the majority of known pollution-related deaths in the U.S. is caused by tobacco (350,000 deaths per year) and radon (5,000 to 20,000 deaths per year). Yet the government continues to subsidize tobacco farmers, allow seductive cigarette advertising, and support a reduction of the cigarette tax. The case of radon, too, is noteworthy because it could be solved relatively easily. If EPA and other concerned agencies put a reasonable emphasis on radon alone, we could prevent several thousand lung cancer deaths each year.

Techniques for identifying and measuring indoor radon have improved immensely over the past 10 years, and inexpensive monitors, sensitive and accurate enough to determine whether radon is a concern in individual homes, are now available for less than $20. Many homeowners can modify their homes fairly simply to minimize radon concentrations by closing off the radon entry points and ventilating as near to the source as possible.

Some of the best radon research and monitoring equipment has emerged from federal energy programs analyzing the ventilation conditions of energy-efficient buildings. Popular press reports have repeatedly implicated "tightened" buildings as the cause of indoor pollution, but the evidence to date does not indicate that energy conservation efforts are creating health hazards. According to a report in progress by the American Council for an Energy Efficient Economy, researchers found homes with extremely low ventilation rates where radon was not a concern, while leakier homes experienced high radon levels. The key is to identify those homes with significant sources, and implement available control techniques.

One of the problems of this health threat is that the location of homes with high radon levels remain largely unknown. A national survey of indoor radon in the U.S. housing stock is of paramount importance to understand the distribution of this hazard across the country. Additional data on the distribution of other significant indoor pollutants are also needed.

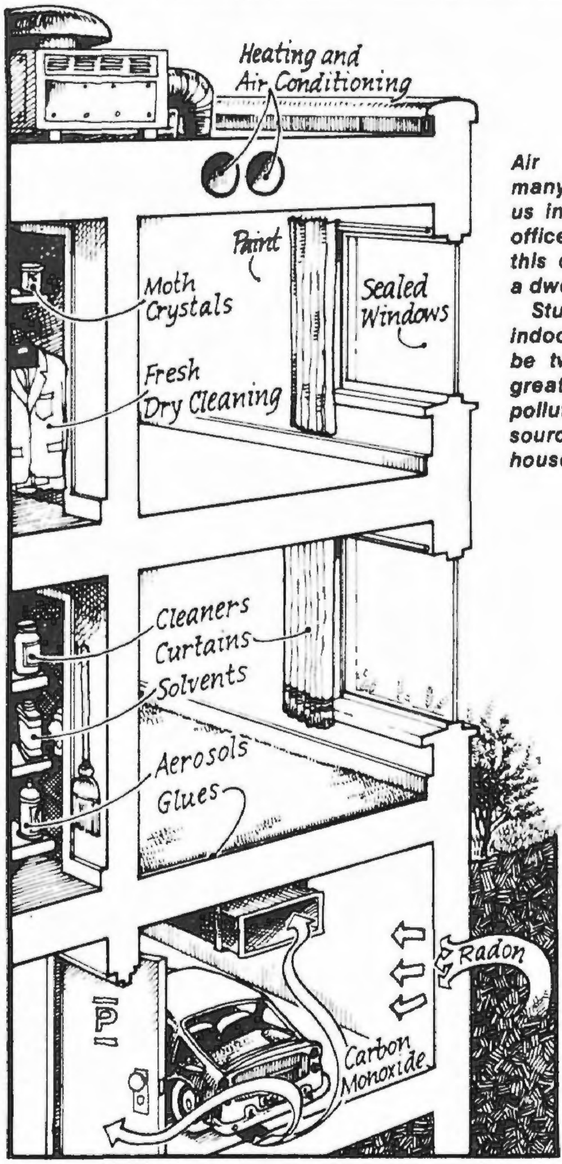
A key part of the problem lies with Congress which needs to reconsider and update the way it funds and organizes all the agencies that are protecting our health. Agency budgets should be related to their potential contribution to our well-being.

Indoor air hazards can be significantly reduced before we have a problem of epidemic proportions.

That is why I support funding specifically allocated for the study of indoor environments. This past year I sponsored the Indoor Air Quality Act of 1985, which was incorporated into EPA's pending Office of Research and Development authorization bill. It would require that EPA:

- Coordinate federal, state, local, and private research efforts relating to indoor air;
- Prepare a research plan;
- Conduct research to identify, monitor, characterize, and measure pollutants;

Air Pollution, In My Home?



Air pollution from many sources assails us in our homes and offices, as shown in this cut-away view of a dwelling.

Studies show that indoor pollution can be two to five times greater than outdoor pollution. Many of its sources are common household products.

study the effects on health; identify high-risk building types; evaluate control technologies; and disseminate information;

- Establish broad-based advisory groups; and

- Report on the risks to human health associated with indoor air pollution, the need for further research, and the need for possible federal actions to mitigate risks associated with indoor air problems.

I also consider it appropriate for the Committee on Indoor Air Quality, which has been designated by Congress to coordinate the research efforts of the 16 agencies examining indoor environments, to convene a study with EPA to reprioritize funding within the related agencies so that each dollar spent has a fair chance of contributing equally to improving our health and well-being.

Initiatives in the private sector have also contributed to our knowledge of indoor air quality. I admire the efforts of groups such as the Consumer Federation of America (CFA) and the American Council for an Energy Efficient Economy (ACEEE) in bringing this issue to the attention of policy-makers and consumers alike. CFA has designated indoor air quality as its number one health and safety issue, and has held conferences and published a newsletter on this topic. ACEEE's ongoing research clearly indicates that healthy indoor air in energy-efficient homes is attainable; but only a national commitment to achieving this important public health goal will get us there.

Much remains to be done, particularly the establishment of an information clearinghouse to effectively disseminate information on indoor air quality. The scientific and technical communities working on these problems need to exchange information, as do the many state and local health agencies. And last, but certainly not least, individual citizens who may have potential problems desperately need information.

Since I began focusing on this issue, I have received many requests for information, as I am sure EPA and other organizations have also. Consumers want to know: How do I know if I have a problem? How can I measure for pollutants in my home? What health effects are indicative of an indoor air pollution problem? What should I do to combat unsafe levels? These and scores of other questions need to be answered. Arming consumers and building operators with accurate information will help prevent the fraud and marketing abuse which lurk around the corner whenever a new hazard is coupled with a lack of adequate and reliable information.

There is another old adage I strongly believe, and that is "an ounce of prevention is worth a pound of cure." With a commitment by EPA, other government agencies, and the private sector, I believe that indoor air hazards can be significantly reduced before we have a problem of epidemic proportions and before Americans become resigned to living in homes that make them sick. □

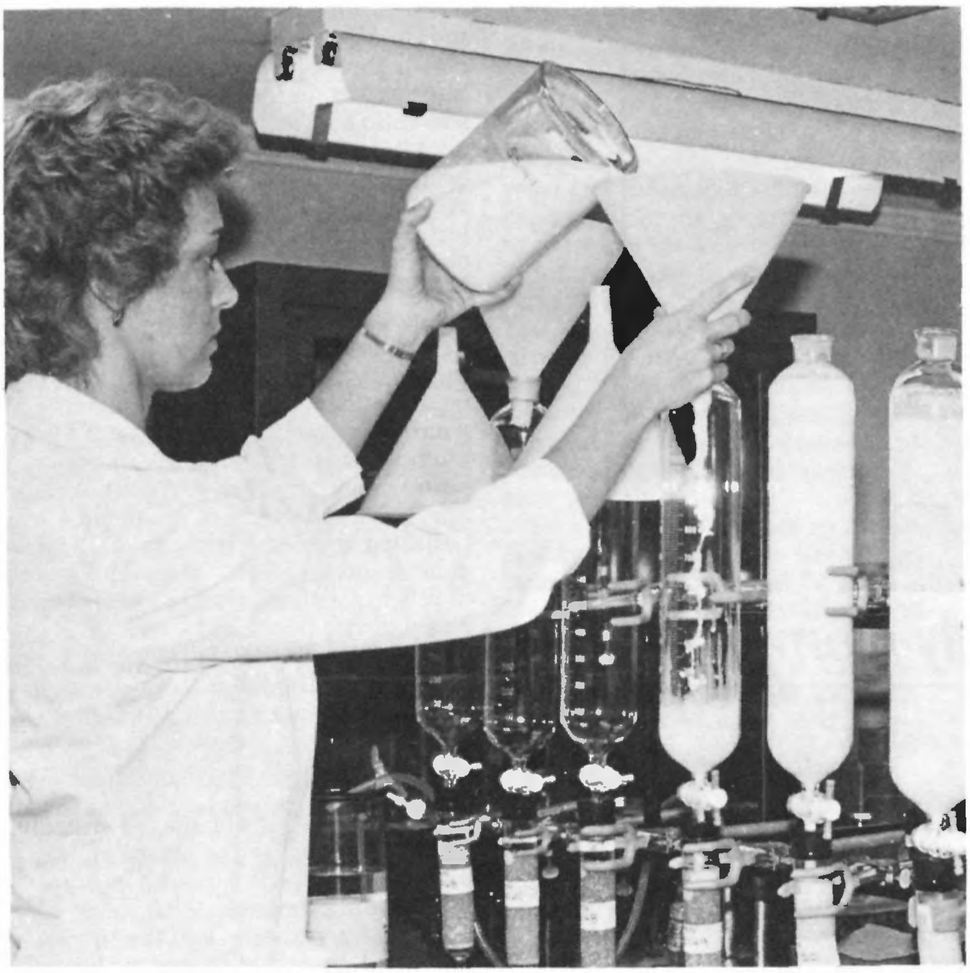
Answering Questions About Chernobyl

by Roy Popkin

Before the reactor blew on April 26, few Americans had heard of the Soviet Union's Chernobyl nuclear power plant; 48 hours later, it was a household word, the anxious focus of the press, the public, and the government. Was dangerous radioactive fallout heading to the United States? Was the health and safety of Americans abroad being threatened? No one knew.

Answering these questions became the job of the Task Force on the Soviet Nuclear Accident. At the peak of its activity, it was measuring domestic radiation levels, monitoring foreign levels, tracking the situation at Chernobyl, and handling hundreds of phone calls everyday. For almost a month, the Task Force was the source of information for Americans on the world's worst nuclear disaster.

Chernobyl was a secret disaster at first. The initial evidence that a major nuclear accident had occurred came not from Soviet sources, but from Sweden, where on April 27 workers at a nuclear power plant were found to have radioactive particles on their clothes. It was Sweden's search for the source of radioactivity—there was no leak at the



At EPA's Eastern Environmental Radiation Facility in Montgomery, AL, Vicki Lloyd tests samples of pasteurized dairy milk for Strontium 90, a fission product that may be present in nuclear fallout. Following the accident at Chernobyl, EPA increased milk monitoring from once a month to twice a week.

(Popkin is a writer/editor for the EPA Office of Public Affairs.)

What Does a Task Force Really Do?

The letter from the White House was short and to the point. From Larry Speakes, Deputy Press Secretary to President Ronald Reagan, it was addressed to EPA Administrator Lee M. Thomas:

"*My congratulations on a job well done in the wake of the Chernobyl accident. The interagency group you headed so effectively ought to be used as a model for future situations like this.*"

Interagency task forces are not unusual in emergencies and even in relatively mundane situations. The Chernobyl task force was formed quickly, its structure based in large part on an existing Memorandum of Understanding which gave EPA the lead role when there was an atmospheric nuclear detonation abroad, as in the case of two Chinese nuclear tests which led to extensive monitoring in the United States. Although Chernobyl was not the same, the required response activities were judged to be quite similar.

The Task Force met for the first time at 5:30 PM on Wednesday, April 30. The fire in the graphite core was still burning and the situation at the reactor site was still unclear. The Task Force's first job was to assign tasks:

EPA would be the clearinghouse for offers of assistance to the Soviet Union and would coordinate with the Department of State; DOE would help

Swedish plant—that led to the first hint of a nuclear problem in the Soviet Union.

EPA first learned about a possible radiological incident from press and citizen inquiries coming in on Monday, April 28. The Agency's Press, Radiation, and International Activities offices began fielding calls while working with the State Department, the Nuclear Regulatory Commission (NRC), and the Department of Energy (DOE) to find out what was happening. Although the Soviet news agency, TASS, finally issued a terse statement that evening confirming an accident at the Chernobyl plant, the Soviets offered no details. The resulting information vacuum fueled rumors of all kinds, from fatality estimates to speculation about fires in adjoining reactors.

Tuesday morning, an interagency group met at the White House to review what little information was then available. Although President Reagan was en route to the economic summit meetings in Tokyo, EPA was confirmed as the "lead" agency for coordinating the federal response, and EPA Adminstrator Lee Thomas was designated head of the Task Force. In addition to EPA, the Task Force was to include DOE and NRC, the White House, the Departments of State, Interior, and Agriculture, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Air Force, the Food and Drug Administration (FDA), the Federal Emergency Management Agency (FEMA), the Federal Aviation Administration (FAA), and the U.S. Public Health Service.

The Task Force immediately established an "up front" approach to

the FAA take measurements; the Centers for Disease Control/FDA medical network—normally used in drug-tampering incidents—would be used to inform state health officers. The lead for public information would be EPA; and DOE would handle congressional liaison. At the same meeting, the Task Force also decided to step up the monthly ERAMS milk monitoring to twice a week.

On Thursday, the Task Force broadened its assignments:

- The State Department was to report on the Soviet obligation to report data.
- EPA's Office of International Activities was to make recommendations on an international information exchange.
- EPA's Office of Radiation Programs (ORP) was to work with the Department of State to prepare a cable requesting technical information from the USSR and to solicit information based on questions submitted by Task Force agencies.
- A Health Working Group was formed to examine potential long- and short-term health effects, identify symptoms and effects, and distribute information to health officials.
- ORP/EPA was to be responsible for day-to-day events, reporting, and data collection.
- A DOE-NRC-FEMA-CIA subgroup was to develop and evaluate possible reactor scenarios.
- NOAA was to provide the meteorological and dispersion information for the daily Task Force report.
- DOE was to evaluate the technical aspects of extinguishing a graphite reactor fire.

The Task Force met daily through May 9, then skipped the weekend, although updated task force reports were issued by the EPA press office on Saturday and Sunday. Excerpts from minutes of Task Force meetings show the variety of actions taken by the interagency group.

May 2—The Task Force decided to contact counterpart agencies in affected countries to obtain radiological data. (NRC placed calls to 18 countries.)

May 3—NRC sent a notice to its licensees requesting they report any unusual radiation levels. EPA was to get radiological data from DOD bases in Europe and Japan, as well as coordinate data from several other countries.

NOAA reported that the radioactive plume had reached Japan, but no numbers were firmly established. The Department of State was to call our embassy there, and EPA was to determine when data from the military would be available. State and HHS were to work on another cable to offer medical liaison with the USSR. USDA reported that the World Agriculture Outlook Board had requested data from the Task Force to consider in its grain and sugar beet projections. Early radiation readings did not appear alarming.

May 6—The Task Force decided to begin publishing consolidated data, with positive U.S. measurements placed in context, their meaning and health implications explained. The Health and Agriculture Working Group(HAWG) reported on projected health effects and identified Protective Action Guides. EPA was asked to provide radiation data on returning U.S. citizens to the Health and Agriculture group. Chairman Thomas directed that any discussions should explain protective action guides and compare them with ERAMS and other U.S.data.

May 12—The Health and Agriculture Working Group reported it had completed development of an advisory outlining levels of concern for imported products.

May 14—the last meeting of the Task Force. The group decided that EPA would continue its operations, including public reports and intensified monitoring until deemed to be not necessary. Other agencies would continue to cooperate as needed. The Task Force would issue a summary health and dose assessment report with EPA serving as the lead agency. EPA and other agencies were to evaluate the lessons learned in the context of their individual responsibilities and push to modify their own procedures accordingly. HAWG would submit to Lee Thomas a list of areas needing improvement. The scope of the Memorandum of Understanding was to be re-examined, as well as the need for real time dose and health information, and the role of the State Department, especially in relation to the need for an international capability for faster, real-time data collection. Thomas announced he intended to send a wrap-up memorandum to the White House. □

the news media, providing access to such top level experts as Harold Denton, Director of Nuclear Reactor Regulation for NRC; Dr. Lester Machta, director of NOAA's Air Resources Laboratory; Dale Bunch, DOE Deputy Assistant Secretary for Reactor Deployment; and Sheldon Meyers, director of EPA's Office of Radiation Programs (ORP) and head of Task Force support efforts (with a quickly mobilized team of ORP staff serving as the focal point for Task Force support). At the first press conference, Thomas promised every effort to provide as much reliable information as was available. He also ruled out conjecture and second-guessing. Comments would be based on known facts, even if there were gaps in the information coming from Soviet or other official sources.

During the next few weeks, both the facts and the radioactive clouds from Chernobyl spread slowly westward. EPA's Environmental Radiation Ambient Monitoring System (ERAMS)—continuously operated by ORP and augmented by reports from DOE national labs, the military, U.S. diplomatic missions abroad, and commercial nuclear power plants in this country—provided daily radiation measurements based on samples from hundreds of monitoring posts in the United States and abroad. The headquarters press office worked seven days a week until May 23, issuing daily task force reports and fielding thousands of in-person visits and phone calls from reporters all over the world. Chris Rice, press specialist for the radiation program, began to feel like the "voice of Chernobyl" as he handled phone calls from print and broadcast reporters.

"I Trained All My Life for This"

Five days after the Chernobyl explosion ORP/Las Vegas specialist Richard Hopper was home preparing for dinner when the telephone rang. By 11 that night he was on a red-eye flight to Washington. His luggage included a variety of hand-held radiation monitors and 60 "Thermal Luminescent Dosimeters," the familiar looking film badges we see in hospitals and laboratories. He was on his way to being EPA's man on the scene in Eastern Europe.

Hopper's mission? To monitor radiation levels in U.S. diplomatic missions in Poland, Hungary and Bulgaria, the Eastern European countries most directly in the path of meteorological systems carrying radioactive debris from the damaged Soviet reactor.

The next morning, the 43-year old, dark-haired Westerner met with other members of the team he was joining at EPA headquarters, then went to a briefing at the State Department, where the priority subject of discussion was whether to evacuate U.S. women and children in those countries. Hopper, whose regular job involves monitoring radioactivity and radiation exposure around the EPA Las Vegas Laboratories and the Nevada nuclear test site, suggested they hold the decision until he'd had a chance to check the actual radiation levels.

Arriving in Warsaw on May 3, he found the embassy people "full of apprehension. Anxiety definitely had taken over."

Many Poles were reluctant to accept their government's initial reassurances. In fact, he believes their concern helped the embassy attache speed him through Polish customs without having his instruments and equipment inspected.

En route from the airport, Hopper took readings in a number of places, including office buildings and houses, inside and outside. He found the readings to be very low. Because he had spent many years at the Nevada test site and had organized the monitoring network after the Three Mile Island incident, Hopper anticipated many questions he would be asked, but also assumed there would be problems in Europe that he hadn't heard about back home. The first day in Poland, he met with a team of Polish scientists (whose knowledge of the Las Vegas lab—one had actually been there—gave Hopper added credibility). They told him they were advising the populace to be wary of drinking milk and water, and eating vegetables that might contain radio-active particles.

That evening, he continued his monitoring activities until late at night. The next morning he spent two hours briefing the entire embassy staff, including families. He discussed the exposure levels he had found and the Polish scientists had recorded, putting the levels into a perspective that indicated there would be no long-term health effects for the embassy personnel and their families. After this, he met privately with individuals—mostly pregnant women—who had special concerns but were reluctant to discuss their fears in a public gathering. To Hopper, this was as important as talking to the larger group. He knew, from years of Nevada experience, that such concerns are "very real and frightening to the people involved. A danger you can't see or feel or smell can seem much worse than it really is."

Before leaving Poland, Hopper also went to Kracow and Poznan to monitor radiation levels and brief the U.S. consular staffs and their families; he also talked to the students and staffs at the schools attended by U.S. and British embassy children. He additionally managed a trip close to the border area closest to Chernobyl, where he took even more readings. His working days ran easily to 18 hours. Before leaving Poland, he set up a monitoring system at the embassy and trained the staff to use it over the next six months, a process he repeated in Hungary and Bulgaria.

In Hungary, too, where modern town laboratories were doing the monitoring, he found an openness about sharing information on the part of government authorities. And he found the same need for empathetic briefing of embassy people and their families. In Bulgaria, there was little sharing of information with him on the part of government officials, but his sessions with U.S. embassy personnel were comparable to those in Warsaw and Budapest.

Hopper has been on the EPA staff since the agency was founded, coming to EPA after serving at the Nevada test site and with the Public Health Service. He has three children, the oldest 24, At the peak, eight press office staff members were dealing with media and other calls, although the pace slackened as it became apparent that the Chernobyl fire was out and that radiation levels in the United States were well below danger levels.

In addition to calls from the press, calls from organizations, congressional offices, and concerned individuals were also pouring into headquarters, the Regional Offices, and various EPA laboratories. At headquarters, responsibility for answering such inquiries was ultimately given to the Office of Public and Private Sector Liaison, which answered hundreds of individual calls and also circulated needed information through a system developed by the Centers for Disease Control to notify health officials of over-the-counter drug tampering incidents.

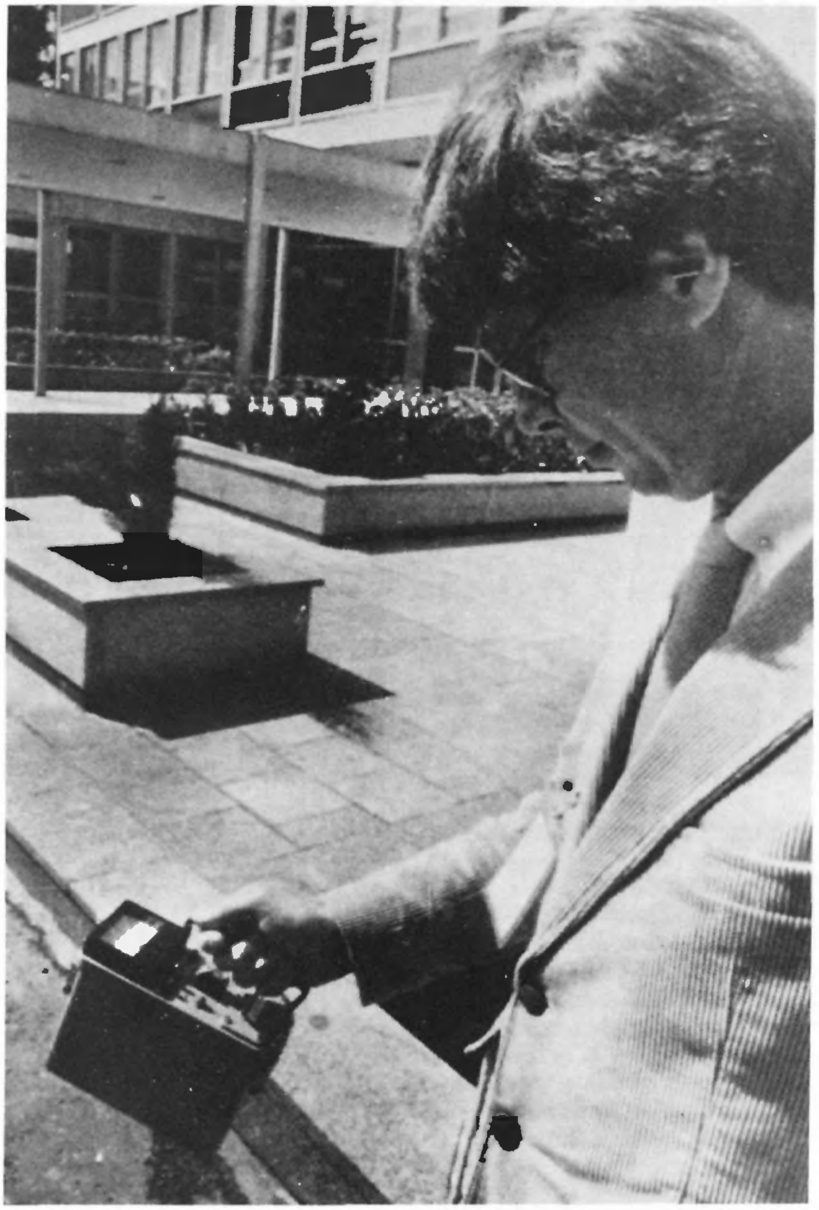
Most of the calls received by EPA offices concerned possible dangers to U.S. citizens traveling abroad, but others were concerned with reports of radioactivity in specific parts of the United States:

- Region 9 was called by a post office in Seattle which had received a parcel from Sweden. Was it safe to handle?
- Region 3 had a caller who wanted to know when the radioactive cloud would pass over Pittsburgh so she could take in her wash.
- Research Triangle Park had a call from a North Carolina dog breeder who had arranged to purchase an expensive German shepherd from a breeder in West Germany. He wanted to know if there had been heavy fallout in the

and his wife, Jacki, is a health physicist. Of this special assignment he says, "It was the opportunity of a lifetime. I've been training for this assignment for the last 20 years."

His feelings of satisfaction are more than echoed by a message from the U.S. Ambassador in Poland to the Secretary of State for relay to EPA:

"The entire staff of Embassy Warsaw joins me in expressing our heartfelt and most sincere thanks to Mr. Hopper for the outstanding manner in which he performed during his recent visit to Poland. His superb technical competence was perhaps expected, but he proved to be equally well qualified and adept at dealing with press inquiries, explaining his findings, reassuring worried mission members, and maintaining an invariably cooperative and cheerful attitude through long and very intensive workdays. He was highly professional in meetings with Polish scientific experts and obtained valuable information. He enthusiastically undertook three long and tiring field trips to various regions of Poland, making readings which enabled policy decisions to be taken in Washington. His serious but friendly manner and long experience made him particularly effective in visiting our diplomatic school and talking with pupils there. He . . . earned our unanimous admiration and respect." □



EPA radiation specialist Richard Hopper checks background radiation readings in front of the U.S. Embassy in Warsaw, Poland, on May 5, 1986.

Wide World Photos

dog's home so he could cancel the deal if the dog could get sick or harm his other dogs in North Carolina.

EPA's Office of International Activities (OIA) was also heavily involved. Radioactive debris from the reactor was monitored around the world and concern was high in most countries. OIA worked closely with the State Department to get radiation data on fallout within their borders. This information was used to inform the public of world-wide radiation levels and potential health risks for travelers.

Richard Hopper of the ORP Las Vegas facility was sent to Poland, Hungary, and Bulgaria to work with U.S. Embassy officials monitoring potential impacts on U.S. employees there.

The Task Force met for the last time on May 14. Its last public report was issued on May 23, just short of four weeks after the accident. Reports from the Soviet Union are still adding new information, EPA's ERAMS system continues its regular monitoring activity, as does the instrumentation Hopper took to the U.S embassies abroad. The fallout from Chernobyl created no health problems for Americans here or abroad, but the nation now knows that, should another such accident occur or other radiation emergencies arise, there is an effective system in place to provide scientifically credible information about potential dangers and what to do about them. □

At the Montgomery facility, Avis Culver collects precipitation samples for radiation analysis. To monitor fallout from Chernobyl, EPA also provided daily radiation measurements based on air samples from hundreds of monitoring posts in the U.S. and abroad.

Advice on Asbestos in the Home

by Dave Ryan

"Millions of Americans Face Asbestos Hazards in Homes" screams a headline in the *Atlanta Constitution*; "Is Asbestos Lurking in Your Home?" the *San Diego Union* asks ominously; "As Home Asbestos Crisis Grows Worse, Remedies Can be Costly and Dangerous," the *Wall Street Journal* warns in Armageddon-like tones.

True, home is where the heart is, but many Americans fear that it's also where the asbestos is—inside their domestic fortresses, creating time bombs of cancer in their very own kitchens and recreation rooms.

Approached with knowledge and caution, asbestos in any home can be safely brought under control.

It's easy to see how citizens can become apprehensive under such a barrage of headlines, but EPA has some advice: don't panic.

Asbestos is dangerous if inhaled, but its presence in your home is not necessarily a cause for alarm. As long as asbestos-containing material is maintained in good condition, there's usually no problem. It's only when this material is damaged that asbestos becomes dangerous, because then the fibers can escape into the air and be inhaled. (Soft, easily crumbled material, which EPA calls friable, has the greatest potential for releasing asbestos fibers into the air and therefore has the greatest potential to create health risks.)

In the majority of cases, then, these materials are best left in place. In fact, it's usually more dangerous to try to remove them; improper removal can disperse high levels of asbestos into the air.

(Ryan is a Press Officer in the EPA Office of Public Affairs.)

Asbestos-containing materials can be found in many areas throughout the house, but these are the more common areas where asbestos may be found:

- **Pipe and Furnace Insulation:** Many homes built in the last 30 or 40 years have hot water and steam pipes and furnace ducts insulated with material containing asbestos. The most common type of this insulation contains asbestos mixed with paper, textile, or cement materials. These materials can often be repaired if the damage is minimal and in a confined area. Removal is recommended for damaged pipes when more than a small area has deteriorated.

- **Wall and Ceiling Insulation:** Homes built between 1930 and 1950 may have asbestos insulation sandwiched between exterior and interior walls. The quantities of asbestos involved may be substantial, and, correspondingly, so are the risks of exposing and disturbing it. Walls and ceilings should be checked for concealed asbestos insulation before beginning any repairs or renovations.

- **Stove and furnace insulation:** Asbestos has frequently been used to insulate wood-burning stoves as well as oil, coal, and wood furnaces. Usually the asbestos is contained in cement sheets, stiff paperboard, or paper. Some door gaskets in stoves, ovens, and furnaces may also contain asbestos.

- **Vinyl Floor Tiles and Vinyl Sheet Flooring:** Asbestos is often found in vinyl floor tiles and sheet flooring or their backing. If the flooring is sanded or cut to fit into place, or if old flooring is removed and the surface beneath it is sanded, fibers can be released into the air. To avoid disturbing asbestos fibers in existing flooring, it's best to place new flooring material directly over the old.

- **Patching Compounds and Textured Paint:** Homes built or renovated before 1975 may have patching compounds or textured paints with asbestos applied on wall or ceiling joints. If these materials are in good condition, it's best to leave them untouched. No patching compounds or textured paint should be sanded or scraped unless lab tests have confirmed them to be free of asbestos.

- **Walls and Ceilings:** In rare instances, private homes may have asbestos material sprayed or troweled on walls or ceilings, although this is much more likely to be found in large offices or apartment buildings built before 1973. Leave it undisturbed unless it shows signs of deterioration.

- **Roofing, Shingles, and Siding:** Asbestos-containing portland cement has sometimes been used to bind roofing and siding shingles. Since roofing and shingling are outdoors, intact materials pose minimal risk to building occupants; roofers who remove shingles, however, may experience a significant health threat unless they use proper procedures for handling asbestos-containing materials. Homeowners should avoid cutting, sanding, or scoring materials, although worn or damaged siding should be painted to seal in fibers that might otherwise escape.

What to do if you suspect there's asbestos in your home?

The first thing is to call EPA's TSCA (Toxic Substances Control Act) Assistance Office at the toll-free number (800) 424-9065 (554-1404 in the District of Columbia). They'll be glad to send a free packet including an asbestos fact sheet; a copy of a booklet called "Asbestos in the Home"; and a report titled "Guidance for Controlling Asbestos-Containing Materials in Buildings." The TSCA Assistance Office can also refer you to the Regional Asbestos Coordinator (RAC) in the nearest EPA regional office. The RAC offices are staffed by technical experts, architects, and engineers who have extensive practical experience with asbestos problems. In addition, many states now have licensing requirements for asbestos contractors. RACs can refer you to state contacts who can provide a list of licensed contractors.

For a thorough inspection of your living quarters, however, you'd better get some expert assistance.

Your local health department might inspect your home for free, or at least refer you to specially trained inspectors you can hire to do the job.

But, whoever does the work, you must remember that visual inspection alone is insufficient to identify asbestos. Laboratory analysis using polarized light microscopy is the only positive method of identification. Costs currently range from $20 to $50 per sample, and often several samples are required to confirm the presence of asbestos.

Samples must be collected in a way that protects the health of the sampler and ensures validity. The proper sampling procedures are spelled out in EPA's report, "Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials." If you're looking for a qualified laboratory near you, you can call another EPA toll-free number for help: (800) 334-8571, extension 6741.

If action must be taken to abate asbestos, it should only be done by a trained and qualified contractor. Home repair contractors are usually not experienced in the proper procedures for handling asbestos. A good abatement contractor will:

- Seal off the work area from the rest of the home with plastic sheeting and duct tape, and make sure not to track asbestos dust throughout the house;
- Always wear a respirator, protective gloves, and other protective clothing. Clothing should be disposed of as asbestos waste immediately after use. Clothing that cannot be thrown away should be washed separately from other clothes;
- Always wet asbestos-containing material before working with it. Wet asbestos fibers do not float in the air as readily as dry fibers, and are therefore easier to capture and dispose of;
- Avoid breaking asbestos-containing material into small pieces, which are more likely to release breathable fibers into the air;
- Place any debris from the work in 6-millimeter plastic trash bags and follow the instructions of the local health department for disposing of it in an approved landfill. The contractor should take care not to break the bag;

Asbestos-coated hot water piping in a residential basement.

- Be sure not to dust or sweep particles suspected of containing asbestos, since this will disturb microscopic fibers and make them airborne. The fibers are so small that they cannot be seen. They can pass through normal vacuum cleaner filters and get back into the air. Dust should be removed by wet mopping and the use of High Efficiency Particulate Apparatus (HEPA) vacuum cleaners;
- Thoroughly clean the work area twice with wet mops, wet rags, or sponges, and be sure that no fibers are tracked into other areas of the home. All cleaning equipment should be disposed of in the same trash bags containing the asbestos materials.

It is important to find a contractor who conscientiously follows these safe work practices. In an effort to increase the numbers and availability of responsible contractors, EPA is encouraging all states to adopt certification programs ensuring that all asbestos abatement contractors are licensed to perform their work correctly.

Last year, EPA awarded grants to 12 states to support contractor certification programs, and this year plans awards to an additional 20 states. Partly as a result of this funding, 13 states now operate their own certification programs, and an additional 17 have certification bills either passed or pending in their legislatures. These states maintain lists of licensed contractors and make the lists available to the public.

Last year, EPA also opened three national training centers at Tufts University, Georgia Institute of Technology, and the University of Kansas. So far, these centers have instructed over 1,500 people, including contractors, building owners and managers, maintenance workers, school officials, architects, and consultants in various aspects of asbestos identification, maintenance, and control. Because of their success, EPA plans to open two more centers this year, one at the University of Illinois in Chicago and another at the University of California at Berkeley. In addition, four satellite centers will open late this spring to train contractors in proper abatement techniques. These will be located at Drexel University in Philadelphia, Rutgers Medical School in New Jersey, the University of Texas at Arlington, and the University of Utah in Salt Lake City.

In January of this year, EPA also proposed to ban five specific asbestos products for which there are adequate substitutes, and to phase out the use and importation of all other asbestos-containing products over the next 10 years. The ban will immediately prohibit the further sale and use in the U.S. of five products, the first three of which are used mainly in the construction and renovation industry: (1) saturated and unsaturated roofing felt; (2) flooring felt and asbestos felt-backed sheet flooring; (3) vinyl-asbestos floor tile; (4) asbestos-cement pipe and fittings; and (5) asbestos clothing. While EPA is not attempting to downplay the essential danger of inhaled asbestos, the Agency urges citizens not to let fear propel them into hasty and ill-conceived actions. When asbestos-containing materials are in good condition, the most appropriate action is to periodically inspect the materials for signs of damage or deterioration. If deterioration or damage is minor or localized, such simple steps as enclosing or repairing the material may be adequate. Only when asbestos-containing material is deteriorating over a broad area, or when it is likely to be disturbed by repair or renovation, should removal be considered, and then only by a trained contractor.

Approached with knowledge and caution, asbestos in any home can be safely brought under control. □

Update

A review of recent major EPA activities and developments in the pollution control program areas

AIR

Standards for Industrial Boilers

The Agency has proposed new rules under the Clean Air Act requiring reductions of sulfur dioxide emissions for new or modified industrial boilers.

The proposed rules require that new or modified steam generating units larger than 29 megawatts (100 million Btu/hour) achieve a 90 percent reduction in sulfur dioxide emission.

EPA rules are expected to apply primarily to industrial boilers but would include the largest institutional and commercial boilers and the smallest utility boilers.

The 90 percent reduction standard represents the performance capabilities of demonstrated control technologies over the 30 day averaging time of the standard.

ENFORCEMENT

Firm Indicted

A Pennsylvania firm and two of its officials have been indicted in connection with the storage and transportation of hazardous waste in south central Kentucky. The investigation was conducted by the EPA Office of Criminal Investigation in Region 4.

RAD Services Inc., Arthur J. Sciullo, Executive Vice President, and George R. Gary, head of the Chemicals Division, were indicted on five counts by a federal grand jury. According to U.S. Attorney Joseph Wittle, RAD illegally stored thousands of tons of hazardous waste in a Bowling Green warehouse, between 1980 and 1983, without notifying the EPA. The material was emission control dust, a byproduct of air pollution control devices in steel mills.

The investigation was prompted by complaints from residents of Rutherford County who became suspicious of late-night dumping in 1983.

HAZARDOUS WASTE

Superfund Priority List

EPA has added 170 hazardous waste sites to its final Superfund National Priorities List (NPL), making them eligible for long-term action under the Superfund site cleanup program.

The Agency also proposed 45 sites for the priority list. The proposed sites are subject to a 60-day public comment period and could be added at a later date.

With these additions, there are now 703 sites on the final NPL and 185 proposed sites. EPA deleted eight sites from the final NPL on March 7, 1986, since work on those sites had been completed.

PESTICIDES

Dicofol Registration Cancelled

EPA announced its decision to cancel the registration of the pesticide dicofol unless certain modifications are made to reduce significantly the levels of DDT and related contaminants in this product.

EPA is requiring two kinds of modifications to the dicofol registration. First, the levels of DDT allowed in dicofol will be reduced in two stages. There will be an initial and immediate reduction to less than 2.5 percent DDTr (DDT and related derivatives including DDD, DDE and, tetrachloro-DDT) contamination in the technical-grade compound. After December 31, 1988, all technical-grade dicofol products offered for sale must contain less than 0.1 percent DDTr. The second modification requires the registrants of dicofol to include a warning statement on labels of all products stating that loaders and applicators of the chemical should wear impervious gloves.

TOXICS

Information on Commercial Chemicals

The Agency has issued a final rule requiring chemical manufacturers and importers to report current production and plant-site information on thousands of commercial chemicals.

The new rule requires companies to report to EPA every four years beginning this year.

This rule requires the first substantial update of production and plant-site data for chemicals listed on EPA's chemical substances inventory. EPA will collect the latest information on chemicals in the current inventory on a plant-by-plant basis, including each chemical's identity, whether the firm is a manufacturer or importer, whether or not use of the substance is limited to the site where it is manufactured, how much is produced, the plant's technical contact, and whether any of the information is confidential.

WATER

Research Burn Permit Denied

EPA's Assistant Administrator for Water, Lawrence J. Jensen, has denied the application by Chemical Waste Management, Inc., for a research permit to conduct ocean incineration of toxic wastes.

Jensen said that his review of public comments and the hearing officer's recommendations had led him to conclude that it was not necessary to conduct the research burn at this time.

Chemical Waste Management had planned to conduct the research burn using the Vulcanus II, a special incinerator ship. The permit proposed burning 708,958 gallons of fuel oil containing 10 to 30 percent polychlorinated biphenyls (PCBs) at sea approximately 140 miles east of Cape May, NJ. □

Appointments/Awards

Thomas L. Adams, Jr.

Robie G. Russell

Lee DeHihns

Douglas D. Campt

Thomas L. Adams Jr. has been nominated to be Assistant Administrator for EPA's Office of Enforcement and Compliance Monitoring. Adams will be responsible for judicial enforcement actions against violators of federal environmental laws and for maintaining national consistency in the enforcement of the civil and criminal laws and regulations.

Since 1983 Adams served as the EPA Deputy General Counsel for Regional Coordination. From 1977 to 1983 he was assistant director for governmental relations for Republic Steel Corp. Prior to that he served for two years as assistant general counsel for the Federal Trade Commission and earlier as minority counsel for the Senate Commerce Committee's Subcommittee on Environment and Consumer Affairs.

Adams is a graduate of the University of Virginia and the Vanderbilt University School of Law.

Robie G. Russell has been named EPA's Regional Administrator for the Pacific Northwest Region (Region 10).

Russell has served as Senior Deputy Attorney General for the state of Idaho since 1981. As chief of the local government division, he has dealt with a broad range of issues including land use, elections, local government law, disaster planning, public meetings and records, and Indian law. He was Idaho Deputy Attorney General and acting chief of the natural resources division from 1979 to 1981.

Russell received a bachelor's degree in political science from the University of Idaho in 1973. He received a law degree from the University of Idaho in 1978.

Lee DeHihns formerly the Associate General Counsel for Grants, Contracts and General Law, will become the new Deputy Regional Administrator in Region 4.

DeHihns, who has been with EPA since 1974, brings to this position an outstanding professional reputation. DeHihns has served at his present position since 1982. He previously served as an Attorney for the Office of the General Counsel, Acting Regional Counsel for Region 5, and Special Assistant to the Deputy Administrator.

DeHihns has received EPA's Bronze Medal and EPA's Special Achievement Award. He received his B.S. degree from the University of Scranton and his J.D. from the Columbus School of Law, Catholic University of America.

Douglas D. Campt has been appointed to be Director of EPA's Office of Pesticide Programs (OPP). He previously served as director of the Registration Division in OPP. Campt has been with EPA since 1970, serving as the Associate Director for Registration and Compliance, and as Program Management Officer. Prior to joining EPA, he was the head of the Registration Review Section, Assistant Chief of the Registrations Branch, and a Plant Quarantine Inspector at the Department of Agriculture.

Campt is a graduate of North Carolina Central University with a degree in biology. □

Performance Awards

Administrator Lee M. Thomas has presented awards to nine members of EPA management for "unusually outstanding" performance. These awards are made annually to those employees in the Performance Management and Recognition System whose job performance results in major progress toward Agency objectives.

The following persons received awards:

Gary A. Amendola, Supervisory Environmental Engineer, Environmental Services Division, Region 5.

Kathleen C. Callahan, Deputy Director, Office of Policy and Management, Region 2.

Thomas B. DeMoss, Director, Technical Support Division, Office of Marine and Estuarine Protection.

John A. Edwardson, Chief, Superfund/RCRA Branch, Budget Division, Office of the Comptroller.

Chester J. France, Chief, Standards Development and Support Branch, Motor Vehicle Emissions Lab, Ann Arbor.

Denise M. Keehner, Chief, Regulatory Section, Exposure Evaluation Division, Office of Toxic Substances.

Walter E. Mugdan, Deputy Regional Counsel, Office of Regional Counsel, Region 2.

Gilman D. Veith, Associate Director for Research Operations, Environmental Research Laboratory, Duluth.

Thomas C. Voltaggio, Chief, Superfund Branch, Hazardous Waste Management Division, Region 3.

NYT Pictures

Kathleen Varaday inspects the air pump system attached to her home in Boyertown, PA. The system helps to ventilate radon from her home.

Back cover: Sailing. Photo by John Bowden, Folio, Inc.

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