

Weekend Sports

Sports Scores - 326-6000

☐ Drug testing key in Ueberroth ruling **C1**

☐ Temple falls in Atlantic-10 semis **C3**

☐ Ches-Mont wrestlers dominate South **C4**



Pottstown boys-girls sweep in districts — C2



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16 schools show working levels of radon

By **TERRY BRENNAN**
Mercury Editor

PHILADELPHIA — The Pennsylvania Department of Environmental Resources has identified 16 schools in the eastern part of the state which have recorded indoor radon concentrations above .02 working levels, which is considered the maximum safe level for radon exposure.

While none of the concentrations have been found to exceed .1 working levels, remedial efforts are underway at many of the schools in an attempt to bring the radon under the .02 action limit.

Radon is an odorless, colorless, tasteless gas which is formed when uranium decays into radium, and radium decays into radon gas. The radon gas expels radioactive particles called radon daughters.

When radon gas comes up through the ground and seeps into a building through the foundation, basement walls or other openings, the radon daughters attach themselves to dust particles in the air. When the dust particles are inhaled, the radon daughters attach themselves to the lungs and can cause lung cancer.

The federal Environmental Protection Agency has concluded that a lifetime of exposure to .02 working levels of

radon will increase a person's risk of contracting lung cancer by 3 percent.

State health department officials have determined that annual exposure to .02 working levels of radon is roughly equivalent to smoking four cigarettes a day.

"We contracted with ARIX Sciences (of Pottstown) for diagnostic services in schools," said Tim Hartman, DER spokesman. "In 16 schools we found working levels above .02 in areas occupied by students."

"We have not found that high of levels," said Hartman, "and a great deal depends on how much total exposure the students are getting at home. But the levels are generally lower in schools (than in homes)."

School buildings are usually much larger than individual homes, with a higher level of air exchange — something that is engineered into schools in an attempt to keep down the threat of communicable diseases. And newer heating systems also require a higher amount of air exchange.

Increased ventilation is generally considered a good method of decreasing radon concentrations.

"We have tested all the schools in the Reading Prong," said Hartman, "and we are now continuing with our tests in schools outside of the Prong. We have found some schools with radon in and out of the Prong."

The 16 school buildings identified as having a radon problem are:

READING SCHOOL DISTRICT

- 13th and Green Elementary — The school district has already completed remediation work and the working level is now at .02 or below, according to Kenneth B. Mock, director of buildings and grounds.

ALLENTOWN SCHOOL DISTRICT

- Moser Elementary — ARIX tested the old part of the building in early spring and the level was "very high," according to the assistant superintendent of schools, Dr. Samuel Miller. That part of the building has since had new heating and ventilating work done and DER is going to retest. There are a total of 24 buildings in the Allentown district, and all will be tested.

OLEY, VALLEY SCHOOL DISTRICT

- Oley Elementary Center
- Oley Valley High School — Only certain areas of both schools are involved and long-range testing is now being performed in both schools. That is all the information provided by Superintendent Robert J. Lesko.

PARKLAND SCHOOL DISTRICT

(Continued on page A8)

SPECIAL

MERCURY

REPORT:

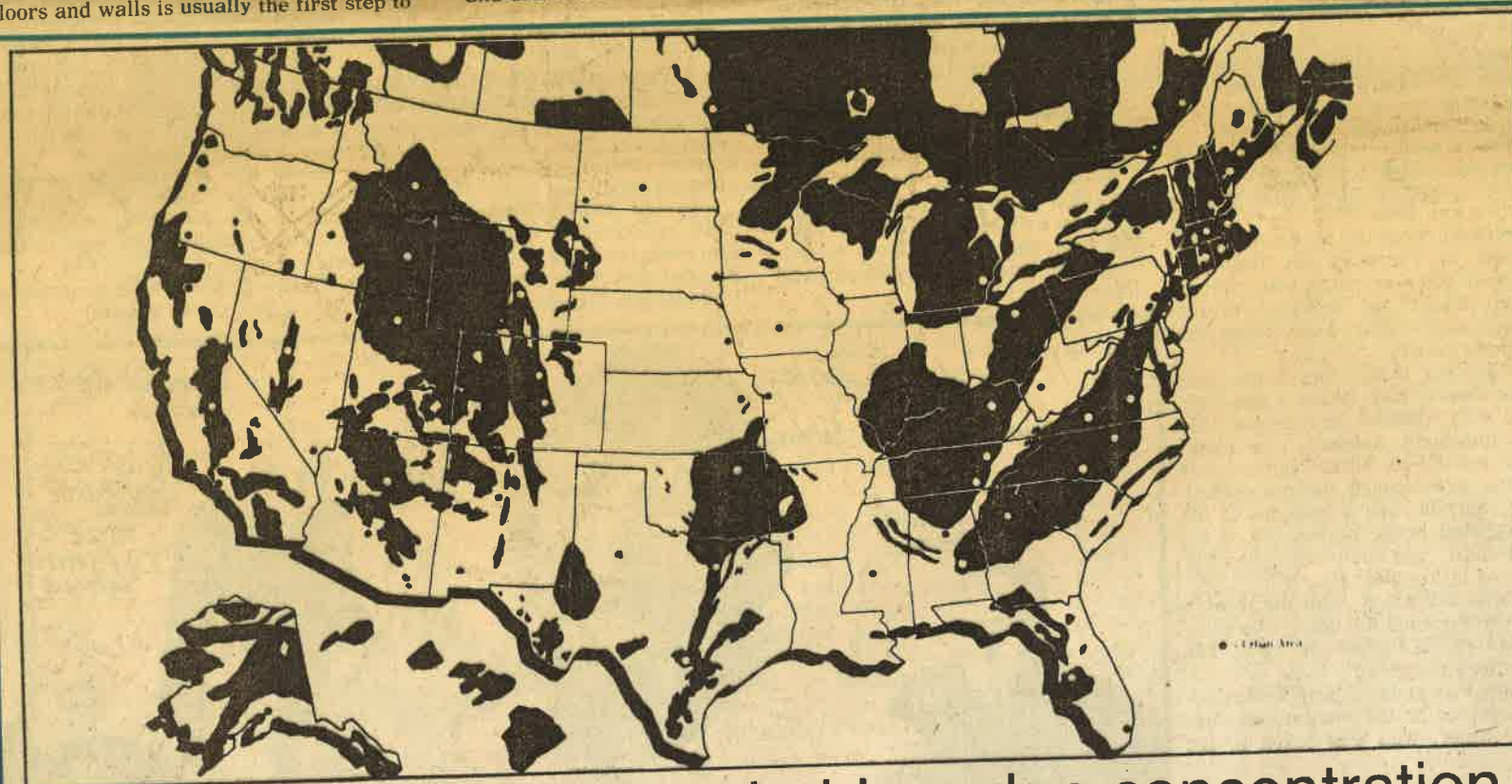
SEE A8-9-10

Man dies in Walnut Street fire

By **SEAN McKINNEY**
Mercury Staff Writer

Moyer, who arrived late at the scene, was at a fire and blistered arms and hands at the scene. Moyer said

Sealing cracks and holes in basement floors and walls is usually the first step to and draws fresh outside air into the home walls, drain the ventilation, which in



Maps show areas of probable radon concentration

By TERRY BRENNAN
Mercury Editor

PHILADELPHIA — Participants in last week's two-day conference on Indoor Radon Pollution at the Center City Holiday Inn, sponsored by the Air Pollution Control Association, continually stressed the fact that radon contamination is both a national problem and an international problem.

If you don't live along the Reading Prong, there is no guarantee that your home will be free of radon, the odorless, colorless, tasteless gas which has been directly linked to the increased risk of lung cancer.

"There is no such thing as no radon, anywhere in the United States," said Dr. Anthony V. Nero, scientist with the Lawrence Berkely Laboratory in California.

"To assume that any house in the United States has no radon is incorrect," said Allan B. Tanner, geophysicist with the U.S. Geological Survey in Reston, Va.

However, geological surveys and scientific study have identified areas of the country and areas of this state which have a higher probability of radon contamination in homes.

The two maps accompanying these stories — the United States (above) and the map of the Greater Delaware Valley (opposite page - A9) — show the presence of geological formations which contain four types of radon-bearing minerals: uranium, granite, phosphate and shale.

While officials of the state Department of Environmental Resources and the state and geological surveys are quick to point out that the presence of these geological formations is not a guarantee that homeowners in those areas will find radon, they admit that there is more likelihood of radon concentrations in the shaded areas.

However, the permeability of the soil, how close the uranium is to the surface and the construction of the house all play major roles in the amount of radon gas which can seep into a home.

The map of the United States shows the possible scope of the national problem, while the map on page A9 outlines local areas which rest on crystalline granite formations containing uranium. The map was first drawn by the Department of Energy.

The Reading Prong, at the top of the opposite map, contains homes in which have been found

"the highest levels of radon concentration in the world," said Dr. Nero. The other two shaded areas, covering a large portion of Chester County, have similar geologic formations to the Reading Prong.

"The two areas are similar in rock features to the Prong, and the geological survey will be looking at it," said Tom Gerusky, director of the Bureau of Radiation for DER. "There's uranium in all of the eastern Pennsylvania counties."

Homeowners should realize, however, that it may be quite some time before DER begins to investigate the possibility of radon concentrations in any area except the Reading Prong. And there is no assurance that DER will pinpoint the Chester County areas for its next focus.

"When the (state) geological survey finishes its gamma radiation screening, they will give us their recommendations of when and how we are going to move out of the Prong," said DER spokesman Tim Hartman.

"My feeling is that we would like another heating season in the Reading Prong area," said Hartman. "It will be no sooner than a year or two years before we move out of the Prong area and start investigating other areas."

Working radon levels found in 16 schools

SOUTHERN LEHIGH

• Lower Milford Elementary School

• Hopewell Elementary School
• Southern Lehigh Senior High
• The Administration Building
— Those school buildings were found to contain radon concentrations above the .02 working level limit. That is all the information made available by the district.

SAUCON VALLEY

• Reinhard Elementary School
— No further information available.

There is also a parochial school in the Lower Saucon Valley area which was identified as having levels above the .02 limit, but no identification of that school has been made available.

Ironically, all of the schools in Boyertown Area School District, much of which sits directly on the Reading Prong, have been tested for radon concentrations and have been found to come within what the district considers "acceptable" working levels of .025.

The former Lincoln Elementary School on West Philadelphia Avenue in Boyertown has been closed because high radon levels were discovered in that school. The building was recently sold to private interests.

While public and parochial schools along the Reading Prong have been tested and those outside the Prong will be tested soon, Hartman said the DER has no plans to investigate day care centers or kinderschools in private homes.

"As of now, we're offering them the same thing we offered to the individual homeowners in the Reading Prong. We have Track-Etch monitoring devices that we will provide for free," said Hartman. "If day care centers in the Prong haven't requested a monitoring device, we urge them to do so."

"We could try to track down the day care centers which haven't requested testing," said Hartman. "But, right now, we're not considering doing that."

(Continued from page A1)

• Fogelsville Elementary
• Schnecksville Elementary
• Ironton Elementary — In all three cases, only certain areas in the school have been found to contain radon. June Rung, secretary to the superintendent, said no remediation is being planned at this time. They are in the process of long-range testing, as recommended by DER. There are a total of 10 schools in the district.

FLEETWOOD AREA

• Fleetwood Elementary — The entire school was tested and three areas showed minimal radon readings: the boiler room, cafeteria and kindergarten, said Superintendent Fred Serfass. The readings ranged from .022 to .025 working levels.

• Richmond Building — The entire building was tested and only the reading room had radon, at .021 working levels. All classrooms were tested and recorded no radon, or background levels at .002 working levels.

There are five buildings in the district, and the rest tested negative. Serfass indicated that the district is involved in long-range testing of the buildings.

BETHLEHEM

• Hartman said that Bethlehem has one school which tested above the .02 level and three others which were currently undergoing a three-month test. Dr. Louis Molnar, director of pupil personnel, said that DER testing was inconclusive, that other agencies were now checking the schools and that "no definite conclusions are available at this time."

EAST PENN

• Veracruz Elementary School — Radon was found in the library area in the cellar and remedial work is scheduled for the week of March 23, according to Cecelia Birdsall, secretary to the superintendent. There are a total of 12 buildings in the district and this is the only one contaminated with radon.

Testing devices have wide range of accuracy

By PETE SHELLEM
Mercury Staff Writer

PHILADELPHIA — With the publicity surrounding indoor radon contamination in the Reading Prong and most of the eastern United States, more and more people want to have their homes tested.

Seeing a booming market, the number of firms offering radon testing has been growing proportionately, and the Environmental Protection Agency plan to provide a

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At the conference on Indoor Radon Pollution sponsored last week at the Center City Holiday Inn by the Air Pollution Control Association, EPA presented a report on the degree of uncertainty found in six radon monitors during an 18-month study of 68 homes in Butte, Mont.

The results ranged from a 44-percent degree of uncertainty in instant grab samples, to an 8-percent factor of uncertainty in a three-month continuous monitoring device.

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This device is one of the most accurate, cost-effective methods for determining radon levels. It was rated at an 18 percent uncertainty factor — the probability of error in the testing procedure in three-month testing and 21 percent in one-month testing.

It can be obtained by contacting the Terradex Corp., 460 N. Wiget Lane, Walnut Creek, Calif., 94598.

• A faster, almost as accurate, device is a Diffusion Barrier

Environmental Resources has decided to start using the DBCAs for its monitoring program in an effort to save time and money.

The DBCA can be obtained for \$12 by writing to Dr. Bernard Cohen, Department of Physics, University of Pittsburgh, Pittsburgh, Pa. 15260.

Checks should be made payable to the University Alumni Association.

• RPISUs or Radon Progeny Integrated Sample Units, which look like a small vacuum cleaner, were rated at a 27 percent uncertainty level in the one week EPA test; 20

the consumer and are most likely cost-prohibitive.

• Five-minute grab samples are the fastest, but least accurate, means of measuring radon. ARIX Sciences in Pottstown will take five separate grab samples for about \$100. The working level test was rated at 44 percent uncertainty factor in the EPA study while the radon gas test was rated at 29 percent.

ARIX also performs tests on building sites which check the ground for radon levels that should be taken into consideration when

A new product presented at the radon conference was called the Air Chek radon sampler, which is a small packet of charcoal which is hung in the home for four days. It costs \$19.95 with results back in three to five weeks or \$29.95 with results in 10 to 15 days.

There is no available independent information on these devices, but the company's marketing literature says the device is calibrated by the Department of Energy Environmental Measurements Laboratory.

The Air Chek detector is available by writing P.O. Box 100, Penrose,

Radon

Remedies differ in cost, effectiveness

By PETE SHELLEM
Mercury Staff Writer

PHILADELPHIA — Along with the hordes of scientists and bureaucrats who have converged on the Reading Prong area to study indoor radon contamination, the problem has also attracted lots of private businesses trying to market radon testing and remediation methods.

Last week's conference on Indoor Radon Pollution at the Center City Holiday Inn offered an example of how radon testing and remediation has become big business.

The two-day meeting was almost like a trade show, with booths promoting new monitoring and ventilation devices, and one press conference on an alleged breakthrough in radon remediation.

The conference even began last Monday with a six-hour class to teach contractors how to measure radon, and participants included almost as many would-be radon entrepreneurs as researchers.

While there is no cure-all for ridding every home of radon, some of the remedial methods have met with much success under particular circumstances. Others are of questionable merit.

Before contracting or attempting any remediation measures, homeowners must understand that all homes are different and what works in one may not work in another. One of the cheapest, best ways to beat radon is to take it into consideration while building the house.

But, most of the homeowners who have discovered radon don't have that option and should consider consulting a recognized expert or the soon-to-be-released Environmental Protection Agency guidance manual to determine the best method for their home before attempting to undertake mitigation efforts.

There have been several reports of unscrupulous persons selling "discount, quick-fix" mitigation methods (such as something that looked like a No-Pest strip that the seller claimed would rid homes of radon by hanging it in the basement), so homeowners should be wary. Contact the DER or EPA or consult government-published literature before hiring a contractor.

There are four main ways to rid an existing home of radon: sealing, isolation, ventilation and filtration.

Sealing and isolation

Sealing cracks and holes in basement floors and walls is usually the first step to

try and can usually be performed by the homeowner. Silicon caulks and non-shrink grout are effective in sealing the obvious entry points of radon in a basement: cracks in the floors or walls, openings around pipes coming into the home, or gaps between the foundation and walls. Epoxy paints can also be used to seal porous concrete block walls and floors.

Not so obvious entry points can be identified by radon flux tests which are offered by various contractors.

If sealing does not reduce radon to safe levels, it can work in conjunction with other remediation techniques.

Isolating basements and crawl spaces through sealing and using vapor barriers can be effective in making the living areas of homes safe from radon. This process is usually more complicated than sealing holes and involves installing tightly sealed ceilings and walls in basements and crawl spaces to "quarantine" that area from the rest of the home.

Pressurization, or drawing outside air into the basement, has proven effective in attempts to isolate radon in the basement.

Ventilation

• Whole House Ventilation

Ventilation appears to be the most successful means of ridding most homes of radon. While the costs of various systems can range to the tens of thousands of dollars, some simple and inexpensive methods are available that work in a variety of situations.

Two major approaches to ventilation are actively venting the source or increasing overall house ventilation.

Increasing overall house ventilation can be as easy as opening windows, which has proven to reduce radon levels in some cases. But, opening windows stops being a viable alternative when fall and winter come along.

One answer to this problem is air-to-air heat exchangers, or balanced mechanical ventilation systems.

Bede Wellford, of NuTone Airxchange, which has done much research into mechanical ventilation on radon, says his product has additional benefits beyond removing radon. Indoor air pollution is a field in itself and there are other contaminants in the home such as formaldehyde and carbon monoxide which also pose a health hazard.

Wellford said the benefit of air exchange, which exhausts stale inside air and draws fresh outside air into the home

while transferring heat from the inside air to the outside air reduces all indoor contaminants along with radon.

The concentration of air contaminants, such as radon in the home is in inverse proportion to the air exchange rate. Nutone's system, which cost from \$800 to \$1,200 installed, gives air exchange rates of one to two air changes per hour with minimal heat loss.

Using this rate of air exchange, NuTone achieved approximately a 76 to 90 percent reduction in radon progeny using systems installed in the basements of 10 homes with radon basement working levels of .039 to 1.84.

The reduction in the upstairs areas of the homes was not as significant, so NuTone devised a ductwork system which distributes the fresh air to the upstairs and recirculates the air as it exhausts from the basement.

This second phase of the research project lessened the reduction in the basement, but increased radon reduction in the living areas, which is more important.

The systems cost about \$100 a year to operate and increase heating bills about \$100 to \$150 per season, according to Wellford.

Air-to-air heat exchangers seem to be a cost effective alternative for remediating homes with low to moderate radon levels. In conjunction with other systems or sealing, they can provide even better results.

The NuTone system is distributed in our area by Energy Resource Technology in Gilbertsville.

• Source Ventilation

One of the most successful programs in homes with almost any level of radon has been EPA's attempt to demonstrate inexpensive methods for controlling radon in 18 homes in the Boyertown area using active source ventilation.

Arthur Scott, president of DSMA Atcon Ltd., which is performing the project, and EPA's Bruce Henschel told the radon conference the project was successful in reducing radon, even in worst case homes, to safe levels in 20 percent of the homes at low costs.

"What about the other 80 percent?" Henschel asked. "We can do them, but the problem is keeping the costs down."

The project's success rate was seriously diminished by obstacles encountered in specific home construction. The program used three approaches to source ventilation: block wall ventilation, using fans to create suction on the voids in cinder block walls; drain tile ventilation, which in-

volves applying suction on existing perimeter drain tiles; and sub-slab ventilation, which involves sucking the gas from under the basement slab.

The EPA conclusions from the program found that wall ventilation was the most effective, but only when major openings in the walls (such as the top void of the block construction or brick veneer gaps) were easily accessible so they could be capped. Henschel said when these inlets were not accessible this technique failed because they could not reach the openings without extensive costs and the program's goal was to demonstrate cheap methods.

Drain tile ventilation was the preferred method because it is the least expensive. A drain tile, or perimeter drain, is a pipe that runs under ground around the perimeter of the basement under the ground for water drainage. Atcon dug down to the drain and attached a pipe and fan which comes above ground level and draws on the drain.

This method works when the drain tile completely surrounds the home. In homes which have basements partially above ground and only partial drain tiles, this method was not very effective.

Sub-Slab ventilation involves attaching the fan to a sump or other hole in the basement floor and channeling the gas outside. This method did not work in homes with block walls or without adequate aggregate under the slab. Another, more expensive sub-slab ventilation method not attempted by the EPA project is placing a perforated pipe under the slab and drawing gas from the pipe with a fan.

Contractors in this area who are performing these ventilation techniques are Bill Broadhead, of Buffalo Homes, in Riegelsville, and ARIX Sciences, which has offices in Pottstown. ARIX is more expensive than most other remediation contractors, but has a more experienced, professional staff and pays attention to detail in restoring homes to their original appearance after remediation.

While ARIX is generally associated with passive ventilation techniques, the company will use the active systems when it is necessary to keep costs at reasonable levels. The company also tries not to actually pull the gas from the soil and destroy the natural equilibrium.

Most contractors insist that the remedial technique used is site specific and most will offer an assessment and estimate.

ARIX charges around \$800 for a com-

plete radon source and mitigation assessment.

Filtration

Filtration does not, at this point, appear to be the answer to the radon problem. Not much research exists, but several companies have tried to demonstrate filtration devices with little or questionable success.

There is also some controversy over attached and unattached radon daughters. Some experts argue that the unattached daughters, which get through when the particles are filtered, are more harmful than the particle attached daughters.

Viskon-Aire, of Salisbury, Md., conducted a four-home demonstration project in the Boyertown area. The company claims a 75 to 97 percent reduction but the air purifier system has serious drawbacks.

The purifiers cost about \$750 and will only clean air in a 30 by 40 foot area, so several may be needed to do one home. Filters for the machine cost about \$70. The main drawback with the system is the fact that the carbon filters, which were touted to last six months to a year, had to be replaced about every month or the filters would collect the radiation and distribute it back into the home.

The filters could not legally be thrown out in the trash either, because of the radiation that collected in them. Legally, they had to be disposed of in a low-level radioactive waste site.

Another company, Control Resources Systems Inc., of Michigan City, Ind., claimed last week it had the solution to the radon problem using High Efficiency Particulate Absolute (HEPA) filters. The filters were created during the Manhattan Project in World War II to remove radioactive particulate from the air during the development of the atom bomb. The device is attached to a home's hot-air heating system.

The company has little test results to support its claims — it only tried the product on two homes and a 30 cubic foot chamber, and it was only successful on one home and the chamber. No long-term research has been conducted.

CRSI plans to perform demonstrations on seven more homes in the area and the results of these tests may show whether or not the system is worthwhile.

Filtration of water with carbon purification devices can be useful if it is determined that waterborne radon is a significant factor in the home environment.

Laboratory in California.

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Testing devices have wide range of accuracy

By PETE SHELLEM
Mercury Staff Writer

PHILADELPHIA — With the publicity surrounding indoor radon contamination in the Reading Prong and most of the eastern United States, more and more people want to have their homes tested.

Seeing a booming market, the number of firms offering radon testing has been growing proportionately, and the Environmental Protection Agency plan to provide a quality assurance program for radon detectors will help consumers in making a choice.

The most important things to look for when choosing a monitoring system are price and accuracy.

Experts agree that the longer the duration of the testing period, the more accurate the result will be because radon levels often fluctuate with such variables as wind, temperature, and barometric pressure and the activities of the occu-

pants of the house.

At the conference on Indoor Radon Pollution sponsored last week at the Center City Holiday Inn by the Air Pollution Control Association, EPA presented a report on the degree of uncertainty found in six radon monitors during an 18-month study of 68 homes in Butte, Mont.

The results ranged from a 44-percent degree of uncertainty in instant grab samples, to an 8-percent factor of uncertainty in a three-month continuous monitoring device.

In some cases, for instance when buying a home, the consumer doesn't have much time to perform the test, so less accurate tests are often required.

The following are tests currently available:

• Track-Etch detectors, the industry standard, is a small plastic cup which can be obtained for about \$25. The cup can be hung in the home for one to three months and must be sent to the manufacturer for evalu-

ation.

This device is one of the most accurate, cost-effective methods for determining radon levels. It was rated at an 18 percent uncertainty factor - the probability of error in the testing procedure in three-month testing and 21 percent in one-month testing.

It can be obtained by contacting the Terradex Corp., 460 N. Wiget Lane, Walnut Creek, Calif., 94598.

• A faster, almost as accurate, device is a Diffusion Barrier Charcoal Absorption (DBCA) Chamber, which sounds technical, but actually looks like a shoe polish can filled with charcoal.

The DBCA has a piece of tape covering a hole. The homeowner removes the tape and hangs the device in the basement for three days. It is then resealed and sent back for evaluation.

It was not rated in the EPA study, but the Pennsylvania Department of

Environmental Resources has decided to start using the DBCAs for its monitoring program in an effort to save time and money.

The DBCA can be obtained for \$12 by writing to Dr. Bernard Cohen, Department of Physics, University of Pittsburgh, Pittsburgh, Pa. 15260. Checks should be made payable to the University Alumni Association.

• RPISUs or Radon Progeny Integrated Sample Units, which look like a small vacuum cleaner, were rated at a 27 percent uncertainty level in the one week EPA test; 20 percent at one month and 16 percent at three months. They cannot be used by the average homeowner and usually must be set up by a contractor. The price of a sample was not available.

Continuous 24-hour monitoring received an 8 percent coefficient of error rating in the three-month EPA test but was not as efficient in shorter-duration tests. But, these devices are virtually inaccessible to

the consumer and are most likely cost-prohibitive.

• Five-minute grab samples are the fastest, but least accurate, means of measuring radon. ARIX Sciences in Pottstown will take five separate grab samples for about \$100. The working level test was rated at 44 percent uncertainty factor in the EPA study while the radon gas test was rated at 29 percent.

ARIX also performs tests on building sites which check the ground for radon levels that should be taken into consideration when building. These tests are valuable tools for builders because the cost of keeping radon out of a home is much lower than the cost of getting it out of an existing structure. These tests cost about \$145 if the buyer digs two 8-foot holes for the monitor. The price includes a gamma reading of the entire property and suggestions about keeping radon out of the home.

A new product presented at the radon conference was called the Air Chek radon sampler, which is a small packet of charcoal which is hung in the home for four days. It costs \$19.95 with results back in three to five weeks or \$29.95 with results in 10 to 15 days.

There is no available independent information on these devices, but the company's marketing literature says the device is calibrated by the Department of Energy Environmental Measurements Laboratory.

The Air Chek detector is available by writing P.O. Box 100, Penrose, N.C. 28766 or calling 1-800-CK RADON.

The most important factor brought out by the EPA study is that the uncertainty factor of any testing device decreases as the duration of the sampling time increases.

The EPA's conclusion was that 24 hours is the minimum testing time to make a decision on what action to take.

Radon

Remedies differ in cost, effectiveness

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But, most of the homeowners who have discovered radon don't have that option and should consider consulting a recognized expert or the soon-to-be-released Environmental Protection Agency guidance manual to determine the best method for their home before attempting to undertake mitigation efforts.

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Sealing and isolation

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try and can usually be performed by the homeowner. Silicon caulks and non-shrink grout are effective in sealing the obvious entry points of radon in a basement: cracks in the floors or walls, openings around pipes coming into the home, or gaps between the foundation and walls. Epoxy paints can also be used to seal porous concrete block walls and floors.

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Wellford said the benefit of air exchange, which exhausts stale inside air and draws fresh outside air into the home

while transferring heat from the inside air to the outside air reduces all indoor contaminants along with radon.

The concentration of air contaminants, such as radon in the home is in inverse proportion to the air exchange rate. Nutone's system, which cost from \$800 to \$1,200 installed, gives air exchange rates of one to two air changes per hour with minimal heat loss.

Using this rate of air exchange, NuTone achieved approximately a 76 to 90 percent reduction in radon progeny using systems installed in the basements of 10 homes with radon basement working levels of .039 to 1.84.

The reduction in the upstairs areas of the homes was not as significant, so NuTone devised a ductwork system which distributes the fresh air to the upstairs and recirculates the air as it exhausts from the basement.

This second phase of the research project lessened the reduction in the basement, but increased radon reduction in the living areas, which is more important.

The systems cost about \$100 a year to operate and increase heating bills about \$100 to \$150 per season, according to Wellford.

Air-to-air heat exchangers seem to be a cost effective alternative for remediating homes with low to moderate radon levels. In conjunction with other systems or sealing, they can provide even better results.

The NuTone system is distributed in our area by Energy Resource Technology in Gilbertsville.

• Source Ventilation

One of the most successful programs in homes with almost any level of radon has been EPA's attempt to demonstrate inexpensive methods for controlling radon in 18 homes in the Boyertown area using active source ventilation.

Arthur Scott, president of DSMA Atcon Ltd., which is performing the project, and EPA's Bruce Henschel told the radon conference the project was successful in reducing radon, even in worst case homes, to safe levels in 20 percent of the homes at low costs.

"What about the other 80 percent?" Henschel asked. "We can do them, but the problem is keeping the costs down."

The project's success rate was seriously diminished by obstacles encountered in specific home construction. The program used three approaches to source ventilation: block wall ventilation, using fans to create suction on the voids in cinder block walls; drain tile ventilation, which in-

volves applying suction on existing perimeter drain tiles; and sub-slab ventilation, which involves sucking the gas from under the basement slab.

The EPA conclusions from the program found that wall ventilation was the most effective, but only when major openings in the walls (such as the top void of the block construction or brick veneer gaps) were easily accessible so they could be capped. Henschel said when these inlets were not accessible this technique failed because they could not reach the openings without extensive costs and the program's goal was to demonstrate cheap methods.

Drain tile ventilation was the preferred method because it is the least expensive. A drain tile, or perimeter drain, is a pipe that runs under ground around the perimeter of the basement under the ground for water drainage. Atcon dug down to the drain and attached a pipe and fan which comes above ground level and draws on the drain.

This method works when the drain tile completely surrounds the home. In homes which have basements partially above ground and only partial drain tiles, this method was not very effective.

Sub-Slab ventilation involves attaching the fan to a sump or other hole in the basement floor and channeling the gas outside. This method did not work in homes with block walls or without adequate aggregate under the slab. Another, more expensive sub-slab ventilation method not attempted by the EPA project is placing a perforated pipe under the slab and drawing gas from the pipe with a fan.

Contractors in this area who are performing these ventilation techniques are Bill Broadhead, of Buffalo Homes, in Riegelsville, and ARIX Sciences, which has offices in Pottstown. ARIX is more expensive than most other remediation contractors, but has a more experienced, professional staff and pays attention to detail in restoring homes to their original appearance after remediation.

While ARIX is generally associated with passive ventilation techniques, the company will use the active systems when it is necessary to keep costs at reasonable levels. The company also tries not to actually pull the gas from the soil and destroy the natural equilibrium.

Most contractors insist that the remedial technique used is site specific and most will offer an assessment and estimate.

ARIX charges around \$800 for a com-

plete radon source and mitigation assessment.

Filtration

Filtration does not, at this point, appear to be the answer to the radon problem. Not much research exists, but several companies have tried to demonstrate filtration devices with little or questionable success.

There is also some controversy over attached and unattached radon daughters. Some experts argue that the unattached daughters, which get through when the particles are filtered, are more harmful than the particle attached daughters.

Viskon-Aire, of Salisbury, Md., conducted a four-home demonstration project in the Boyertown area. The company claims a 75 to 97 percent reduction but the air purifier system has serious drawbacks.

The purifiers cost about \$750 and will only clean air in a 30 by 40 foot area, so several may be needed to do one home. Filters for the machine cost about \$70. The main drawback with the system is the fact that the carbon filters, which were touted to last six months to a year, had to be replaced about every month or the filters would collect the radiation and distribute it back into the home.

The filters could not legally be thrown out in the trash either, because of the radiation that collected in them. Legally, they had to be disposed of in a low-level radioactive waste site.

Another company, Control Resources Systems Inc., of Michigan City, Ind., claimed last week it had the solution to the radon problem using High Efficiency Particulate Absolute (HEPA) filters. The filters were created during the Manhattan Project in World War II to remove radioactive particulate from the air during the development of the atom bomb. The device is attached to a home's hot-air heating system.

The company has little test results to support its claims — it only tried the product on two homes and a 30 cubic foot chamber, and it was only successful on one home and the chamber. No long-term research has been conducted.

CRSI plans to perform demonstrations on seven more homes in the area and the results of these tests may show whether or not the system is worthwhile.

Filtration of water with carbon purification devices can be useful if it is determined that waterborne radon is a significant factor in the home environment.

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found in 16 oct...