Standards for Airborne Radon in Buildings

Houses built on uranium mine wastes in U.S.		Must be below 3 pCi/l
Phosphate mining regions in Florida	4 pCi/l	Take remedial action
	2 pCi/l	Reduce to as low as reasonably feasible
Uranium mining	30 pCi/l	Take prompt remedial action
	4 pCi/l	Take remedial action
	2 pCi/l	Investigate
Sweden (maximum levels permitted)	11 pCi/l	Existing buildings
	5 pCi/l	Houses undergoing remodeling
	2 pCi/l	New houses
Union of Concerned Scientists	5 pCi/l	Remedial action indicated
	2–5 pCi/l	Remedial action suggested

Table 1: Recommendations about radon in buildings vary widely, both as to what levels warrant concern and as to what actions should be taken.

presence of radiation, long-term health may suffer.

We know a great deal about the effects of high doses of radiation on human beings. This information comes from studies of A-bomb survivors, uranium miners, occupational hazards, accidents, and persons treated with radiation therapy.

But we know little about the effects of low-dose radiation in the home. A higher risk of cancer is suspected. But to date, no direct evidence links radon exposure in the home to higher cancer rates.

Higher cancer rates among uranium mine workers are the main reason for concern over radon in the home. For example, living for 60 years in a home with an airborne radon level of 10 picoCuries per liter (pCi/l), exposes you to a radon dose comparable to that faced by a uranium miner considered at risk for lung cancer. Some evidence suggests that miners have increased lung-cancer rates from exposures equivalent to living in a house for 20 years with airborne radon levels of 2 pCi/l—a more typical household level. But other environmental hazards in mines, ranging from diesel fuel to cigarette smoke, make it impossible to predict the cancer risk in homes accurately based on mine studies.

The connection of low radon levels and higher cancer risk is full of uncertainties. And when exposure to airborne radon is mixed with smoking or other environmental contaminants, the health effects are still more unpredictable and may build on each other.

Some researchers estimate the risk of dying from lung cancer as a result of breathing airborne radon to be a 1-percent increase for each 4 pCi/l of lifetime exposure. Laws limit uranium mine levels to a maximum of 66 pCi/l.

At this point, it's up to each of us to judge the significance of health risks from radon in a home. In most cases, there is no urgency. The uncertainties surrounding the health effects of low-level radiation have made scientists and government agencies wary about setting standards for airborne radon. But there are standards. The lack of a solid scientific basis for a standard is hinted at by the variety of actions authorities suggest for dealing with low levels of radon. Table 1 shows several standards currently in use.

Detecting radon

Passive detectors and devices that give immediate readings can measure radon levels in the water and air. In some states, public health departments can measure wellwater, but the sample must be properly collected. Call local or state health authorities to find out whether they offer this service.

You can get passive track-etch monitors for air, water, and soil from some state public health laboratories and from Terradex, a manufacturer in California. You leave these devices in place for one to six months for collection and then return them to the testing lab for analysis.

Specialized counting devices such as the Wrenn meter are known as near-real-time monitors. They give results almost immediately. But this equipment is expensive. Few institutions except those doing research in the field own them.

What can be done about it

Remedial Action. If you find high airborne radon levels in a house the next step is to spot its sources. Does it come from the wellwater, soil gas, building materials, or some combination of these?

Once you identify the main sources you can make a plan of action. Where wellwater is in the 10,000-to-15,000 pCi/l range or higher, many health authorities recommend that the homeowner install a control system that uses activated carbon or spray aeration. These systems cost $500 to $1000 and will remove 85 to 99 percent of the radon from the water.

There are many ways to lower high airborne radon levels that come from soil gas. These include sealing the pathways of soil gas entry (with or without adding ventilation beneath the sealed floorslab), increasing whole-house ventilation (with or without air-to-air heat exchangers), and ventilating sealed-off areas such as crawlspaces and basements. There is evidence that filtering dust out of the air helps, since it reduces the level of radon daughters, which attach to dust particles. This remains unproven and controversial.

Sealing floor slabs with caulks and epoxy, sub-slab ventilation, and spot-venting sump holes and drains are strategies that have