
CONSTRUCTION CONTRACTORS CONFRONT THE INDOOR RADON HAZARD: HOMEOWNERS' PRIVATE CAUSES OF ACTION AND A FEDERAL RESPONSE WITH THE INDOOR RADON ABATEMENT BILL

I. INTRODUCTION

In recent years, many residential homeowners have suffered a personal health hazard from indoor radon exposure. Studies indicate that indoor radon exposure is the leading cause of lung cancer after cigarette smoking¹ and estimates show radon exposure is responsible for 5,000 to 20,000 lung cancer deaths in the United States annually.² One

1. Note, *Clearing the Air on Radon Testing: The Duty of Real Estate Brokers to Protect Prospective Homebuyers*, 15 FORD. URB. L.J. 767, 768 (1987). Radon exposure represents the second leading cause of lung cancer after cigarette smoking. USA Today, Sept. 13, 1988, at 1, col. 1. The Environmental Protection Agency (EPA) estimates that out of 130,000 lung cancer deaths in 1986, 5,000-20,000 can be attributed to radon. U.S. ENVIRONMENTAL PROTECTION AGENCY AND THE U.S. CENTERS FOR DISEASE CONTROL, PUB. NO. OPA-86-004, A CITIZEN'S GUIDE TO RADON: WHAT IT IS AND WHAT TO DO ABOUT IT (1986) [hereinafter A CITIZEN'S GUIDE TO RADON].

2. See A CITIZEN'S GUIDE TO RADON, *supra* note 1, at 1. Besides the EPA's study, some researchers attribute as many as 30,000 deaths each year to radon exposure. See RADON DETECTION, MEASUREMENT & ABATEMENT (pamphlet issued by Radon Engineering, a unit of PSI Engineering, Inc.). To put 20,000 annual radon deaths into perspective, this figure represents more than half the number of traffic fatalities in the country each year. Kass & Gerard, *Real Estate Transactions and Radon*, N.Y.L.J., July 15, 1987, at 1-2, col. 1. Moreover, the EPA ranks it as the environmental problem posing the highest risk of cancer. *Id.* at 2, col. 1. Indoor radon exposure far exceeds radiation exposure from nuclear power plants. Radon levels have even been compared

study suggests that some Americans receive fifty times more exposure to radiation in their homes than they receive from other sources, such as the nuclear power industry.³ Until recent years, many families were unaware that this carcinogen existed at dangerous levels within their homes.⁴ Surprisingly, almost every house contains radon and by 1986, up to twelve percent of the country's seventy-five million homes contained enough radon to warrant remedial action.⁵

Because the radon problem escaped detection for so long, scant legislative and administrative action addressed this health hazard at the state and federal levels. Even the Environmental Protection Agency (EPA) disclaimed authority to regulate indoor radon pollution.⁶

to the "equivalent of having a Three Mile Island accident . . . occur in the neighborhood every week." Cross & Murray, *Liability For Toxic Radon Gas in Residential Home Sales*, 66 N.C.L. REV. 687, 688 (1988) (quoting Nero, *The Indoor Radon Story*, TECH. REV., Jan. 1986, at 28).

3. *U.S. Spending on Radiation Dangers Is Skewed*, N.Y. Times, Dec. 6, 1985, at A34, col. 3 (letter from Bernard L. Cohen, Professor of Physics, University of Pittsburgh). Even more shocking, people living near nuclear power plants receive greater radiation exposure in one day from radon than they receive in one year from nuclear power plants. *Id.*

4. Note, *Radon Gas: Contractor Liability for an Indoor Health Hazard*, 12 AM. J. LAW & MED. 241, 241-42 (1986). Radon contamination actually gained national attention in December 1984 when Stanley Watras discovered radon in his Boyertown, Pa. home. Galen, *Lawyers Grapple With Radon Issue: Litigation Surge Likely*, NAT'L L.J., July 21, 1986, at 1, col. 1. Mr. Watras began setting off radiation alarms at his job at a nuclear power plant. After confirming that he was not receiving radiation from his job, he tested his home and discovered that his family was breathing radon-contaminated air as dangerous as smoking 135 packs of cigarettes a day. *Id.*

5. *Perils of Radon and Ignorance*, L.A. Daily J., Sept. 2, 1986, at 4, col. 1. More recently, the EPA estimated that approximately 10 percent of U.S. homes had radon concentrations exceeding EPA guidelines. H. Greenberg, *Radon, Measurement and Reduction*, MOBILITY, January 1989, at 37. Data collected from 20,000 homes in New Jersey alone indicated that as many as three in every ten homes contained elevated radon levels. *Id.*

6. Bart, *Proposed Federal Legislation in Response to Radon Hazards*, 17 REAL EST. L.J. 163 (1988). Although the Clean Air Act establishes a detailed program to control air quality and allows the EPA to promulgate regulations for any air pollutant, the Act does not specify if regulation extends to indoor air such as radon-contaminated air. Kirsch, *Beyond Closed Doors: Indoor Air Pollution and Government Policy*, 6 HARV. ENVTL. L. REV. 339, 363-65 (1982). See generally Clean Air Act, 42 U.S.C. §§ 7401-7462 (1982). The EPA has expressed conflicting views concerning its authority to regulate indoor air quality and has refrained from issuing any such regulation. Kirsch, *supra* at 363-65.

Prior to the Indoor Radon Abatement Bill in 1988, the Radon Gas and Indoor Quality Research Act of 1986 authorized the EPA to research the indoor radon hazard. Congress passed the Act as Article IV of the Superfund Amendments and Reauthoriza-

Hence, once radon contamination received nation-wide attention, the previously unrecognized threat of liability arose, giving homeowners an avenue of relief for consequences of radon contamination. Specifically, homeowners seeking legal redress for radon exposure might resort to common law tort remedies. Construction contractors of residential homes thus emerge as potential defendants.⁷ This Note examines con-

tion Act of 1986, Pub. L. No. 99-499, §§ 401-05, 100 Stat. 1613, 1758-60 (1986) codified at 42 U.S.C. § 7401 (1982 & Supp. IV 1986), Under the Radon Gas and Indoor Quality Research Act, the EPA Administrator established a program researching radon gas and indoor air quality. The EPA designed a program to "gather data and information on all aspects of indoor air quality in order to contribute to the understanding of health problems associated with the existence of air pollutants in the indoor environment." Radon Gas and Indoor Air Quality Research Act of 1986, Pub. L. No. 99-499, § 403(a)(1), 100 Stat. 1758-59 (1986). The research program included:

(1) research and development concerning identification, characterization, and monitoring of the sources and levels of indoor air pollution, including radon, which includes research and development relating to—

(A) the measurement of various pollutant concentrations and their strengths and sources,

(B) high-risk building types, and

(C) instruments for indoor air quality data collection;

(2) research relating to the effects of indoor air pollution and radon on human health . . .

. . . .

(4) demonstration of methods for reducing or eliminating indoor air pollution and radon, including sealing, venting, and other methods that the Administrator determines may be effective. . . .

Radon Gas and Indoor Air Quality Research Act of 1986, Pub. L. No. 99-499, § 403(b), 100 Stat. 1758-59 (1986).

The Act did not authorize any type of federal regulatory program because "[n]othing in (the) title . . . authorized the Administrator to carry out any regulatory program or any activity other than research, development, and related reporting, information dissemination, and coordination activities. . . ." *Id.* at § 404. The Act succeeded, however, in requiring the EPA to establish specific goals addressing the radon problem.

Recently, the EPA released research results which indicated elevated radon levels in 21% of 11,600 homes tested. Bart, *supra*, at 164. The EPA surveyed the states of Alabama, Colorado, Connecticut, Kansas, Kentucky, Michigan, Rhode Island, Tennessee, Wisconsin and Wyoming. *Id.* at n.3. The states revealing the two highest readings were Alabama, recording 6% over the recommended level and Michigan, recording 9% over the recommended level. *Id.* at n.4.

7. An attorney who writes and lectures on indoor air pollution has commented that "litigation involving indoor radon is definitely a growing area and . . . there is a group of possible defendants that is very concerned: manufacturers of building products such as bricks and concrete, . . . building contractors, (and) ventilation contractors. . . ." Galen, *supra* note 4, at 8, col. 3 (quoting Laurence S. Kirsch). As a result, litigation concerning naturally occurring radon is steadily on the upswing. *Id.* at 8, col. 4. See also *New Accountability for Realty Agents: Coast Case Raises Their Liability for Defects in Property*, N.Y. Times, Nov. 9, 1986, § 8 at 22, col. 3 (comment from claims adjusting expert,

struction contractor liability for residential radon exposure and reviews the recently enacted Indoor Radon Abatement Bill. Part II discusses the nature and history of the radon hazard. Part III explores the principal common law theories of liability that construction contractors face: negligence, products liability, breach of implied warranty of habitability and fraud. This Note also considers possible defenses available to construction contractors under each theory. Finally, Part IV reviews Congress' enactment in October 1988 of the Indoor Radon Abatement Bill (the Bill) and analyzes the current and future status of construction contractor liability in light of the Bill.

II. THE NATURE AND HISTORY OF THE RADON HAZARD

A. Sources and Concentration Levels

Radon is an odorless, radioactive gas common in the atmosphere throughout the world.⁸ Uranium, a common trace element⁹ in rocks such as granite, shale, and limestone, produces radon.¹⁰ Because of its volatility, radon dissipates quickly into the atmosphere and concentrates in soil, oceans, groundwater and vegetation.¹¹ As it dissipates, radon decomposes, emitting alpha particles.¹² When the emitted alpha particles strike the human body, they damage exposed human tissue, possibly causing cancer in the tissue.¹³ The buildup of harmful alpha particles within a building creates indoor radon exposure which threat-

Frederick J. Fisher that "it is only a matter of time before similar suits start occurring elsewhere in the country, probably in the Northeast involving radon contamination.")

8. Cross & Murray, *supra* note 2, at 687.

9. Note, *supra* note 4, at 242. "A trace element is an element commonly found in minerals in concentrations of less than one percent." *Id.* at n.5.

10. *Id.* at 242. Brick and concrete are composed of these rocks. *Id.* Further, the construction industry frequently uses granite and limestone for building and walkway construction. *Id.*

11. *Id.* at 243.

Radon is a radioactive gas formed by decay of radium which is formed in turn by the decay of uranium that is naturally present in rocks and soil in many parts of the United States. Since radium and uranium are common elements in rock and soil, radon is being constantly generated everywhere.

Hearings On Radon and Indoor Air Pollution Before the Subcomm. On Natural Resources, Agriculture Research and Environment of the House Comm. on Science and Technology, 99th. Cong., 1st Sess. 117 (1985) [hereinafter *Radon Hearings*] (statement of Sheldon Meyers, EPA director for the Office of Radiation Programs).

12. Note, *supra* note 4, at 243.

13. Cross & Murray, *supra* note 2, at 690.

ens individual health.¹⁴ Indoor radon emits from three distinct sources: (1) building materials containing radioactive elements; (2) radon-contaminated water or natural gas in the home; and (3) the ground beneath residential homes.¹⁵ Although concrete blocks or bricks constitute the most likely source of radon, these building components are not the dominant source.¹⁶ In certain parts of the country, groundwater or gas can contain high radiation levels, but water and natural gas only constitute approximately three percent of the average concentration throughout the country.¹⁷ By far, radon in the ground beneath residential homes constitutes the primary source of indoor radon exposure.¹⁸ Because virtually all soils emit radon gas, the gas diffuses into homes through various pathways and causes contamination.¹⁹

Scientists generally use two methods to measure radon concentration levels. First, nuclear physicists measure concentrations in terms of the amount of radioactive particles that decompose per second.²⁰ Then, they measure the resulting measure of concentration by the number of decompositions per second for each liter of air.²¹ This measurement is called a picoCurie per liter (pCi/L).²² The EPA's original radon research suggested that home radon concentrations in excess of 4 pCi/L

14. *Id.* Although radon exposure from outside sources is a common risk, dispersion of the harmful particles into the atmosphere vitiates this risk. *Id.*

15. *Id.* See also A CITIZEN'S GUIDE TO RADON, *supra* note 1, at 4.

16. Cross & Murray, *supra* note 2, at 691. Experts believe that concrete accounts for only up to ten percent of indoor radon exposure. *Id.* Even though materials utilized in a building structure can contribute to substantial indoor concentrations, this is not usually the case. *Id.* (quoting Nero, *Indoor Concentrations of Radon-222 and Its Daughters: Sources, Range and Environmental Influences*, INDOOR AIR AND HUMAN HEALTH 43, 49 (1985)).

17. Cross & Murray, *supra* note 2, at 691. However, water can be a major contributor to high indoor concentrations of radon. *Id.* For instance, radon levels in water are highest when water is supplied privately and found in Appalachia, New England and Piedmont. In some instances, radon-contaminated water can account for up to 35% of the difference between indoor and outdoor radon levels. *Id.* at n.26 (citing *Radon in Homes*, 258 J.A.M.A. 668, 669-70 (1987)).

18. Cross & Murray, *supra* note 2, at 692. See also *Radon Hearings*, *supra* note 11, at 184 (according to Professor Richard Wilson of Harvard, "(t)he real hazards, then, are building on ground with high levels of radon, such as . . . inadequate basement sealing.").

19. Cross & Murray, *supra* note 2, at 692.

20. Comment, *Radon: An Environmental Problem That Is Too Close to Home*, 4 J. CONTEMP. HEALTH L. & POLICY 415, 416 (1988).

21. *Id.*

22. *Id.*

significantly increased the risk of developing cancer.²³ This standard, however, is disputed and not dispositive as a health-based standard.²⁴ Nevertheless, past EPA policy recommended remedial action within several months when radon levels reached between 20 and 200 pCi/L and recommended action within a few years when levels reached between 4 and 20 pCi/L.²⁵

The second method, termed a "Working Level" (WL), measures the amount of alpha-ray energy in the air.²⁶ The EPA considers .02 WL as a safe measure of radon.²⁷ One national survey of indoor radon levels estimated that national median indoor radon levels were roughly 0.015 WL.²⁸ Studies also revealed that roughly one million homes averaged

23. *Id.* EPA scientists estimate that if 100 individuals are exposed to 4 pCi/L over a 70-year period, between one and five of them will contract lung cancer. New Jersey Department of Environmental Protection, *Information You Should Know About Radon* (pamphlet).

24. Comment, *supra* note 20, at 416. Bernard Cohen, a University of Pittsburgh physicist, views the 4 pCi/L standard as arbitrary. One radon testing company will not recommend remedial measures until the level reaches 80 pCi/L. *Id.* at 417. Moreover, the legislative history of the Indoor Radon Abatement Bill suggests that although the EPA utilized this standard in its original radon research, the EPA did not really consider 4 pCi/L as a health-based standard. See *infra* notes 173-78 and accompanying text (discussion of the EPA considerations). More drastically, scientists and government officials assume that there is no completely safe level of radon exposure because any level of exposure to radiation, no matter how low, can cause cancer. Cross & Murray, *supra* note 2, at 696. See also 52 Fed. Reg. 2822, 2824 (1987) ("there is no completely risk-free level of exposure").

25. Comment, *supra* note 20, at 417.

26. *Id.* A "working level is defined as any combination of the short half life radon decay products which ultimately emits 1.3×10^5 million electron volts of alpha-ray energy in one liter of air." *Radon Hearings, supra* note 11, at 27 (from report of the Office of Radiation Programs U.S. EPA). See Cross & Murray, *supra* note 2, at 695 n. 48 (assuming certain equilibrium conditions, 1 WL equals 100 pCi/L of radon).

27. Comment, *supra* note 20, at 417. Comparable risks at this level and 4 pCi/L are 200 chest x-rays per year. For levels above 1.0 WL or 200 pCi/L, the EPA recommends temporary relocation if occupants start to remedy the problem within a few weeks. At levels above 1.0 WL or 200 pCi/L, the cancer risk is sixty times the non-smoker risk which also represents a four pack a day smoker. Moreover, these levels represent a greater risk than 20,000 chest x-rays per year. Note, *supra* note 1, at 769 n. 11.

28. Cross & Murray, *supra* note 2, at 695. Higher measurements ranging from 0.1 to 1.0 WL occur frequently. *Id.* One Pennsylvania home recorded Working Levels of 13.5 in the basement, 12.4 in the family room and 8.0 in various other rooms. *Id.* See *supra* note 4 (discusses the Watras family). Such an environment adds "an annual risk of death due to lung cancer of 13% and a lifetime risk of 585%. This is equivalent to smoking 135 packs of cigarettes a day or having 455,000 chest x-rays per year." *Radon Hearings, supra* note 11, at 92. In another finding, a Clinton, New Jersey resident dis-

radon concentrations of 0.08 WL.²⁹

Prior to the discovery of radon gas in homes, studies of underground uranium miners linked radon and cancer.³⁰ The miners had a lung cancer mortality rate of 75 percent.³¹ Initial discoveries of radon in homes occurred in the late 1960's when builders constructed houses in Colorado atop waste products from uranium mines.³² Later discoveries revealed extensive radon contamination in the Reading Prong, a geographical extension through Pennsylvania, New Jersey and New York.³³ Parts of New England, Florida and the Appalachian Moun-

covered radon levels in his basement exceeding four times the EPA's recommended limit and comparable to having 1500 chest x-rays annually. Uehling, *Radon Gas: A Deadly Threat*, Newsweek, Aug. 18, 1986, at 60. For an estimated one million homes with annual radon exposure of 2 WLM (a "working level month" representing exposure to a WL for approximately 170 hours), the individual lung cancer risk from residing in the home for one year exceeds one in twenty-five hundred. The lifetime risk is one in fifty. Cross & Murray, *supra* note 2, at 697. The average home has a 0.3 WLM exposure level representing a one in three hundred lifetime cancer risk. *Id.* Although the radon concentration recommended measures are not dispositive as health-based standards, these measures do represent guidelines for the courts. See *Union Carbide Corp. v. Industrial Commission*, 196 Colo. 56, 59, 581 P.2d 734, 738 (1978) (radiation exposure at a concentration 70% greater than the federal exposure level effective at the time held sufficient to impose liability).

29. Cross & Murray, *supra* note 2, at 695.

30. Galen, *Health Dangers That 'Put Everything Else to Shame*, NAT'L L.J., July 21, 1986, at 8, col. 2. Miners have been exposed to radiation concentrations on the order of 1 to 20 working levels. Kirsch, *supra* note 6, at 346 n.50. Prior to the knowledge of home radon contamination, radon was thought only to pose a major problem to uranium miners, mining companies and the EPA. See, e.g.: *Begay v. Kerr-McGee Corp.*, 499 F. Supp. 1317 (D. Ariz. 1980) (suit by uranium mining company for personal injury from radon exposure at defendant's mining operations); *Oil, Chemical and Atomic Workers Int'l Union v. Zegeer*, 768 F.2d 1480 (D.C. Cir. 1985) (suit brought by uranium miners exposed to radon gas); *American Mining Co. v. Thomas*, 772 F.2d 640 (10th Cir. 1985) (challenge to EPA standards for stabilization and control of by-products at uranium processing site). See also EPA Proposed Clean Air Act Standards to Control Radon-222 Emissions from Uranium Mill Tailings Plants, 51 Fed. Reg. 6382 (1986) (addresses standards related to controlling disposal of mill tailings which are waste products of uranium).

31. Galen, *supra* note 30, at 8, col. 2.

32. Kass & Gerard, *supra* note 2, at 2, col. 2.

33. *Id.* at 2, col. 1. In fact, 40% of homes surveyed in the Pennsylvania area contained high concentrations of radon gas. Note, *supra* note 4, at 245. Compared to the EPA recommended WL of 0.02, the average WL on the Reading Prong has measured 0.065 WL. Some values in various counties located on the Reading Prong have measured as follows: Lehigh-0.060 WL, Northampton-0.076 WL, Berks-0.069 WL and Bucks-0.059 WL. Note, *supra* note 4, at 247 n.51. The New Jersey Department of Environmental Protection estimated that 250,000 New Jersey homes faced indoor radon exposure. Comment, *supra* note 20, at 419.

tains also exhibited high concentrations.³⁴ However, the risk of high indoor radon levels is a national phenomenon and, because of the frequency and unpredictability of its occurrence, the EPA recommends testing for every American household.³⁵

B. *Home Testing Methods and Remedial Measures*

Today, readily available means exist to test home radon levels. The two most common testing devices are the charcoal canister and the alpha track detector.³⁶ The charcoal canister remains in a house for three to seven days after which it goes to a laboratory for a radon count.³⁷ The price of the canister ranges from ten to twenty-five dollars.³⁸ This test is not foolproof, however, because tampering with canisters is relatively easy.³⁹ The alpha track detector remains in a home for two to four weeks before it undergoes laboratory analysis.⁴⁰ This test costs from twenty to fifty dollars.⁴¹ Using a third method, contractors can test soil gas levels of undeveloped land by sinking pipes into the ground.⁴²

If tests disclose high levels of radon, remedial measures can alleviate the problem. First, sealing holes and cracks in basement floors can effectively reduce the amount of radon gas that enters a home.⁴³ Sec-

34. Kass & Gerard, *supra* note 2, at 2, col. 1. Specifically, studies have revealed high indoor radon levels in New Hampshire, Maine, Florida, Idaho, Montana, North Carolina, South Carolina, Georgia, Texas, California and Washington. Note, *supra* note 4, at 247 n.54.

35. See Berreby, *The Radon Raiders: Turning Perils Into Profits*, N.Y. Times, July 26, 1987, § 3, at 6, col. 2.

36. A CITIZEN'S GUIDE TO RADON, *supra* note 1, at 5.

37. *Id.*

38. *Id.*

39. Kass & Gerard, *supra* note 2, at 2, col. 3. The canisters can be placed outdoors or near an open window where radon levels are almost always far lower. *Id.* at col. 3-4. Conceivably, construction contractors or real estate brokers could tamper with the charcoal canisters in an attempt to sell homes purporting to have safe radon levels.

40. A CITIZEN'S GUIDE TO RADON, *supra* note 1, at 5.

41. *Id.* Since radon levels vary from season to season and room to room, a screening method only reveals a potential radon problem. *Id.* at 6-7. The EPA recommends follow-up measurement periods ranging from one week to one year. *Id.*

42. Kass & Gerard, *supra* note 2, at 2, col. 4.

43. Comment, *supra* note 20, at 418. Sealing holes and cracks, however, has significant limitations because sealing every possible entry point proves difficult. However, the use of sealants may be the most cost-effective response to indoor radon since the cost runs less than \$750 for a one-time application. Cross & Murray, *supra* note 2, at 700.

ond, proper ventilation throughout a home can prevent radon buildup.⁴⁴ Third, a device placed below a home's foundation can redirect radon's entrance and disperse it into the air.⁴⁵ Depending on the severity of contamination and the construction of the house, remedial measures cost anywhere from one hundred to five thousand dollars.⁴⁶

Homeowners residing in radon-contaminated homes experience approximately a twenty year latency period before potential discovery of cancer.⁴⁷ Because radon discovery in homes is relatively recent, researchers know little about radon's effect on people living in houses containing high radon levels.⁴⁸ However, evidence of radon's effect on uranium miners⁴⁹ suggests that homeowners in radon-contaminated homes face cancer risks as well. Because of radon's latency period, little litigation exists to date. Nevertheless, injured homeowners may seek relief under several theories of liability.

III. THEORIES OF CONTRACTOR LIABILITY

Although several groups emerge as potential defendants in lawsuits concerning indoor residential radon contamination,⁵⁰ construction

44. Comment, *supra* note 20, at 418. Increased ventilation may be the most effective means of reducing indoor radon concentrations. Cross & Murray, *supra* note 2, at 700. However, with increasing energy costs and adverse effects on homeowner comfort, this can be an impractical remedy. *Id.* at 700-01. Additionally, increased ventilation may prove the most costly remedial measure with annual costs approximating \$500. *Id.* at 701.

45. Comment, *supra* note 20, at 418. An EPA-sponsored study disclosed that installation of a powerful fan beneath a house or in the basement could lower radon levels by more than 97%. Cross & Murray, *supra* note 2, at 701. Although initial installation costs range from \$1000 to \$2000, annual operating costs approximate only \$140. *Id.* at n.98.

46. Kass & Gerard, *supra* note 2, at 2, col. 4. The EPA suggests varying methods to reduce radon exposure including natural ventilation, forced ventilation, air supply, heat recovery ventilation, sealing cracks and openings and covering exposed earth. Cross and Murray, *supra* note 2, at 769. For the EPA's detailed discussion of radon reduction methods, see U.S. ENVIRONMENTAL PROTECTION AGENCY, Pub. No. OPA-86-005, RADON REDUCTION METHODS: A HOMEOWNER'S GUIDE (1986).

47. Kass & Gerard, *supra* note 2, at 2, col. 1.

48. *Id.*

49. Scientists have been able to extrapolate figures from radon's effect on uranium miners to arrive at the 5,000 to 20,000 lung cancer death estimate. *Id.*

50. Actually, five potential groups predominate: (1) owners of the undeveloped land; (2) real estate agents; (3) engineers or land surveyors; (4) private house inspectors; and (5) construction contractors or builders. Note, *supra* note 4, at 248. While this Note focuses on construction contractor or builder liability, for a general discussion of real estate agent liability, see Note, *supra* note 1, and Cross & Murray, *supra* note 2.

contractors appear to be the most likely candidates because they are in the best position to prevent indoor radon hazards.⁵¹ One radon testing company's statement that the majority of its business involved consulting work for construction developers and builders⁵² demonstrates that contractors themselves recognize the magnitude of the radon problem and worry about their liability.

A. *Negligence*

In order to establish entitlement to recovery from a contractor on a negligence theory, the homeowner must prove by a preponderance of the evidence that: 1) the contractor owed the homeowner a duty to use reasonable care in building the residence; 2) the contractor breached this duty; and 3) the contractor's breach proximately caused the homeowner's injury.⁵³

Under the reasonable care requirement, courts hold a contractor responsible for consequences of an act which are reasonably foreseeable.⁵⁴ Thus, a plaintiff homeowner needs to prove that the building contractor knew or should have known that the building or its design could result in radon contamination. Because radon is a colorless, odorless gas, a homeowner faces difficulty proving that the presence of radon was foreseeable to the contractor.⁵⁵ The courts will not impose a duty of care if a reasonable contractor did not and could not have known of possible radon contamination. However, a homeowner may be able to establish a duty of care if the homeowner demonstrates that the contracting industry was aware of radon testing procedures,⁵⁶ in

51. Note, *supra* note 4, at 248.

52. Comment, *supra* note 20, at 427.

53. Note, *supra* note 4, at 248-49. See also W. KEETON, D. DOBBS, R. KEETON & R. OWEN, PROSSER AND KEETON ON THE LAW OF TORTS, § 30, at 164-65 (5th ed. 1984) [hereinafter PROSSER & KEETON] (discusses the elements of cause of action founded upon negligence).

54. PROSSER & KEETON, *supra* note 53, § 29, at 162. See also *Coburn v. Lenox Homes, Inc.*, 173 Conn. 567, 575, 378 A.2d 599, 603 (1977) ("It is clear that a defectively constructed house is likely to result in damage to the owner and there is no reason why the builder-vendor should not be liable for the effects of his negligence if they were foreseeable."); *Simmons v. Owens*, 363 So. 2d 142, 143 (Fla. Dist. Ct. App 1978) ("[b]uilding contractors should be held to the general standard of reasonable care for the protection of anyone who may foreseeably be endangered by their negligence."); *Moxley v. Laramie Builders, Inc.*, 600 P.2d 733, 736 (Wyo. 1979) (builder liable for damages that are foreseeable and caused by his negligence).

55. Note, *supra* note 4, at 249.

56. *Id.*

particular pre-construction soil testing.⁵⁷ If testing reveals high radon levels on an unbuilt site, architects can modify the design of a building to minimize radon intrusion at no great burden to the contractor.⁵⁸ Hence, an injured homeowner can impute constructive knowledge to a building contractor who was aware of available radon testing procedures.⁵⁹ However, because of the recent discovery of radon contamination, courts probably will not deem negligent the construction industry's past failure to develop design standards to prevent radon contamination.⁶⁰ Nevertheless, future construction standards will most likely include radon testing procedures and proper design standards because of the magnitude of radon contamination today, especially in areas known to be susceptible to radon contamination.⁶¹

If a homeowner successfully proves that a contractor owed a duty of reasonable care to protect against radon contamination, the homeowner must then prove that the contractor breached this duty.⁶² A contractor's breach will depend upon the reasonableness of building on uranium-bearing rocks.⁶³ Since awareness of risks associated with radon is fairly recent, most courts would probably find construction of residences on radon-contaminated land reasonable because rock composition was previously not a major factor in site planning.⁶⁴ In fact,

57. See *supra* notes 36-42 and accompanying text (discusses common radon testing procedures).

58. Kass & Gerard, *supra* note 2, at 2, col. 5.

59. Note, *supra* note 4, at 249. A plaintiff homeowner could impute constructive knowledge to a construction contractor or builder because the knowledge of the industry, rather than the knowledge of any individual manufacturer, is relevant towards determining liability. *Id.* at n. 63. See also PROSSER & KEETON, *supra* note 53, § 32, at 187 (knowledge of the industry is relevant).

60. Note, *supra* note 4, at 250.

61. Generally, an industry's standards of care evidence whether a defendant acted negligently. *Id.* Since homeowners have detected radon in recent years and radon's health threat is real, construction contractors will probably establish future radon industry standards. In fact, the Indoor Radon Abatement Bill includes a provision encouraging state and local governments to incorporate radon prevention standards and techniques into future construction industry standards. See *infra* notes 161-64 and accompanying text (discusses the Bill provision).

62. Note, *supra* note 4, at 250. The standard of proof is the care and skill of an ordinary builder under the circumstances. Cross & Murray, *supra* note 2, at 720. See *Mitchem v. Johnson*, 7 Ohio St. 2d 66, 73, 218 N.E.2d 594, 597 (1966) (builder has a duty to exercise ordinary skill and care). See generally PROSSER & KEETON, *supra* note 53, § 32, at 173-193 (defining the reasonable person standard).

63. Note, *supra* note 4, at 250.

64. *Id.* When siting an area for development, the construction industry considers

residential construction on uranium-bearing land in the past was not only reasonable but preferable to building on less stable rock foundations.⁶⁵ However, courts have recently held against contractors for failure to select safe sites for construction. In *ABC Builders Inc. v. Phillips*,⁶⁶ the Wyoming Supreme Court held a builder-vendor liable for house damage from a landslide where the builder was an experienced contractor and possessed extensive knowledge about the location of the site.⁶⁷ According to *Phillips*, a homeowner may successfully claim that a builder breached a duty of care by building in a high radon area.⁶⁸ Moreover, courts might presume a breach of the duty of care where contractors build in violation of regulatory recommendations for reducing radon exposure.⁶⁹

If a homeowner succeeds in proving the construction contractor's duty and breach, the homeowner must further show that the breach proximately caused the homeowner injury or damage.⁷⁰ A homeowner might attempt to recover for injury on grounds of emotional distress or future harm.⁷¹ Under these theories, a homeowner may recover money damages for fear of cancer, increased risk of cancer, future medical surveillance and intentional infliction of emotional distress.⁷² These claims follow the "at-risk" injury notion whereby a party exposed to a toxic substance faces risk of potential future injury.⁷³

A plaintiff homeowner encounters difficulty seeking recovery for at-risk injuries where no manifest disease exists.⁷⁴ Moreover, few cases have addressed the viability of a homeowner's claim that radon expo-

rock strength, rock porosity and the durability of underlying rock and soil which are properties generally independent of a rock's composition. *Id.*

65. *Id.* at 250-51.

66. 632 P.2d 925 (Wyo. 1981).

67. *Id.* at 937. In *Phillips*, the hillside behind plaintiff's house gradually slid down and pushed against the house. After failure to save the residence by digging trenches around the foundation failed, plaintiff-homeowner moved elsewhere. *Id.* at 928. The builder had access to studies and conclusions disclosing that the ground was unstable. *Id.* at 938.

68. Cross & Murray, *supra* note 2, at 720.

69. *Id.* Although recommendations for radon reduction do not constitute binding regulations, recommended guidelines should, at a minimum, provide persuasive evidence of negligence. *Id.* at n.235.

70. PROSSER & KEETON, *supra* note 53, § 30.

71. Note, *supra* note 4, at 251.

72. *Id.*

73. *Id.*

74. *Id.* Damage recovery for at-risk injuries in toxic tort cases is beyond the scope

sure increased cancer risk. In *Brafford v. Susquehanna Corp.*,⁷⁵ the United States District Court for the District of Colorado considered a family's claim that radon gas emission from uranium mill tailings permeated their home and increased their risk of developing cancer.⁷⁶ Plaintiffs claimed that they were exposed to radiation greatly in excess of United States regulatory standards.⁷⁷ The *Brafford* court followed decisions in other jurisdictions in holding that to recover damages for enhanced cancer risk, plaintiffs must have suffered a definite, present, physical injury.⁷⁸ Medical experts testified that radon exposure caused cellular damage which constituted a present physical injury, precluding defendant's motion for summary judgment.⁷⁹

Brafford suggests that a homeowner claiming damage from radon

of this Note. The issue is addressed here only to note that a homeowner must establish proximate damage as an element of a negligence claim.

75. 586 F. Supp. 14 (D. Colo. 1984).

76. *Id.* at 15. Uranium ore processing produces waste materials known as mill tailings. Prior to the time plaintiffs purchased their home, a mill that Susquehanna Corp. owned removed the mill tailings and placed the waste in and around the foundation of plaintiffs' home. *Id.* Plaintiffs alleged that they were exposed to radon gas during the time they resided at this home. *Id.*

77. *Id.* Although the case history did not allude to a specific federal regulatory standard, such as 4 pCi/L, the EPA and South Dakota Department of Health and Natural Resources measured the property's radiation levels. *Id.* They concluded that "plaintiffs have been exposed to levels of radiation greatly in excess of those permitted by regulatory standards of the United States Government." *Id.*

78. *Id.* at 17. In *Anderson v. W.R. Grace & Co.*, 628 F. Supp. 1219 (D. Mass. 1986), the United States District Court of Massachusetts held that an emotional distress claim could only be upheld if physical injury accompanied emotional distress. *Id.* at 1226-27. The court further stated that a claim for increased risk of cancer only succeeded where a future cancerous condition was related to a current illness. *Id.* at 1231. The Fifth Circuit's decision in *Hagerty v. L&L Marine Services, Inc.*, 788 F.2d 315 (5th Cir. 1986), expands *Anderson*. The *Hagerty* court held that, with or without physical injury, a plaintiff could recover damages for serious mental distress arising from fear of developing cancer. *Id.* at 318. The fear, however, must be reasonable and causally related to the defendant's negligence. *Id.* The *Hagerty* court further held that a plaintiff could recover damages for increased risk of contracting cancer only where he could show that the toxic exposure more probably than not would cause cancer. *Id.* at 319. Since *Hagerty* did not allege that he had cancer or would develop it in the future, the court ruled that *Hagerty* could not recover damages for increased risk of contracting cancer. *Id.* at 320. *See also* *Evers v. Dollinger*, 95 N.J. 399, 408, 471 A.2d 405, 410 (1984) ("the spread of cancer cells into once healthy tissue . . . is an injury in and of itself"); *Cloys v. Turbin*, 608 S.W.2d 697, 701 (Tex. Civ. App. 1980) (even "imperceptible" growth of tumor constituted present injury).

79. *Brafford*, 586 F. Supp. at 18. The experts concluded with a reasonable degree of medical probability that plaintiffs suffered chromosomal damage caused by the radiation. *Id.* at 17-18. One expert characterized the injury as present because "the subcellu-

exposure has a difficult burden of proof because the homeowner must have a present physical injury. Decisions outside the radon context are more liberal, allowing damages for increased risk of cancer when the manifestation would be less likely to occur.⁸⁰ Likewise, a plaintiff's claim for future medical surveillance costs probably faces a reasonable medical probability standard.⁸¹ Finally, a long latency period hinders proof that radon exposure caused an injury.⁸²

As a defense to a homeowner's negligence action, a construction contractor might claim that he lacked responsibility for the radon contamination.⁸³ To succeed, the contractor needs to prove that radon gas most likely entered the home from natural methods such as radon-contaminated gas or groundwater rather than negligent construction.⁸⁴

A negligence claim fails to give homeowners the best option for a radon contamination action. A contractor can claim he owed no duty of care because the risk of radon contamination was not reasonably foreseeable. Moreover, the contractor can claim the homeowner's injury was not the proximate result of negligent construction. *Brafford* demonstrates the problems associated with proving injury.⁸⁵ Despite a homeowner's problems with proving a negligence claim, contractors are in a more precarious position today than before the radon hazard

lar changes operated to deprive plaintiffs of a degree of immunity which they had enjoyed prior to their exposure to the mill tailings." *Id.* at 18.

80. See *Askey v. Occidental Chemical Corp.*, 102 A.D.2d 130, 477 N.Y.S.2d 242 (1984) (future expenses of medical monitoring resulting from exposure to toxic chemicals allowed as recoverable consequential damages if plaintiffs established with reasonable degree of certainty that expenditures were reasonably anticipated); *Hagerty*, 788 F.2d 315 (seaman soaked with toxic chemicals allowed damages for increased risk of cancer where toxic exposure more probably than not would cause cancer). *But see* *Depass v. United States*, 721 F.2d 203, 206-10 (7th Cir. 1983) (injured plaintiff allowed recovery for decreased life span even if proof failed to show probability of early death); *Martin v. City of New Orleans*, 678 F.2d 1321 (5th Cir. 1982), *cert. denied*, 459 U.S. 1203 (1983) (in awarding damages, jury allowed to consider small risk that bullet lodged in plaintiff's neck might someday sever spinal cord).

81. See *Hagerty*, 788 F.2d 315 (plaintiff exposed to toxic substances allowed recovery for reasonable costs of medical checkups). See also *Askey*, 102 A.D.2d 130, 477 N.Y.S.2d 242 (1984) (medical surveillance costs held recoverable).

82. Note, *supra* note 4, at 253. Courts reluctantly compensate "at risk" injuries because the long latency period associated with these injuries creates problems connecting the defendant's act with later development of the disease. *Id.* at n.92.

83. *Cross & Murray supra* note 2, at 720.

84. *Id.* at 720-21.

85. See *supra* notes 75-81 and accompanying text (discusses proof of damage or injury).

gained national attention. Although radon testing can be costly,⁸⁶ construction contractors should conduct tests to detect radon and inhibit further development of indoor radon contamination and avoid future negligence actions.

B. *Products Liability*

Under the products liability theory, anyone who places a defective product into the marketplace is subject to fault regardless of liability.⁸⁷ To recover under a products liability theory, a homeowner must demonstrate that the home, as a "product," was defective and unreasonably dangerous when sold.⁸⁸ The defect could be the possible result of the manufacturing process, manufacturing design or manufacturer's failure to warn of the product's dangerous qualities.⁸⁹ Case law illustrates that whether a real estate development is a "product" for purposes of strict liability varies according to circumstances.⁹⁰

Courts have held mass production developers of new homes strictly liable. For instance, in *Bastian v. Wausau Homes*⁹¹ the District Court for the Northern District of Illinois found that a mass-produced home

86. See *supra* notes 36-42 and accompanying text (discusses radon testing measures and costs).

87. Note, *supra* note 4, at 254. See also PROSSER & KEETON, *supra* note 53, § 99, at 695-97. The theory originates from the idea that, by shifting fault to the defendant engaged in a profit-making enterprise, society ultimately bears the loss through higher prices for defendant's product and burdening society with the loss is better than burdening specific individuals. Note, *supra* note 4, at 254.

88. *Id.* at 255. See also RESTATEMENT (SECOND) OF TORTS, § 402A(1) (1965) which states:

One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if (a) the seller is engaged in the business of selling such a product, and (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.

Id.

89. Note, *supra* note 4, at 255.

90. The policy rationales that courts have considered in characterizing the home as a product include: 1) concern for public health and safety; 2) buyer inability to inspect and identify certain potential defects in the product; 3) buyer reliance on the skill and expertise of the manufacturer; 4) deep pocket considerations; and 5) mass production of the item. Cross & Murray, *supra* note 2, at 705-06. See *infra* notes 91-99 and accompanying text (discussing the court decisions characterizing the home as a product).

91. 620 F. Supp. 947 (N.D. Ill. 1985).

was a product for strict liability purposes.⁹² Because mass production of new homes closely resembles the manufacture of any other product, other jurisdictions have similarly applied the strict liability theory.⁹³ Unlike a mass producer of homes, the small builder lacks the opportunities to shift loss to the consumer.⁹⁴ Nevertheless, in *Patitucci v. Drelich*,⁹⁵ the New Jersey Superior Court held a small builder strictly liable for an inadequate sewer system.⁹⁶ The *Patitucci* court believed that the builder's construction expertise outweighed the absence of being a mass producer.⁹⁷ Since radon contamination exposes homeowners to cancer risk, not exempting small builders promotes the public's interest.⁹⁸ Further, *Patitucci* implies that because a homeowner relies on a builder's expertise whether the builder is a mass producer or not, denying the homeowner recovery is unfair.⁹⁹

Even if a plaintiff homeowner successfully establishes that the builder constructed and marketed a "product," the homeowner must demonstrate that a defective condition in the home caused the radon

92. *Id.* at 950.

93. Comment, *Radon Gas: Ramifications for Real Estate Transactions in Pennsylvania*, 91 DICK. L. REV. 1113, 1132 (1987). See, e.g.: *Kriegler v. Eichler Homes Inc.*, 269 Cal. App. 2d 224, 74 Cal. Rptr. 749 (1969) (builder strictly liable for failure of radiant heating system); *Blagg v. Fred Hunt Co.*, 272 Ark. 185, 612 S.W.2d 321 (1981) (house is a product for purposes of strict liability law); *Smith v. Old Warson Development Co.*, 479 S.W.2d 795 (Mo. 1972) (purchase of a new home from builder-vendor is subject to warranty claim).

94. Cross & Murray, *supra* note 2, at 707. See also Comment, *Strict Tort Liability to the Builder Vendor of Homes: Schipper and Beyond?*, 10 OHIO N.U.L. REV. 103, 122 (1983):

To allow a judgment against this type of individual could result in the loss of his business and perhaps more. This result would do more than protect an innocent consumer. It would protect that individual to the detriment of another who is unable to shift the risk or to use a business loss.

95. 153 N.J. Super. 177, 379 A.2d 298 (1977).

96. *Id.*

97. *Id.* at 179, 379 A.2d at 298. The court stated that because the sewer system was "a defective condition unreasonably dangerous to the user or consumer," a strict liability cause of action existed. *Id.* at 180, 379 A.2d at 299. See also *McDonald v. Mi-anecki*, 79 N.J. 275, 293, 398 A.2d 1283, 1292 (1979) (builder's skill, knowledge and ability to prevent defects important in determining if home is a product).

98. Cross & Murray, *supra* note 2 at 707. "[b]ecause radon has severe adverse health effects, society should place the burden where the least human exposure would result. Requiring builders to take preventative steps during the course of construction would result in less total exposure of home residents to radon gas." Comment, *supra* note 93, at 1130.

99. Cross & Murray, *supra* note 2, at 706.

contamination.¹⁰⁰ Courts are unlikely to impose liability when natural occurrences cause radon contamination, such as when a contractor builds a house upon uranium-bearing rock beneath the home.¹⁰¹ However, homeowners might demonstrate a defective house design with a risk-utility test.¹⁰² According to the test, a product is defectively designed if the danger of the product outweighs its utility.¹⁰³ In the radon context, the risk of death from lung cancer outweighs the home's utility when radon levels are high.¹⁰⁴ Current construction techniques can prevent significant indoor radon concentrations.¹⁰⁵ Builders who fail to employ such techniques should be liable for damages resulting from preventable radon contamination.

Besides defective design, a homeowner might show that a flaw in construction made the product unreasonably dangerous.¹⁰⁶ The con-

100. *Id.* at 708. More specifically, a product can be unreasonably dangerous and defective for the following reasons: (1) a flaw in the product that was present in the product at the time the defendant sold it; (2) the manufacturer's failure to adequately warn of a risk or hazard related to the manufacturer's design of the product; or (3) a defective design for the product. *Id.* See also PROSSER & KEETON, *supra* note 53, § 99(1)-(3) (outlines conditions for an unreasonably dangerous and defective product).

101. Note, *supra* note 4, at 255. If courts considered natural occurrences as manufacturing or design defects, then a house built structurally sound could be held defective if lightning damage occurred after purchase. *Id.* Thus, the strict liability requirement of a design defect seems to apply to "defects originating when the product was in the manufacturer's control and not to defects caused by natural processes which may subsequently create hazardous conditions." *Id.*

102. Cross & Murray, *supra* note 2, at 710.

103. *Id.* PROSSER & KEETON identify three policy reasons underlying this test: (1) the harmful consequences resulting from the reasonably foreseeable uses of the product caused by the way the product was designed outweigh the benefits of the product measured in terms of human desires and needs; (2) although the harmful consequences do not outweigh the benefits, there are alternative, safer products available to serve the same human desires and needs; and (3) although the harmful consequences do not outweigh the benefits, there is a feasible method to design a safer product. PROSSER & KEETON, *supra* note 53, § 99(3). While the courts utilize this test most often in evaluating unreasonably dangerous design defects, another test is the consumer contemplation test. This test considers a product defectively dangerous if "it is dangerous to an extent beyond that which would be contemplated by the ordinary consumer who purchased it with the ordinary knowledge common to the community as to the product's characteristics. Although a radon-contaminated home would prove dangerously defective under the consumer contemplation test, courts and commentators have criticized the test. Cross & Murray, *supra* note 2, at 710.

104. Cross & Murray, *supra* note 2, at 710.

105. *Id.* See *supra* notes 43-46 and accompanying text (discussing remedial measures to reduce indoor radon concentrations).

106. Cross and Murray, *supra* note 2, at 708.

struction contractor would be strictly liable for consequences of the flaw.¹⁰⁷ Radon exposure indicates three possible construction flaws: (1) inadequate sealage; (2) inadequate ventilation; and (3) contaminated building products.¹⁰⁸ First, a homeowner might contend that inadequate construction caused improper sealage so that radon seeped into the home. Second, a homeowner might contend that inadequate construction failed to provide sufficient ventilation to allow radon gas to escape. Finally, a homeowner might contend that a contractor used construction materials contaminated with high levels of uranium or radon.¹⁰⁹

As a defense to strict liability for defective design, construction contractors might claim that they conformed with state-of-the-art design techniques when they built the home.¹¹⁰ In *Feldman v. Lederle Laboratories*,¹¹¹ the New Jersey Supreme Court held that the state-of-the-art defense applied when determining defective design and only reasonably obtainable and reliable knowledge would be imputed to the manufacturer.¹¹²

107. *Id.* at 709.

108. *Id.*

109. *Id.* Whichever flaw a homeowner alleges, expert testimony demonstrating that the damage would not have occurred but for a flaw in the product is persuasive. *Id.*

110. Prior to 1984, courts were confused as to whether this defense applied to both design defect and failure to warn cases. Cross & Murray, *supra* note 2, at 712. For example, the New Jersey Supreme Court rejected an absolute state-of-the-art defense in a strict liability action for failure to warn in *Beshada v. Johns-Manville Products Corp.*, 90 N.J. 191, 447 A.2d 539 (1982). In *Beshada*, plaintiff-workers exposed to asbestos sued asbestos manufacturers for personal injury and wrongful death. The manufacturers asserted the state-of-the-art defense claiming that the asbestos health threat was undiscoverable at the time they marketed asbestos. *Id.* at 197, 447 A.2d at 542. In rejecting the state-of-the-art defense, the court looked to the policy rationales for strict liability, namely risk spreading, accident avoidance and simplification of the fact-finding process. Cross & Murray, *supra* note 2, at 713.

However, a 1984 New Jersey case suggested that the state-of-the-art defense was viable in strict liability actions for both types of cases. In *O'Brien v. Muskin Corp.*, 94 N.J. 169, 463 A.2d 298 (1983), the New Jersey Supreme Court allowed defendants to assert the state-of-the-art defense in a strict liability case based on defective design. Cross & Murray, *supra* note 2, at 713. In addressing the risk-benefit analysis of a product, the court believed that the jury should consider the utility of a product based on need and product alternatives and the dangers of the product that the manufacturer knew or should have known about. *Id.* Hence, O'Brien questioned the proper role of the state-of-the-art defense in defective design and failure to warn cases. *Id.*

111. 97 N.J. 429, 479 A.2d 374 (1984).

112. Cross & Murray, *supra* note 2, at 714 (citing *Feldman*, 97 N.J. at 458, 479 A.2d at 388).

According to *Feldman*, contractors who built homes before radon contamination gained national attention may successfully assert a state-of-the-art defense. Although the precise date at which builders could reasonably obtain knowledge about radon's hazardous effects is disputed,¹¹³ the federal government first issued reports about the indoor radon hazard in 1976.¹¹⁴ Thus, the state-of-the-art defense may have persuasive force for contractors who constructed contaminated homes prior to 1976. Nevertheless, contractors building in high radon areas today should not feel secure claiming a state-of-the-art defense.¹¹⁵ Additionally, in the future, high radon levels may become presumptive evidence of housing defects.¹¹⁶

Optimally, a homeowner will succeed in a products liability suit when: 1) the builder sold homes at mass production; 2) radon entered the house through faulty construction such as inadequate scalage, inadequate ventilation or radon-contaminated building materials; 3) the sale occurred when contractors knew or should have known about radon contamination; and 4) indoor radon levels exceeded applicable standards.¹¹⁷ Realistically, the faulty construction requirement is difficult to satisfy, especially when the source of the radon contamination is water, natural gas or ground soil rather than building materials. Additionally, the risk-utility test is burdensome because proper ventilation or scalage techniques can stop contamination in most radon-contaminated homes. Nonetheless, a homeowner will likely prevail in a products liability claim when the contractor is a mass producer or small builder and the homeowner proves faulty construction and excessive radon contamination.

113. Cross & Murray, *supra* note 2, at 715 n.193. In *Wayne v. Tennessee Valley Auth.*, 730 F.2d 392, 396 (5th Cir. 1984), the Fifth Circuit held that a producer of phosphate slag containing radon did not know or have reason to know of the danger of radon gas when, in 1969, the producer sold the blocks. Further, the producer did not know or have reason to know of such danger until the late 1970's when the producer ceased sales of phosphate slag and informed the public why it was doing so. 730 F.2d at 396. Others might place the relevant date somewhat earlier than the late 1970's. Cross & Murray, *supra* note 2, at 715 n.193.

114. Cross & Murray, *supra* note 2, at 715 n.193.

115. "Clearly, today's builders in high radon concentration areas have a duty to construct homes with radon dispersment devices and to warn potential buyers of the dangers of radon contamination." *Id.* at 714.

116. *Id.* at 715. Since radon contamination has received much attention, contractors should be on notice to avoid building homes in high radon areas and, at a minimum, warn prospective buyers of the presence of high concentrations. *Id.* at n.194.

117. *Id.* at 714.

C. Implied Warranty of Habitability

Under the theory of implied warranty of habitability, a home seller impliedly warrants that the home is reasonably suited for habitation.¹¹⁸ While courts generally recognize that a building warrants some level of workmanship, courts define "workmanship" differently.¹¹⁹ In *Degnan v. Executive Homes, Inc.*,¹²⁰ two homeowners sued a contractor when their homes incurred structural damage for breach of implied warranty of habitability.¹²¹ While the *Degnan* court believed that the theory applied to structural defects and defects discovered in underlying land, the court held that in order for the homeowner to prevail, the builder's construction must have aggravated the defect in the underlying land.¹²² Because the contractor in *Degnan* built upon a slope which subsequently aggravated the unstable underlying land, the court found the builder liable for breach of implied warranty of habitability.¹²³

In *Elderkin v. Gaster*,¹²⁴ homeowners sued the builder-vendor of their home alleging that the water supply was unfit for human consumption.¹²⁵ Although the builder properly constructed the home and well which supplied the home's water, the water beneath the well was inadequate.¹²⁶ The Pennsylvania Supreme Court held that the home violated the implied warranty of habitability because the home had an unhealthy water supply.¹²⁷ Hence, the court nearly made a residential

118. Comment, *supra* note 93, at 1119. The implied habitability warranty rejects the common law rule of caveat emptor (let the buyer beware). Galen, *supra* note 4, at 8, col. 4. The theory originated in California. *Id.* States adopting some form of the theory include: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Vermont, Washington and Wyoming. Comment, *supra* note 93, at 1119 n.58

119. Cross & Murray, *supra* note 2, at 716.

120. 696 P.2d 431 (1985).

121. *Id.*

122. *Id.* at 434.

123. *Id.*

124. 447 Pa. 118, 288 A.2d 771 (1972).

125. *Id.*

126. Comment, *supra* note 93, at 1121. Plaintiffs alleged that the drinking water contained pollutants and contaminants making it "unfit for human consumption, [and] objectionable because of its toxic effects. . . ." *Elderkin v. Gaster*, 447 Pa. 118, 288 A.2d 771 (1972).

127. *Elderkin*, 447 Pa. at 130, 288 A.2d at 777.

seller the insurer of a home's quality in addition to the insurer of elements such as the water supply.¹²⁸

*Nobel v. Marvin E. Kanze*¹²⁹ addressed the implied warranty theory in the context of a home contaminated with radon. In *Nobel*, a homeowner sued a construction firm for installing an air conditioning unit which caused radon seepage into the home.¹³⁰ The plaintiff spent approximately six months and \$100,000 to pinpoint the problem and reduce radon levels which surpassed fourteen times the EPA's maximum safety standard.¹³¹ Hence, *Nobel* represents an important case for applying the implied warranty theory in radon litigation.

Degnan, *Elderkin*, and *Nobel* provide support for a homeowner who sues a contractor for breach of implied warranty of habitability. Under *Degnan*, a court might hold a contractor liable for indoor radon contamination because the contractor's construction upon uranium-bearing land accelerated the radon's natural emissions to reach hazardous levels.¹³² The more liberal view of *Elderkin* suggests that although a home is structurally sound, a construction contractor is liable for a home with high radon levels due to external, natural factors beyond the contractor's control. Hence, a court might find a contractor liable for building a house near water contaminated with excessive levels of radon.¹³³ Finally, unlike *Degnan* and *Elderkin*, *Nobel* specifically addresses liability for radon contamination. *Nobel* suggests that contractors risk liability for breach of implied warranty of habitability

128. Comment, *supra* note 93, at 1122. The court adopted an implied warranty theory that was much more liberal than in any other jurisdiction at the time. *Id.* The court rationalized that the builder and purchaser shared unequal bargaining power. Furthermore, the builder chose the site and held himself out as being capable of choosing a suitable site. *Id.* at 1122 n.82.

129. No. 83-05253 (Montgomery Co., Pa. C.C.P. Civ. Div. 1983).

130. *Id.* The homeowner alleged that the unit had leaks in its vents and ducts which caused excessive radon gas accumulation in his home. The homeowner sought damages for home repairs, increased risk of cancer, severe emotional distress and residential inconvenience from ventilating the home with open windows. *Id.* at 4-6.

131. Galen, *supra* note 4, at 8, col. 4. Following Nobel's own discovery of radon, he tested 100 homes in his neighborhood and uncovered 15 homes with excessive radon levels. *Id.*

132. Note, *supra* note 4, at 264.

133. Cross & Murray, *supra* note 2, at 718-19. But a ruling in accordance with *Elderkin* could be unduly harsh because *Elderkin* does not base liability on fault. See Comment, *supra* note 93, at 1122. The author notes, however, that even in a jurisdiction adopting a liberal implied warranty of habitability, a court will probably still consider degree of fault in determining whether the implied warranty includes the duty to sell a home which has safe radon levels. *Id.* at 1123.

for defective workmanship such as installing ineffective ventilating systems or supplying building materials that emit radon gas.

Despite *Degnan*, *Elderkin* and *Nobel*, courts will probably deny a claim for breach of implied warranty of habitability for properly built homes sold before knowledge of radon's hazards became public.¹³⁴ Contractors face liability for breach of implied warranty, however, for homes they constructed after revelation of the radon problem because radon contamination becomes similar to any other latent defect.¹³⁵ Today, construction contractor liability merits two justifications. First,

134. Comment, *supra* note 93, at 1129. See *supra* notes 113-15 and accompanying text (discussing applicable discovery dates). Even if a homeowner can successfully prove implied warranty of habitability, a contractor might claim lack of privity as a defense. Although a growing number of courts have abolished the privity requirement, some courts have not allowed remote purchasers recovery against a builder. Cross & Murray, *supra* note 2, at 717-18. Compare *Terlinde v. Neely*, 275 S.C. 395, 271 S.E.2d 768 (S.C. 1980) (implied warranty of habitability for latent defects of home extended to subsequent home purchasers for reasonable amount of time) and *Moxley v. Laramie Builders, Inc.*, 600 P.2d 733 (Wyo. 1979) (implied warranty of habitability extended only for reasonable length of time and limited to latent defects) with *Elden v. Simmons*, 631 P.2d 739 (Okla. 1981) (no termination of builder-vendor's implied warranties of habitability and construction in workmanlike manner upon transfer of title from original to subsequent purchaser) and *Richards v. Powercraft Homes Inc.*, 678 P.2d 427 (Ariz. 1984) (privity not required with builder-vendor of home for breach of implied warranty of habitability).

135. Comment, *supra* note 93, at 1129. The real estate industry has already witnessed the existence of radon disclaimers of liability and radon inspection clauses. For example, the New Jersey Association of Realtors adopted a contingency clause for buyers. Sherman, *Radon and Real Estate: Potentially Costly Mixture*, N.J.L.J., Nov. 27, 1986, at 24, col. 1-2. The clause warns of a potential radon problem, disclaims the realtor's ability to give scientific advice, recommends professional testing and suggests parties who might pay for remediation. *Id.* A back-out provision also protects skittish buyers. *Id.* Although no standard form exists in the construction industry, a builder might incorporate a provision in a contract of sale that the buyer takes the home "as is" or that the builder affirmatively disclaims any liability for the presence of unsafe levels of radon gas. Comment, *supra* note 93, at 1146.

General disclaimer and inspection provisions, however, may not provide a contractor with an effective avenue of relief. In *Tyus v. Resta*, 328 Pa. Super. 11, 476 A.2d 427 (1984), a contract of sale included a provision that the buyer inspected the home or waived the right to do so. *Id.* at 21, 476 A.2d at 432. In holding that the builder's inspection clause was unavailing as a defense to an implied warranty of habitability claim, the Pennsylvania Superior Court reasoned that an inspection clause requires reasonable inspection of the property and an undiscoverable latent defect falls outside the clause. *Id.* at 22, 476 A.2d at 433. Because radon is clearly a latent defect that a reasonable inspection would not uncover, a *Tyus* disclaimer does not diminish a buyer's rights. Comment, *supra* note 93, at 1147. Construction contractors might find a better defense if the disclaimer is not general, but instead evidences a clear intent to disclaim liability for the defect of radon. For the buyer's protection, an ideal clause in a contract of sale would require radon testing before closing, retesting once the buyer occupied the

measures to reduce radon levels during construction are less expensive than remedial measures after a home is built.¹³⁶ Second, when builders take preventative measures during construction, homeowners suffer less exposure to radon.¹³⁷ Nevertheless, the *Elderkin* decision is questionable because contractors may not be able to control high radon accumulation from natural sources. Consequently, the success or failure of a claim for breach of implied warranty of habitability depends upon the source of the radon contamination.

D. *Fraud*

Owners of radon-contaminated homes may bring actions against builders for fraudulent misrepresentation or nondisclosure of the existence of dangerous radon levels. A contractor's fraudulent misrepresentation or nondisclosure falls into three categories: (1) the contractor knew of the radon problem and represented that no problem existed; (2) the contractor represented that no radon problem existed but failed to test the home to ascertain the truth of his representation; or (3) the contractor knew of a radon problem but failed to disclose the problem to the homeowner.¹³⁸

1. Misrepresentation of a Known Radon Condition

To recover under this theory, the homeowner must show: 1) misrepresentation; 2) the builder's knowledge of the misrepresentation; 3) the builder's intention to induce reliance; 4) the homeowner's justifiable reliance; and 5) homeowner damage as a proximate result of such reliance.¹³⁹ Hence, a contractor's sale of a radon-contaminated home coupled with knowledge of the condition constitutes fraud if the contractor

house and a seller-funded escrow account for future remediation costs. Sherman, *supra*, at 24, col. 2.

136. Comment, *supra* note 93, at 1130. See also M. LAFAVORE, RADON: THE INVISIBLE THREAT 21 (1987) ("Radon-proofing a home as it is being constructed is almost always cheaper and less complicated than having to go back and do the job once the home is completed.").

137. Comment, *supra* note 93, at 1130.

138. *Id.* at 1138.

139. *Id.* at 1138-39. In general, the elements for a cause of action in fraud or deceit are 1) a defendant's false representation of a fact; 2) defendant's knowledge that the statement was false or that he lacked a sufficient basis for making the statement; 3) intent to induce plaintiff reliance on the information; 4) plaintiff's justifiable reliance on the information; and 5) plaintiff's damage resulting from such reliance. Cross & Murray, *supra* note 2, at 722 (citing PROSSER & KEETON, *supra* note 53, § 105, at 728).

represented that the house was a safe dwelling.¹⁴⁰ Courts could find actionable fraud or deceit from a builder's false statement that a home was habitable or that a home contained no latent or hazardous condition.¹⁴¹ A contractor's false representation that a home has no radon problem suggests a higher degree of culpability.¹⁴² Additionally, a homeowner has a cause of action when a contractor improperly measures radon and improperly reports a radon test with intent to deceive. If, after completing construction, a contractor used radon measurements from one area of a home which had low radon levels and reported these measurements as representative of the entire home, the contractor's action is fraudulent.¹⁴³

2. Representation Without Knowledge That a Radon Problem Does Not Exist

Courts commonly hold contractors and builders liable for negligent misrepresentation.¹⁴⁴ Under this standard, a builder is liable for misstatements about radon contamination.¹⁴⁵ Although no case law addresses negligent misrepresentation in the context of radon contamination, the Pennsylvania Supreme Court addressed negligent misrepresentation in the construction industry in *Highmont Music Corp. v. J.M. Hoffman Co.*¹⁴⁶ In *Highmont*, a lessor of a store stated

140. Comment, *supra* note 93, at 1139.

141. *Id.* Any generalized statement about the condition of a home constitutes a fraudulent misrepresentation when a latent condition exists that renders the statement false. *Id.* Generalized statements held to be fraudulent misrepresentations include statements that the home is in "A-1 condition," basement joists are "as good as new," and "floors are in good condition." *Id.*

142. *Id.*

143. *Id.* at 1139-40. Although this Note does not explore homeowner remedies for fraudulent misrepresentation, various remedies include rescission, damage recovery and medical surveillance costs. *Id.* at 1140. See *supra* notes 70-78 and accompanying text (discussing proof of damage in a negligence action).

144. See, e.g.: *Schneider v. Vennard*, 183 Cal. App. 3d 1340, 228 Cal. Rptr. 800 (1986) (cause of action for negligent misrepresentation only requires showing of negligence); *Stone v. Farnell*, 239 F.2d 750 (5th Cir. 1957) (fraud action in defendant's sale of residential realty to plaintiffs only required finding of negligence). Unlike intentional misrepresentation, the plaintiff, in claiming negligent misrepresentation, does not have to prove that the defendant made the misrepresentation with intent to deceive or with knowledge of a statement's falsity. Cross & Murray, *supra* note 2, at 722. Thus, a statement made with an honest belief in its truth may constitute negligent misrepresentation. *Id.*

145. Cross & Murray, *supra* note 2, at 722.

146. 397 Pa. 345, 155 A.2d 363 (Pa. 1959).

that the floors were "very, very strong" when, in actuality, the floors lacked good support.¹⁴⁷ In concluding that the lessee had a cause of action, the court reasoned that the defendant should not have stated the floors were "very, very strong" when he lacked knowledge of the floors' condition.¹⁴⁸ Applying *Higmont* to the radon situation, a builder is liable if he states a home is radon safe when the builder has no knowledge of a home's radon level.¹⁴⁹

In instances where a builder makes no affirmative statements concerning radon contamination the issue becomes whether courts can impute constructive knowledge to the builder.¹⁵⁰ For recent housing sales, courts might hold builders liable for constructive knowledge of the radon risk because high radon levels are now reasonably discoverable. To escape liability, builders should suggest that potential buyers obtain a radon contamination inspection. Alternatively, builders should conduct a radon test before construction.¹⁵¹ At a minimum, the contractor building in a high radon area should determine if a ra-

147. *Id.* at 347-48 n.1, 155 A.2d at 364-65 n.1.

148. The court stated that "absolute knowledge of the defect need not be shown, for if the defendant had no knowledge of the defective condition of the floors, he should not have made the statement that the floors were 'very, very strong.'" 397 Pa. at 350, 155 A.2d at 366.

149. Comment, *supra* note 93, at 1141.

150. Cross & Murray, *supra* note 2, at 723. Constructive knowledge hinges on the question whether the builder is liable for failure to disclose a condition of which he was unaware. *Id.* Traditionally, courts did not view silence as fraud. However, the Restatement provides: "A vendor of land who conceals or fails to disclose to his vendee any condition, whether natural or artificial, which involves unreasonable risk to persons on the land, is subject to liability to the vendee and others upon the land. . . ." *Id.* at n. 248 (citing RESTATEMENT (SECOND) OF TORTS, § 353(1) (1965)).

151. Cross & Murray, *supra* note 2, at 723. Although beyond this Note's scope, it is significant to note that besides construction contractors, real estate brokers should also suggest that buyers obtain a radon contamination inspection prior to final sale. *Id.* A construction contractor's radon inspection clause or disclaimer in a contract of sale proves ineffective when the builder has acted fraudulently. Comment, *supra* note 93, at 1150. Hence, a builder cannot effectively disclaim liability for radon contamination when the builder has failed to disclose a known radon condition or has misrepresented the home's radon status. *Id.* For instance, in *National Building Leasing v. Byler*, 252 Pa. Super. 370, 381 A.2d 966 (1977), the Pennsylvania Superior Court held that an inspection clause did not preclude the buyer's justifiable reliance. When the buyer sued the seller in a fraud action because the land contained debris from prior homes, the court allowed parol evidence of misrepresentation to modify the contract of sale. *Id.* at 375, 381 A.2d at 963. Hence, an inspection clause does not necessarily preclude an action for fraud or failure to disclose a radon condition. Additionally, since radon is a latent condition and undiscoverable upon reasonable inspection, the homeowner's reliance on a misrepresentation is justifiable.

don hazard exists and, if so, disclose the problem to potential buyers.¹⁵²

3. Knowledge of a Radon Problem and Duty to Disclose

Courts generally agree that when a seller of a home knows of a dangerous latent condition, the seller must disclose this condition to the buyer.¹⁵³ Since high radon concentrations may be a latent defect, a builder who knows of home radon contamination should inform a potential buyer of this information.¹⁵⁴ In *Schnell v. Gustafson*,¹⁵⁵ the Colorado Court of Appeals held that a homeowner had an action for fraud and deceit when the seller failed to disclose that the home sat on uranium-bearing land.¹⁵⁶ After *Schnell*, a construction contractor's failure to inform a buyer that a new home was located in a high radon area could result in a fraud action. The National Association of Realtors mandates informing home purchasers "if the agent believes a home is in a radon-prone area."¹⁵⁷ Generally, construction contractors are familiar with the area where they build. Construction contractors who believe they are building in a radon-prone area should have a duty to disclose the situation to potential buyers. The possibility of contractor liability for failure to disclose a known radon condition increases the chances that prospective homeowners are making informed

152. Cross & Murray, *supra* note 2, at 723. "[a]s knowledge of radon and its effects on residential real estate grows, the builder, seller and real estate broker of homes in radon-prone areas must be expected both to determine if a radon problem exists and to disclose that problem to potential purchasers." *Id.*

153. Saporta v. Bargagelata, 220 Cal. App. 2d 463, 33 Cal. Rptr. 661 (1963) (real estate agent/broker liable to purchaser not only for affirmative and intentional misrepresentations, but also nondisclosure to the purchaser); Weintraub v. Krobatsch, 64 N.J. 445 (1974) (deliberate concealment or nondisclosure of roach infestation); Neveroski v. Blair, 141 N.J. Super. 365, 358 A.2d 473 (1976) (broker's intentional concealment of termite damage); Quashnock v. Frost, 299 Pa. Super. 9, 445 A.2d 121 (1982) (broker's failure to disclose termite infestation). See also RESTATEMENT (SECOND) OF TORTS, § 353(1)(b) (1965) (a home seller faces liability when the seller "knows or has reason to know of the condition, and realizes or should realize the risk involved.").

154. Cross & Murray, *supra* note 2, at 722.

155. 638 P.2d 850 (Colo. Ct. App. 1981).

156. *Id.* at 852. In *Schnell*, home purchasers sued the seller for failing to disclose that the home was built on uranium mill tailings. *Id.* Although the case does not specifically address liability for a building contractor, the rationale can be extended to contractors who build on uranium-bearing land.

157. Hanley, *Radon: For the Homeowner, Some Questions and Answers*, N.Y. Times, Jan. 1, 1987, at 39, col. 3.

choices and that they will incur less overall radon exposure.¹⁵⁸

IV. A FEDERAL RESPONSE: INDOOR RADON ABATEMENT A. *Purpose and Summary*

Congress finally responded to the radon hazard with the Indoor Radon Abatement Bill,¹⁵⁹ which assists states in establishing programs to alleviate the radon problem.¹⁶⁰

158. Comment, *supra* note 93, at 1143. Less overall radon exposure exists because builders would have an incentive to take precautionary measures against hazardous radon exposure. Nevertheless, the Fifth Circuit's decision in *Wayne v. Tennessee Valley Authority*, 730 F.2d 392 (5th Cir. 1984), demonstrates that proving a contractor knew or had reason to know of radon contamination presents an obstacle to a homeowner's fraud action. In *Wayne*, a phosphate slag producer did not fraudulently withhold knowledge of the hazardous radioactive nature of phosphate slag when the producer did not know or have reason to know of the danger of radon. *Id.*

159. Indoor Radon Abatement, Pub. L. No. 100-551, 102 Stat. 2755 (1988). The Bill amended the Toxic Substances Control Act by adding Indoor Radon Abatement after Title II of the Act (15 U.S.C. § 2601 and following). Generally, the Toxic Substances Control Act authorized the EPA to test chemical substances and mixtures that might present unreasonable risk of injury to the health or environment. Toxic Substances Control Act, 15 U.S.C. § 2603(a) (1982). Furthermore, the Act authorized the EPA to collect accurate data with respect to the effect of chemical substances and mixtures on the health and environment and to regulate chemical substances and mixtures which present an unreasonable risk of injury to the health and environment. *See id.* § 2601(b).

160. H.R. REP. NO. 1047, 102nd Cong., 2d Sess. 7-8, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS 3612-13. Prior to the Bill's enactment, several states already developed programs to combat the radon problem. For instance, New Jersey responded in 1986 when the State enacted statutes to study radon gas, establish a public information and education program and certify radon testers. N.J. STAT. ANN. § 26:2D 59-80 (West 1986). Specifically, New Jersey has a statutory provision addressing radon testing related to the sale of a building which provides:

In the case of a prospective sale of a building which has been tested for radon gas and radon progeny, the seller shall provide the buyer, at the time of contract of sale is entered into, with a copy of the results of (the radon test) and evidence of any subsequent mitigation or treatment, and any prospective buyer who contracts for the testing shall have the right to receive the results of that testing.

N.J. STAT. ANN. § 26:2D-73 (West 1986). Additionally, violations of certain provisions constitute a crime of the third degree. N.J. STAT. ANN. § 26:2D-77 (West 1986).

Despite state response, Congress still recognized that radon contamination was a national problem. Additionally, Congress recognized states' limits in dealing with the problem. The House Report states:

[a]n increasing number of States have developed programs for addressing the radon problem. In many instances, however, State programs lack the technical expertise necessary to assess the health risks associated with radon exposure and to evaluate the efficacy of current methods of radon detection and mitigation or to develop improved methods. Furthermore, many States lack the financial resources to undertake adequate programs for addressing the radon problem.

In enacting the Bill Congress declared a national long-term goal to make the air within buildings as radon-free as the ambient air outside buildings.¹⁶¹ The Committee on Energy and Commerce believed that builders should construct new homes and buildings which limit the infiltration and entrapment of radon.¹⁶² However, the Committee recognized the goal's practical and economic limits in both existing and new buildings.¹⁶³ The Committee noted the lack of reasonably available construction technology to ensure that builders can attain safe outdoor ambient levels in many existing and new buildings.¹⁶⁴ More importantly, the Committee emphasized that the goal "does not . . . create a legal cause of action for any building occupant, building purchaser, or member of the public against building owners, real estate professionals, lenders, or builders."¹⁶⁵

To achieve Congress' national goal, a second provision of the Bill, Section 303, directs the EPA to furnish periodic updates to the public about radon's health risks¹⁶⁶ and the methods available to measure and

H.R. REP. NO. 1047, *supra* note 160, at 7, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, 3613.

161. Indoor Radon Abatement, Pub. L. No. 100-551, § 301, 102 Stat. 2755 (1988). The Committee on Energy and Commerce adopted this goal to encourage the public to bring radon levels in existing homes and buildings down as low as possible.

162. H.R. REP. NO. 1047, *supra* note 160, at 11, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3617. According to Deputy Administrator A. James Barnes, in his testimony to the Subcommittee on Health and the Environment, "We really want to try in this country to drive those indoor radon levels down as low as we can so that we are protecting the public health." *Id.*

163. *Id.* "The Committee intends that this national goal be viewed as a long-term aspirational goal for the public. The Committee recognizes, [however,] that there are significant practical and economic limitations in attaining this goal in existing and new buildings." *Id.*

164. *Id.* The Committee on Energy and Commerce believed that "reasonably available construction technology does not currently exist to ensure that the outdoor level could be attained and maintained in many existing or new buildings." *Id.* Hence, the Committee recognized that radon testing methods currently existing do not suffice to prevent hazardous radon exposure. This recognition has significant implications for holding the construction contractor liable on a common law tort claim. *See infra* notes 183-92 and accompanying text (discusses the implications).

165. H.R. REP. NO. 1047, *supra* note 160, at 11, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3617.

166. *Id.* Section 303 provides:

(a) PUBLICATION.—In order to make continuous progress toward the long-term goal established in section 301 of this title, the Administrator of the Environmental Protection Agency shall, not later than June 1, 1989, publish and make available to the public an updated version of its document titled 'A Citizen's Guide

reduce indoor radon levels.¹⁶⁷ Section 303 requires the EPA to furnish information about the cost and technological feasibility of reducing radon concentrations in existing and new buildings and the relationship between short and long-term testing techniques.¹⁶⁸ The Bill recommends that testing programs include devices which prevent radon's entrance into buildings and reduce radon levels.¹⁶⁹ In order to provide a wide range of devices to the public, the Bill urges the EPA to accelerate and broaden the testing program.¹⁷⁰ Further, the Bill requires the EPA to describe a series of action levels,¹⁷¹ to indicate the health risk associated with various radon levels and to furnish information about outdoor radon levels around the country.¹⁷²

The Section 303 requirement to issue periodic updates about radon's health risks arose from Committee concern that the EPA never in-

to Radon'. The Administrator shall revise and republish the guide as necessary thereafter.

(b) INFORMATION INCLUDED—

(1) ACTION LEVELS—The updated citizen's guide published as provided in subsection (a) shall include a description of a series of action levels indicating the health risk associated with different levels of radon exposure. . .

Indoor Radon Abatement, Pub. L. No. 100-551, § 303, 102 Stat. 2755-56, (1988). Regarding the health risks, Section 303 requires the EPA to inform the public about the increased health risks of potentially sensitive populations, such as children and by persons engaged in potentially risk-increasing behavior, such as smoking. H.R. REP. NO. 1047, *supra* note 160, at 12, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3617.

167. Indoor Radon Abatement, Pub. L. No. 100-551, § 303(b)(2)(c), 102 Stat. 2755, 2756 (1988).

168. *Id.* The Committee was aware of information suggesting that instantaneous or short-term radon test results may not indicate reliable and accurate long-term radon levels. By the same token, the Committee on Energy and Commerce expressed concern about the public's surrendering of radon mitigation measures if short-term tests displayed low levels. Hence, in the future, the EPA should consider whether the public should only utilize results from long-term tests. H.R. REP. NO. 1047, *supra* note 160, at 16, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3620.

169. H.R. REP. NO. 1047, *supra* note 160, at 16, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3621.

170. *Id.* "[T]he Committee is concerned about EPA's delay in testing radon mitigation equipment and believes that aggressive EPA testing can accelerate the introduction of products available to the consumer." *Id.*

171. *See infra* notes 173-178 and accompanying text (discussing the revised action level studies).

172. H.R. REP. NO. 1047, *supra* note 160, at 13, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3617. The EPA's information on outdoor levels will be at a degree of geographic resolution that is accurate and useful to the public. *Id.*

tended 4 pCi/L to be a health-based standard.¹⁷³ Rather, the EPA believed this action level reflected an amalgam of information regarding health risks, population exposure and mitigation feasibility and costs.¹⁷⁴ In the new update, the EPA will not designate a single particular radon level as an action level or guidance level.¹⁷⁵ Instead, the updated citizen's guide will contain a series of action or guidance levels including levels below 4 pCi/L to allow homeowners to evaluate the health risk at each radon level.¹⁷⁶ Furthermore, the Bill encourages the EPA to issue periodic literature informing the public of radon risks below 4 pCi/L.¹⁷⁷ By using a series of action levels, the EPA hopes to prevent public misinterpretation of levels below 4 pCi/L.¹⁷⁸

As a third important provision, Section 304 requests the EPA to develop model construction standards and techniques to control radon levels within new buildings.¹⁷⁹ Organizations involved in establishing

173. H.R. REP. NO. 1047, *supra* note 160, at 13, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3618. The current EPA guidance document advises that "follow-up measurements are probably not required" if screening measurements are less than 4 pCi/L. H.R. REP. NO. 1047, *supra* note 160, at 12, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3617. The EPA believes exposures in the 4 pCi/L range are "average or slightly above average for residential structures." *Id.* at 3617-18. Nevertheless, according to the Committee, many people have misinterpreted the EPA's designated action level as meaning that little or no risk from radon levels exists below 4 pCi/L. *Id.* See also *Indoor Radon Abatement: Hearings on H.R. 2837 Before the Subcomm. on Health and the Environment, 100th Cong., 2d Sess. 56 (1987)* (statement of EPA Deputy Administrator A. James Barnes that the Agency's 4 pCi/L was not intended to be a health-based standard).

174. H.R. REP. NO. 1047, *supra* note 160, at 13, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3618. Originally, the EPA adopted a single action level to focus public attention on the radon problem. The Bill requests the EPA to compare exposure risks from radon with other appropriate examples, such as cigarette smoking and x-ray treatment. *Id.*

175. H.R. REP. NO. 1047, *supra* note 160, at 13, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3618-19. In fact, the EPA's September 12, 1988 press release on radon addresses home radon levels above and below 4 pCi/L. *Id.*

176. *Id.* at 3619.

177. H.R. REP. NO. 1047, *supra* note 160, at 13-14, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3619. According to the legislative history, the EPA will no longer advise the public that 4 pCi/L is a benchmark.

178. *Id.* According to the Committee on Energy and Commerce: In light of the health risks posed by even low levels of radon, the Committee expects that in future EPA literature regarding radon, the Agency will recharacterize the information regarding the risks of exposure to low levels of radon so that the public is made aware of the risks that remain at levels below 4 picocuries per liter. *Id.*

179. Indoor Radon Abatement, Pub. L. No. 100-551, § 304, 102 Stat. 2755, 2756

national building construction standards and techniques should assist the EPA in developing these standards.¹⁸⁰ The standards and techniques will account for geographic differences in construction types and materials as well as geology, weather and other variables that can affect radon levels in new buildings.¹⁸¹ Finally, Section 304 authorizes the EPA to ensure that organizations and authorities responsible for developing national model building codes and regulating building construction adopt the Agency's model standards and techniques.¹⁸²

B. *Analysis of the Indoor Radon Abatement Bill's Effect on Future Construction Contractor Liability*

Although the Indoor Radon Abatement Bill specifically disclaims creating a homeowner's cause of action for radon exposure,¹⁸³ the Bill has significant implications for construction contractor liability. First, the Bill addresses radon contamination by attempting to draw nationwide attention to the problem.¹⁸⁴ By making radon contamination a national issue, the Bill facilitates homeowners' chances of imputing constructive knowledge of the radon hazard to building contractors. Constructive knowledge of the radon hazard benefits a homeowner

(1988). The Committee understood that incorporating radon mitigation methods during construction rather than through modifications after construction would prove more cost effective. H.R. REP. NO. 1047, *supra* note 160, at 16, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3621.

180. *Id.* Besides this support, the EPA is to continue working with the building industry to identify improved radon reduction practices during construction. The EPA will incorporate any findings into periodic revisions of the model construction standards and techniques. H.R. REP. NO. 1047, *supra* note 160, at 17, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3622.

181. *Id.* The EPA Administrator shall draft a document containing the model standards and techniques which will be available for public review and comment. By June 1, 1990, the Administrator shall issue final model standards and techniques to the public. *Id.*

182. *Id.* The Committee on Energy and Commerce realized that model building codes regulated almost all new building construction. Hence, the Committee desired that current model building codes incorporate the future radon construction standards and techniques so that state and local communities could follow suit. H.R. REP. NO. 1047, *supra* note 160, at 16, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS, at 3621.

183. *See supra* note 165 and accompanying text.

184. Although the radon hazard gained nationwide exposure prior to the Bill's enactment, the Radon Gas and Indoor Quality Research Act of 1986 only authorized the EPA to conduct research into the radon problem. *See supra* note 6 and accompanying text. The Bill goes further and takes positive and constructive steps towards developing proper construction standards to mitigate the radon hazard.

who has a potential claim for negligence or for breach of implied warranty of habitability¹⁸⁵ when the homeowner cannot otherwise establish the contractor's knowledge.

Second, the EPA's establishment of a series of action levels rather than the previous standard of 4 pCi/L¹⁸⁶ notifies contractors that they cannot escape potential liability by relying on only one measurement standard. Hence, construction contractors should not reasonably believe that 4 pCi/L is a safe radon concentration level. In fact, contractors must resort to proper radon mitigation measures¹⁸⁷ because the establishment of a series of action levels suggests that contractors cannot be sure of a reasonable level for human habitation. Moreover, the EPA's establishment of a series of action levels suggests that a homeowner has a better chance of proving a breach of implied warranty of habitability or products liability claim.¹⁸⁸ If the homeowner can show that the contractor constructed the house after the Bill's enactment¹⁸⁹ and that the house emitted a radon concentration level exceeding the EPA's suggested levels,¹⁹⁰ the homeowner may successfully prove that the contractor built a defective product.

Finally, and perhaps most significantly, the Bill provides state assistance in developing programs to promote public awareness and develop technologically and economically feasible mitigation measures.¹⁹¹ As

185. Constructive knowledge sometimes becomes important in establishing the knowledge element of a cause of action for negligence or implied warranty of habitability. Whereas constructive knowledge may already be imputed to construction contractors who build in high radon areas, the Bill provides even stronger support for a plaintiff homeowner's proving knowledge of the radon defect. *See supra* notes 55-59 and accompanying text and *supra* notes 134-37 and accompanying text (discusses constructive knowledge under negligence and implied warranty of habitability claims).

186. *See supra* notes 173-78 and accompanying text.

187. In this regard, a contractor's belief that 4 pCi/L was a proper concentration level may not satisfy the reasonable care requirement in a negligence action. Likewise, a court might not hold that the contractor wins the implied warranty claim on the theory that 4 pCi/L rendered the house suitable for human habitation.

188. *See supra* notes 87-90 and accompanying text (discussing product defect as an element of the cause of action).

189. *See supra* notes 113-14 and accompanying text discussing the applicable discovery dates of radon's hazard. The enactment of the Bill evidences strong support for contractor realization of the magnitude of the problem and contractor responsibility to employ preventative measures during construction.

190. It seems likely that courts will use federal regulatory levels in determining if a contractor has acted negligently. *See supra* note 24 and accompanying text (discusses the use of federal regulatory levels in tort claims).

191. *See supra* note 160.

part of these state programs, the Bill attempts to have model construction industry standards and techniques incorporated into state and local construction industry standards.¹⁹² This state and local adoption of radon prevention standards and techniques becomes important because, while the Bill intentionally fails to impose construction contractor liability, states can enact statutes to hold contractors liable.¹⁹³ Furthermore, with state and local adoption of model construction standards for radon mitigation, construction contractors will likely be held to these new construction methods as evidence of industry standards.

V. CONCLUSION

Construction contractors face potential liability for home radon contamination under common law theories of negligence, products liability, breach of implied warranty of habitability and fraud. Homeowner causes of action for negligence, products liability, and breach of implied warranty hinge on whether the construction contractor had direct or constructive knowledge of the radon hazard. Furthermore, the source of the radon hazard plays a key role in assessing liability. The homeowner can probably establish a successful action in fraud when the contractor intentionally or negligently misrepresented a home's radon condition. As knowledge of radon contamination becomes more widespread, construction contractors should have a duty to disclose any radon condition.

The Indoor Radon Abatement Bill presents important implications for construction contractor liability. Although the Bill is newly enacted, one can safely assume that future construction industry standards will include preventative measures to eradicate the radon contamination hazard.

*Rita M. Nichols**

192. *See supra* notes 179-82 and accompanying text. The Committee on Energy and Commerce specifically hoped that model building codes would incorporate future radon construction standards and techniques. *Id.*

193. Some states have already enacted statutes creating liability. *See supra* note 160 (discusses New Jersey's provisions). Nonetheless, the Bill now gives states greater incentive to work for radon prevention and provides states with federal construction standard guidelines.

* J.D. 1990, Washington University

