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CHAPTER 17A Indoor Air Quality

A growing body of scientific and medical scholarship suggests that indoor air contaminants may pose a threat to human health that equals, and in some instances may exceed, the dangers of outdoor air pollution. In the absence of a uniform federal framework to govern indoor air quality issues, individual federal and state agencies, state legislatures, municipalities, and private standard-setting bodies have taken action on their own. This chapter introduces the major indoor air contaminants and their health effects and provides an overview of indoor air quality regulation and litigation, with an emphasis on considerations for the practitioner.

Indoor air hazards are generally divided into the following categories, each with its own health effects and regulations: radon; asbestos; volatile organic compounds (VOCs); formaldehyde; biological contaminants; pesticides; environmental tobacco smoke (ETS); and airborne contaminants that trigger "sick-building syndrome" (SBS). *See* § 17A.02.

To the extent there is regulation of indoor air quality, that regulation tends to be in a piecemeal fashion by legal and non-legal mechanisms, including:

- federal environmental laws, *see* § 17A.03;
- state and local indoor air legislation, *see* § 17A.05; and
- voluntary and consensus standards, *see* § 17A.06.

The U.S. Environmental Protection Agency (EPA) has established itself as a key player on indoor air quality issues, and has adopted a primarily non-regulatory, information-dissemination-based approach. EPA has issued reports and guidance documents and acted as a coordinating body. *See* § 17A.04. The Occupational Safety and Health Administration (OSHA) regulates various indoor air contaminants in the workplace. *See, e.g.*, § 17A.03[3].

Litigation over indoor air quality disputes continues to expand. Plaintiffs alleging illness and property damage from indoor air contaminants rely on both old and emerging theories of legal liability, *see* §§ 17A.08, 17A.09[2], and they are increasingly framing causes of action against employers in terms of recklessness or fraud to avoid state workers' compensation bars. *See* § 17A.09[1]. Most indoor air lawsuits target multiple defendants, including not only premises owners and product manufacturers (*e.g.,* manufacturers of HVAC equipment) but also designers,

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architects, installers, leasing agents, landlords, and any other person or entity that can be linked in some way to the presence or control of harmful contaminants in the indoor environment. *See* *§ 17A.08*.

Defendants to indoor air quality lawsuits can mount successful defenses by relying on:

- statute of limitations defenses, *see* *§ 17A.10[1]*;
- deficiencies in the plaintiffs' efforts to demonstrate causation, *see* *§ 17A.10[2]*, or to prove damages, *see* *§ 17A.10[4]*, and
- arguments that certain expert testimony should be inadmissible because it is unreliable and not scientifically valid, under prevailing legal standards, *see* *§ 17A.10[3]*.

Synopsis

CHAPTER 17AIndoor Air Quality

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§ 17A.01 Introduction and Overview of Indoor Air Quality Issues

The legal system has lagged behind scientific discoveries concerning the presence of potentially harmful air pollutants inside homes and other nonindustrial buildings.[1] Since the mid- to late 1970s, the public has been barraged with reports that the health effects of indoor air pollution may dwarf those of all other forms of pollution combined.[2] In 1989, EPA concluded that, based on population risks, indoor air pollution represented one of the most important environmental problems.[3] For example, in homes with particularly high radon levels, exposure to radon has been stated to cause lung cancer risks equivalent to smoking 135 packs of cigarettes each day.[4] Other reports have charged that individuals are exposed indoors to levels of pollutants that greatly exceed their regulated exposure limits in the outdoor environment or maximum permissible worker exposure levels.[5]

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[1] Indoor air pollutants are also present in vehicles. *See, e.g.,* Bob Weinhold, *Don't Breathe and Drive?,* Envtl. Health Perspectives A422, A426 (Sept. 2001) (typical vehicle contaminants include acetonitrile, decanol, formaldehyde, naphthalene, and carbon disulfide; even the "new car smell" contains volatile organic compounds and other pollutants); *Aircraft Cabin Environment: Before the Subcommittee on Aviation of the House Committee on Transportation and Infrastructure*, 108th Cong. (2003) (statement of Dr. John Howard, Director, NIOSH) (discussing contaminants in aircraft cabin air, as well as problems of high occupant density and low ventilation rates); Spivey, *Bad Grades for School Buses*, 110 Envtl. Health Persp. A453 (Aug. 2002) (discussing study finding that children riding diesel-fueled school buses may have increased risk of cancer and aggravated respiratory problems).

[2] Most people spend about 90% of their time indoors. *See* EPA, *Report to Congress on Indoor Air Quality,* 1 (1989) [hereinafter EPA Report to Congress]; U.S. EPA, *Indoor Air Facts No. 6: Report to Congress on Indoor Air Quality* (August 1989) (discussing EPA's report to Congress); Comm. on Indoor Pollutants, Board on Toxicology & Environmental Health Hazards, Assembly of Life Sciences, National Academy of Science, National Research Council, *Indoor Pollutants* 1 (1981) [hereinafter NAS/NRC Report]. Moreover, individuals may be exposed to certain potentially harmful pollutants in the indoor environment at levels that exceed typical levels of outdoor exposure.

[3] EPA Report to Congress, at 4-27. EPA's conclusions were based on a 1987 comparative study of environmental problems in the United States. Effects considered in the evaluation included cancer risks, non-cancer risks, ecological effects, and welfare effects. *See* EPA, *Unfinished Business: A Comparative Assessment of Environmental Problems,* Office of Policy Analysis (1987).

[4] *See* Galen, *Lawyers Grapple With Radon Issue*, Nat'l L.J., July 21, 1986 at 1, col. 1; Fleishman, *Radon: It's Still Here; In-Home Tests Are Common, but Debate Rages on Over Risk Factors*, Washington Post, Jan. 25, 2003 at H1.

[5] Over the past several decades, human exposure to indoor air pollutants has increased due to, among other things, the construction of well-sealed buildings, reduced ventilation rates, the use of synthetic building materials and furnishings, and the use of chemically formulated personal care products, pesticides, and household cleaners. EPA, *Indoor Air Facts No. 1 (Revised)* (Dec. 1991).

EPA conducted a group of studies to assess exposure to indoor air pollutants. Substances such as chloroform, trichlororethane, benzene, styrene, and trichloroethylene were found both in air breathed and exhaled by individuals at levels much higher than that of outdoor air. *See* L.S. Sheldon, *Indoor Air Quality in Public Buildings,* EPA (1988); Wallace, *Personal Exposures, Indoor-Outdoor Air Relationships and Breath Levels of Toxic Air Pollutants Measured in 335 Persons in New Jersey,* 19 Atmos. Environment 1651 (1985).

Moreover, one estimate has placed the aggregate costs of indoor air pollution at tens of billions of dollars per year.[6]

Just in the last several years, concerns with indoor air quality have taken on new prominence both nationally and internationally. For example, following the September 11, 2001 attacks on the World Trade Center in New York, EPA made a public pronouncement that the outdoor and indoor air near the site of the collapsed buildings was safe to breathe. The agency would later face criticism that it lacked sufficient data and analyses to provide such assurances.[7] In 2000, the World Health Organization described access to healthy indoor air as a "right."[8]

Whether reports of serious health risks from indoor air contaminants are accurate—and whether the heightened attention being paid to indoor air quality is merited by the facts—is a judgment call. Nevertheless, the reports have served to alert the public to the real or perceived risks of indoor air pollution. These reports also have encouraged affected individuals, in both employment and residential contexts, to question whether certain ailments they are experiencing may have been caused by the indoor environment and to bring their disputes to the courts.

[1] Adverse Effects of Indoor Air Quality

[a] The Adverse Effects Range Considerably

Adverse effects of exposure to indoor air pollutants may range from mild, short-term discomfort to cancer or death. For many indoor air pollutants, the exposure levels at which various effects occur have not been identified. In addition, certain individuals may be especially sensitive to indoor air pollutants, because of their age and/or existing health condition, and may therefore experience health effects at lower concentrations than the average exposed individual.[9]

[b] Non-Cancer Health and Discomfort Effects

The potential non-cancer health and discomfort effects of indoor air pollutants range from mild sensory irritation to acute toxicity, chronic organ damage, and death.[10] The extent to which effects occur is

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[6] EPA Report to Congress, at 5-17. Measurable economic impacts include materials and equipment costs, direct medical costs, and lost productivity. These concerns are shared by insurance companies, as insurance industry leaders recently warned that building owners and managers must prioritize good indoor air quality on peril of becoming uninsurable. *Poor air quality could jeopardize insurance for employers*, 4 Occupational Hazards 18 (April 1, 2002). *See also* Roberta Wilson, *Up in the air: settle indoor air quality issues during due diligence*, 20 Com. Investment Real Estate J. 37 (Mar./Apr. 2001) (due diligence and sales agreements should identify IAQ issues and allocate any liability).

[7] The debate over EPA's response to the September 11, 2002 attack rages on. *See. e.g.*, *White House Agrees to Allow Review Panel on Response to World Trade Center Collapse*, Nat'l Env't Daily (BNA) (Oct. 29, 2003); *EPA: Acting Administrator Horinko Says Unfounded Criticism Harms Agency*, Nat'l Env't Daily (BNA) (Oct. 10, 2003); *Emergency Response: Senate Report Says EPA, White House Acted Properly After Trade Center Collapse*, Nat'l Env't Daily (BNA) (Sept. 24, 2003). *See also* U.S. EPA, *EPA Response to September 11*, *at* http://www.epa.gov/cgi-bin/epaprintonly.cgi (describing EPA's post-September 11 studies, testing, and reports).

[8] *See* Molhave and Krzyzanowski, *The right to healthy indoor air: status by 2002*, 13 Indoor Air 50-53 (2003). A WHO Working Group in 2000 agreed on a set of nine statements based on fundamental principles of human rights, biomedical ethics, and ecologic sustainability. The first statement reads: "Under the principle of the human right to health, everyone has the right to breathe healthy indoor air." Another statement suggests legal accountability for injuries: "Under the 'polluter pays principle,' the polluter is accountable for any harm to health and for welfare resulting from unhealthy indoor air exposures … ." *Id.* at 50–51.

[9] For example, newborns and young children may be more sensitive to indoor air pollutants. Some elderly, and some individuals with asthma, hay fever, emphysema, bronchitis, and cardiovascular disease, have a reduced resistance to pulmonary irritants and infections. EPA Report to Congress, at 3-5.

[10] EPA Report to Congress, at 3-4.

dependent on numerous factors, including degree of exposure and the susceptibility of the exposed individual.

A number of illnesses have been associated with indoor air pollutants with varying degrees of certainty.[11] For example, biological contaminants, such as dust mites, dander, pollens, and molds, as well as certain organic chemical contaminants, are known to exacerbate asthma, rhinitis, and sinusitis. Exposure to volatile organic compounds or pesticides may affect the neurological system or cause liver disease. Decreased pulmonary function and exacerbation of cardiac problems may result from exposure to combustion gases (*e.g.*, carbon monoxide and nitrous oxide).[12] In addition, pollutant mixtures are thought to play an important role in causing the acute symptoms associated with "sick building syndrome."[13]

[c] Multiple Chemical Sensitivity

The concept of multiple chemical sensitivity (MCS)[14] has generated considerable controversy and debate, and remains highly controversial. The notion that exposure to environmental organic chemicals could lead to illness, distinct from classic allergy sensitization or other health effects of demonstrable cause, was first introduced in the 1960s.[15] A clinical definition of MCS has not been scientifically established.[16] Reports purporting to have identified MCS refer to seven diagnostic features:

(1) it is acquired as a result of some environmental exposure, insult, or illness that can be documented;

(2) symptoms include more than one organ system;

(3) symptoms recur and abate in response to predictable stimuli;

(4) symptoms are elicited by exposures to chemicals of diverse structural classes and toxicological modes of action;

(5) symptoms are elicited by exposures that are demonstrable (albeit at low levels);

(6) exposures that elicit symptoms must be significantly below exposures known to cause adverse human response; and

(7) no single widely available test of organ system function can explain the symptoms,[17] nor can any single widely accepted test of physiological function be shown to correlate with symptoms.[18]

The last test set forth above seems to place MCS—by definition—outside the mainstream of medical science. In fact, MCS has not been recognized in standard medical tests or scientific classifications of disease.[19] Rather, it has become associated with the field of "clinical ecology," a nontraditional area of

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[11] *See* § 17A.02 *infra.*

[12] EPA Report to Congress, at 3-2, 3-3.

[13] *Id.* at 3-8. *See* § 17A.02[9] *infra.*

[14] MCS goes by a number of names: environmental illness, ecological illness, total allergy syndrome, the 20th Century disease, and idiopathic environmental intolerances. The Interagency Workshop on Multiple Chemical Sensitivity, *A Report on Multiple Chemical Sensitivity (Predecisional Draft)* (Aug. 24, 1998), *at* http://www.health.gov/environment/mcs/toc.htm [hereinafter MCS Report].

[15] *See* T. G. Randolf, *Human Ecology and Susceptibility to the Chemical Environment,* Springfield, Ill. (1962).

[16] *See* Various Authors, *Multiple Chemical Sensitivity: A 1999 Consensus*, Archives of Envtl. Health, May/June 1999, at 147–49 (34 signatories calling for establishment of a standardized clinical definition of MCS and a comprehensive clinical protocol).

[17] M. R. Cullen, *The Worker with Multiple Chemical Sensitivities: An Overview of Workers with Multiple Chemical Sensitivities,* 2 Occupational Medicine, State of the Art Reviews (1987).

[18] Many definitions of MCS have been proposed. Common elements tend to include "multiple environmental causes, chronicity, multiorgan symptoms, and symptoms at very low levels of chemical exposure." MCS Report.

medical practice.[20] The findings and treatments reported by clinical ecologists regarding MCS have been widely criticized by many disciplines in organized medicine.[21]

Despite the controversy surrounding the etiology and even the existence of MCS, case reports indicate that increasing numbers of individuals are going to great lengths to avoid many chemicals known to occur in homes, schools, and offices. These chemicals include the products of combustion, cleaning products, fragrances, pesticides, and "outgassing" from synthetic materials used for clothing, furnishing, and building products. Moreover, MCS has been the basis of lawsuits and has resulted in jury awards, including an award for $250,000 to a family who allegedly developed MCS after an exterminator misapplied the termiticide Aldrin in their home.[22] In addition, the United States Department of Housing and Urban Development has concluded that MCS is a disability within the meaning of the Fair Housing Act.[23]

[d] Carcinogenic Effects

EPA has performed a number of cancer risk assessments on indoor air pollutants. Specific pollutants known or suspected to cause cancer include radon,[24] formaldehyde,[25] and asbestos.[26] In 1992, EPA concluded, from the weight of the evidence, that environmental tobacco smoke is responsible for 3,000 lung cancer deaths among nonsmokers per year.[27] The extent to which indoor pollutants may actually cause

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[19] Nevertheless, in 1989, the New Jersey Department of Health concluded from a review of the scientific and medical literature that MCS is a serious medical illness that typically originates with an acute exposure, leading to a triggering of symptoms and heightened sensibilities each time an individual is exposed to very low levels of chemicals. The report identified four populations particularly at risk for MCS: industrial workers; occupants of "tight" or "sick" buildings; residents of communities whose air or water has been contaminated; and individuals who have had actual exposure to various chemicals, pesticides, drugs or consumer products. *See* 3 Indoor Pollution L. Rep. 5 (Mar. 1990).

[20] *See* *Marcetti v. Aronson, 1992 Conn. Super. LEXIS 2405 (Conn. Super. Ct. 1992) at *5*: "Clinical ecology is a form of medical practice based on two concepts: that a broad range of environmental chemicals in the environment can be responsible for an illness in which an unlimited number of symptoms occur in the absence of objective physical findings, pathological abnormalities, or specific abnormal laboratory tests; and that the immune system is functionally depressed by many environmental chemicals." MCS also has been called ecological illness, environmentally induced illness, and chemical AIDS.

[21] For example, in 1989, the American College of Physicians published a position paper on clinical ecology that stated: "Review of the clinical ecology literature provides inadequate support for the beliefs and practices of clinical ecology. The existence of environmental illness as presented in clinical ecology theory must be questioned because of the lack of clinical definition. Diagnoses and treatments involve procedures of no proven efficacy." *See* R.L. DeHart, *Multiple Sensitivity—What Is It?*, *in* Multiple Chemical Sensitivities 36 (Board on Environmental Studies and Toxicity, Commission on Life Science, National Research Council 1992).

[22] Morrison v. Terminix, No. 32,711, Cir. Ct. Hinds County. Miss. (jury verdict Feb. 12, 1990). *See also* Peterson v. Polycap, No. H7276-0 (Cal. Super. Ct. Alameda County 1988).

[23] *See* *§ 17A.09[2][b]* *infra.* San Francisco adopted a perfume policy requesting that citizens not wear scented products to public meetings to protect those people with chemical sensitivities from becoming ill. The policy was enacted in an effort to make meetings accessible to disabled persons under the Americans With Disabilities Act. *See* 6 Indoor Pollution L. Rep. 3 (1993).

[24] A report from the National Academy of Sciences estimates 15,400 or 21,800 radon-related lung cancer deaths per year, depending on the model used. National Academy of Sciences, *Health Effects of Exposure to Radon*, *National Academy of Sciences Report, BEIR VI* (1999), at 3 [hereinafter BEIR VI Radon Report].

[25] EPA has classified formaldehyde as a probable (B1) human carcinogen based on sufficient animal and limited human evidence. The upper-bound lifetime cancer risk for residents of mobile homes who are exposed for 10 years to radon levels equal to twice the background level is 2 in 10,000. EPA Report to Congress, at 4-14.

[26] EPA classifies asbestos as a Group A human carcinogen based on human epidemiological data. Lung cancer and mesothelioma are the most important causes of death among asbestos-exposed individuals. EPA Report to Congress, at 4-15.

cancer at levels present in all or most buildings remains one of the great unanswered questions concerning indoor air quality.

[2] Overview of Indoor Air Quality Litigation

Increased knowledge about the possible dangers of indoor air pollution has created the risk of massive lawsuits for the business community. Complaints from office workers concerning fatigue, headaches, respiratory and skin irritation, and stress in particular indoor environments have been reported for years but often have resulted in nothing more than ostracism and, perhaps, a referral to a psychiatrist.

Emerging information about "sick building syndrome" and the heightened public awareness that has resulted from increased media attention to indoor air pollution have changed the picture markedly. Armed with data concerning the health effects of passive cigarette smoke, formaldehyde, radon, asbestos, and other substances, as well as "tight buildings" themselves (buildings with inadequate ventilation), plaintiffs who believe that they have been injured by the air inside their homes and offices have taken the offensive. They have lobbied at the local, state, and federal levels for protective legislation, and in the absence of such legislation, they have been suing both for injuries to their health and property.

These cases are complex not only in the nature of the technical proof that must be developed and presented, but also in the number of parties involved. Suits have been filed against architects, builders, contractors, building product manufacturers, and realtors. The scope of liability extends further, however, to building owners, building sellers, and, in the commercial context, employers. Nevertheless, there are a number of hurdles attendant to indoor air pollution suits, including statutes of limitations, proof of causation of the alleged injury, proof of damages, and such practical considerations as costs.

Notwithstanding the barriers to recovery, suits based on indoor air pollution liability continue to multiply. Suits have been brought alleging injuries from numerous indoor air pollutants and from "sick building syndrome."

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[27] EPA, *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders,* Washington, D.C., Pub. No. 600/6-90/006F (1992) [hereinafter EPA, Health Effects of Passive Smoking]. *See generally* *§ 17A.02[8] infra.*

§ 17A.02 Indoor Air Pollutants

[1] Numerous Indoor Air Pollutants Have Been Identified

A growing body of popular,[28] scholarly,[29] and legal[30] literature has identified various air pollutants of concern in the indoor environment. Among these indoor air pollutants are radon and its decay products, asbestos, volatile organic compounds (or VOCs), formaldehyde, biological contaminants, and environmental tobacco smoke.[31] These contaminants, along with such other factors as building ventilation, and building heating, ventilation, and air conditioning (HVAC) maintenance, have been assumed to account for a myriad of complaints and symptoms from building occupants, which have been labeled "sick building syndrome."[32]

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[28] *See, e.g.*, Paquette, *Standards Called Lacking on Indoor Air Pollution*, N.Y. Times, Feb. 17, 2002 (Region/Long Island) at 11:7; Dymski, *Save your breath with good indoor air*, Milwaukee J. Sentinel, Jan. 6, 2002 (Entree), at 9N; Meyer, *Curing "Sick Buildings"—Indoor Air Quality Has Been Getting a Lot of Attention Lately*, Buff. News, Sept. 11, 2000 (Business), at IE; Schneider, *The Indoor Pollution Burden,* EPA J., Aug., 1986 at 14; Squires, *Indoor Air Pollution: Confronting America's Newest Health Hazard,* Wash. Post, Sept. 16, 1986 (Health), at 15; Swallow, *Radon Found in Area Homes; Public Awareness Grows of Possible Health Woes,* Wash. Post, Sept 8, 1986 (Business), at 1, col. 1; Pexton & Curren, *Invisible Gas Leads to Visible Hazards,* Montgomery J., Nov. 19, 1986, at 1. *See also* Morris, *Your Indoor Air Quality Might Surprise You* (WTOP radio broadcast, Oct. 24, 2003), *at* www.wtopnews.com/index.php?nid=25&sid=136759.

[29] *See, e.g.,* Samet & Spengler, *Indoor Environments and Health: Moving into the 21st Century*, 93 Am. J. Pub. Health 1489 (Sept. 2003) (journal issue devoted to "the built environment"); *Indoor Air 2002 Abstracts*, 9th International Conference on Indoor Air Quality and Climate (June 30 to July 5, 2002), *at* http://www.indoorair2002.org/abstracts.htm (collecting abstracts on over 700 recent papers analyzing a vast array of indoor air pollutants, as well as larger indoor air quality issues, presented at "the largest multidisciplinary international conference series in the field of indoor air sciences"); U.S. Dept. of Health and Human Services, *Indoor Air and Health Effects,* 95 Envtl. Health Perspectives (1991); Comm. on Indoor Pollutants, Board on Toxicology & Environmental Health Hazards, Assembly of Life Sciences, National Academy of Science, National Research Council, *Indoor Pollutants* (1981) [hereinafter NAS/NRC Report]; Repace, *Indoor Air Pollution,* 8 Envtl. 21 (presented at the International Symposium on Indoor Air Pollution, Health and Energy Conservation, Harvard University, Oct. 13–16, 1981); National Research Council, *Environmental Tobacco Smoke: Measuring Exposures and Assessing Health Effects* (1986). The research became so voluminous that EPA published an extensive bibliography on indoor air pollution. EPA, Bibliography on Indoor Air Pollution (June 1985).

[30] *See, e.g.,* Kirsch, *Behind Closed Doors: Indoor Air Pollution and Government Policy,* 6 Harv. Envtl. L. Rev. 339 (1982); Reitze and Carof, *The Legal Control of Indoor Air Pollution*, 25 B.C. Envtl. Aff. L. Rev. 247 (Winter 1998); Loewy, *Indoor Pollution in Commercial Buildings: Legal Requirements and Emerging Trends,* 11 Temple Envtl. L. & Tech. 239 (1992); Kornreich, *Minimizing Liability For Indoor Air Pollution,* 4 Tul. Envtl. L.J. 61 (1990).

[31] *See generally* U.S. EPA, Office of Radiation and Indoor Air, *The Inside Story: A Guide to Indoor Air Quality*, No. 402-K-93-007 (April 1995) (discussing categories of major indoor air pollutants); U.S. EPA, *Glossary of Terms*, *at* www.epa.gov/iaq/glossary.html (providing concise descriptions of categories of indoor air pollutants and defining other common indoor air quality terms); American Lung Association, *American Lung Association Fact Sheet: Indoor Air Pollution* (Aug. 1999) (discussing indoor air pollutants and their health effects).

[32] Appropriate ventilation is an important means of controlling indoor air pollution. *See* U.S. EPA, Office of Air and Radiation, *Fact Sheet: Ventilation and Air Quality in Offices*, Doc. No. 402-F-94-2003 (Rev. July 1990) ("[P]roper design, operation and maintenance of the ventilation system is essential in providing indoor air that is free of harmful concentrations of pollutants."). Air

[2] Radon

Radon is a colorless, odorless gas produced by the radioactive decay of uranium and radium in rock and soil. As uranium, a ubiquitous element in the earth's crust, decays it produces radium, which, in turn, produces radon gas. Because radon is inert, it can pass through permeable rock and soil into the atmosphere.

Nearly one in 15 homes in the United States has elevated levels of radon.[33] Radon comes from several sources. It is present in most soil and may seep into homes through cracks in foundations, sumps, and unsealed areas around drainage pipes and walls. Both water[34] and natural gas[35] used in the home may contain radon if they pass through underground areas that contain the gas. Buildings located near rich uranium or radium deposits or that have certain construction features[36] are vulnerable to high levels of radon. Radon has a half-life of 3.82 days and decays into short-lived radioisotopes.[37]

[a] Health Effects

Studies of underground mine workers have linked the radioactive particles generated as radon decays to lung cancer in humans.[38] One issue confronting EPA on this subject is whether studies of occupational, dust-laden environmental exposures of miners can be translated into non-occupational residential exposure under vastly different circumstances.[39] Nonetheless, based on these exposures, EPA has set an "action

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cleaning is another means of reducing pollutants in indoor air. U.S. EPA, Office of Air and Radiation, *Indoor Air Facts No. 7: Residential Air Cleaners*, Doc. No. 20A-4001 (Feb. 1990). Removal of the source of the emissions, or control of those emissions, is of course the most effect method for eliminating indoor air hazards. *Id. See also* Arnold, *Sick Building Syndrome Solutions*, 46 Prof. Safety 43, 56 (June 2001) (same).

[33] Office of Air and Radiation, U.S. EPA, *A Citizen's Guide to Radon: The Guide to Protecting Yourself and Your Family from Radon* (4th ed.), EPA Doc. No. 402-K02-006 (Rev. May 2002) [hereinafter Citizen's Guide].

[34] Even if the soil in one area is not rich in radon, groundwater flowing through the soil can carry radon with it from adjacent areas. High levels of radon in water have been correlated with indoor levels of radon. NAS/NRC Report, at 69.

[35] *Id.* at 70.

[36] Building materials and construction techniques can both contribute to elevated radon risks. For example, some granite and concrete products can actually give off radon. More often, the problem results from cracks in the building foundation, or elsewhere in the structure, through which higher-pressure air in the soil is drawn into the lower-pressure air of the indoor environment. *See* U.S. EPA, Office of Air and Radiation, Consumer's Guide to Radon Reduction, No. 402-K-03-002 (Rev. Feb. 2003). Radon-resistant new construction techniques are now available in the marketplace, and are in some instances mandated by building codes. These techniques tend to limit points of entry for radon and provide for acceptable ventilation.

[37] These radioisotopes are referred to as radon daughters, or progeny. Two of the more common daughters, polonium-218 and polonium-214, emit alpha particles.

[38] Epidemiological studies of underground miners, which have long been essential to understanding the risks posed by radon, have consistently demonstrated higher lung cancer mortality than what would be expected in the general population, as well as a correlation between increased risk and increased exposure to radon progeny. National Academy of Sciences, *Health Effects of Exposure to Radon*, *National of Academy of Sciences Report, BEIR VI* (1999) [hereinafter BEIR VI Radon Report]. Appendix D to the BEIR VI Radon Report describes these studies. *See also* F.E. Lundin *et al.,* National Institute for Occupational Safety and Health and National Institute for Environmental Health Sciences Joint Monograph, *Radon Daughter Exposure and Respiratory Cancer: Quantitative and Temporal Aspects* (1971); Whittemore & McMillian, *Lung Cancer Mortality Among U.S., Uranium Miners,* 71 J. Nat'l Cancer Inst. 489 (1983); Hornung & Meinhardt, *Quantitative Risk Assessment of Lung Cancer in U.S. Uranium Miners,* 52 Health Physics 417 (1986); Radford & Renard, *Lung Cancer in Swedish Iron Miners Exposed to Low Doses of Radon Daughters,* 310 New Eng. J. Med. 1485 (1984).

[39] Data from current epidemiological studies of indoor radon do suggest a small increase in the risk of lung cancer from indoor exposure and are consistent with the mining studies. However, due to uncertainties in the residential studies, they "do not conclusively support a definable excess lung-cancer risk associated with radon progeny exposure." BEIR VI Radon Report, at

level" for indoor radon at 4 picocuries per liter of air (pCi/L).[40] Average outdoor radon is approximately 0.4 pCi/L for locations where no elevated sources are present. It appears that the average indoor exposure to radon in the United States is 1.3 pCi/L.[41] The National Academy of Sciences has estimated that between 15,000 and 22,000 lung cancer deaths each year, among non-smokers and smokers combined, are attributable to radon.[42] There is also evidence to suggest a synergistic effect between radon and smoking that places smokers at higher risk of contracting such cancers.[43]

[b] Standards and Regulations

Because radon is a naturally occurring gas, a ban is not feasible. Control techniques include sealing off routes through which radon enters the home,[44] ventilating radon from the soil to prevent entry of the gas into the home,[45] reducing radon levels in building materials, sealing off building materials from which radon emanates,[46] and filtering and ventilating indoor air to remove radon. Where residential indoor air is found to have radon levels above 4 pCi/L, EPA recommends further testing and possible corrective renovations and mitigation.[47] However, because EPA believes that no level of radon is "safe," it recommends that homeowners consider future testing even where indoor radon levels are found to be below 4 pCi/L.[48]

In 1988, Congress amended the Toxic Substances Control Act (TSCA) to provide funding for states and aid to homeowners to control radon in schools, private homes, and federal buildings.[49] Congress set as a national long-term goal that indoor air be as free from radon as is the ambient air outside buildings.[50] The

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356. The indoor environment studies are described in Appendix G to the Report. *See also* Office of Radiation and Indoor Air, U.S. EPA, *EPA Assessment of Risks from Radon in Homes* (June 2003) ("[I]t is anticipated that indoor radon will remain an important public health problem, contributing to thousands of lung cancer deaths annually.").

[40] Office of Air and Radiation, U.S. EPA, *Indoor Radon and Radon Decay Product Measurement Protocols* 1-2 (1989). The action level is not a health-based standard. According to EPA, 4 pCi/L is equivalent to approximately 200-300 x-rays per year or smoking half a pack of cigarettes per day. The "action level" was set by reference to the level of mitigation EPA believes to be feasible. *See also* Office of Air and Radiation, U.S. EPA, *Indoor Radon and Radon Decay Product Measurement Device Protocols* (Rev. July 1992) (updating and superseding prior protocol documents).

[41] Citizen's Guide, at 7.

[42] BEIR VI Radon Report, at 3. Thus approximately one in every seven to ten lung cancer deaths is thought to be radon-related. *Id.*

[43] *Id.* at 4.

[44] Nero, *The Indoor Radon Story*, Tech. Rev., Jan. 1986, at 12.

[45] *Id.*

[46] The building can be sealed off more carefully from the underlying soil, and bricks and concrete can be coated with epoxy resins or other materials to reduce the amounts of radon that can escape into the home interior. These techniques, however, may not prove practical in every home. NAS/NRC Report, at 74–76.

[47] Citizen's Guide, at 6–7.

[48] *Id.* at 7.

[49] In 1990, EPA reported on the status of state radon programs as of September 1989. U.S. EPA, Air and Radiation, *1989 Summary of State Radon Programs* (1990). According to EPA, at that time 40 states had core programs, seven states provided moderate programs, and only four states had extensive programs. For specific examples of state laws, *see, e.g.: Connecticut:* Conn. Gen. Stat. § 19a-14b (mitigation crews must be supervised by an RCP contractor on site); *District of Columbia:* D.C. Code Ann. § 28-4201 (requires testers and mitigators to be EPA proficient); *Kentucky:* Ky. Rev. Stat. Ann. § 211.856 (requires radon professionals to be state certified); *South Dakota:* S.D. Codified Laws Ann. § 43-4-44 (requires sellers of residential real estate to furnish potential buyers with disclosure form that includes radon hazard information); *West Virginia:* W. Va. Code § 16-34-1 (requires licensing of radon testers, mitigators and laboratories). The Environmental Law Institute (ELI) has compiled a radon law and policy database that collects state laws and regulations, municipal ordinances, litigation, reports, and guidance documents. *See* ELI web site at http://www.eli.org/researc/iaqdatabases.htm.

law authorized grants and technical assistance to states for radon control and required EPA to set up a radon information clearinghouse and to study radon in schools and federal buildings.[51] Pursuant to TSCA, EPA proposed model standards and techniques to reduce radon in newly constructed one- and two-story homes in communities with high radon levels. The model standards apply not only to new homes, but also to major renovations of existing homes. These standards and techniques were intended by EPA to serve as a model for use by organizations that develop, adopt, and enforce building codes, including state and local governments.[52]

More recently, EPA has adopted a primarily non-regulatory approach to addressing radon in homes. This approach has relied mainly on the dissemination of information to homeowners and the promotion of state radon disclosure requirements.[53]

In 2011, an EPA-led group of federal agencies issued a Federal Radon Action Plan, which described steps that federal agencies would take to advance radon risk reduction nationally.[53.1] The action plan said that federal programs that owned, managed, administered, financed, or developed policies for homes, schools, and daycare facilities could lead efforts to reduce radon risk by delivering, requiring, and financing radon testing and mitigation, and promoting radon-resistant construction. The action plan also cited the federal government's ability to leverage programs that fund activity in homes—such as home assessment, renovation, retrofit, rehabilitation, and repair—to reduce radon risks. The federal government could also use its purchasing power to increase public understanding of radon risk and to build the market for radon testing, mitigation, and radon-resistant construction services.

In 2015, EPA, other federal agencies, and a number of nonprofit partners led by the American Lung Association released a National Radon Action Plan, which they said built on the achievements of the Federal Radon Action Plan.[53.2] The plan's near-term goals were to reduce radon risk in 5 million homes and to save 3,200 lives by 2020; its long-term goal was to eliminate avoidable radon-induced lung cancer. The tenets of the National Radon Action Plan included "building in" radon risk reduction so that radon testing, mitigation, and radon-resistant construction are standard practices. Other components of the plan included incentives for radon risk reduction, promotion of the use of certified radon services, and increasing visibility of radon issues.

[c] Litigation

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[50] *See* Toxic Substances Control Act (TSCA) § 301, *15 U.S.C. § 2661*.

[51] TSCA §§ 305–309, *15 U.S.C. §§ 2665-2669*. EPA, in partnership with Kansas State University, has established radon hotlines; their numbers are 1-800-767-7236 (1-800-SOS-RADON) (to purchase radon test kits by phone) and 1-800-557-2366 (1-800-55RADON) (for help with radon questions).

[52] *58 Fed. Reg. 19097 (1993)*; Office of Air and Radiation, U.S. EPA, *Model Standards and Techniques for Control of Radon in New Residential Buildings*, Pub. No. 402-R-94-009 (March 1994). *See also* Office of Air and Radiation, U.S. EPA, *Building Radon Out: A Step-by-Step Guide on How to Build Radon Resistant Homes*, Pub. No. 402-K-01-002 (April 2001); Office of Air and Radiation, U.S. EPA, *Radon Mitigation Standards (RMS)*, Pub. No. 402-R-93-078 (Rev. April 1994) (model requirements that can be adopted or modified by state and local government for radon contractor certification or licensure programs).

[53] *See § 17A.05 infra*.

[53.1] EPA et al., Protecting People and Families from Radon: A Federal Action Plan for Saving Lives (June 20, 2011), *http://www.epa.gov/sites/production/files/2014-08/documents/Federal_Radon_Action_Plan.pdf*.

[53.2] EPA et al., The National Radon Action Plan: A Strategy for Saving Lives (Nov. 2015), *http://www.epa.gov/sites/production/files/2015-11/documents/nrap_guide_2015_final.pdf*.

Several suits have been brought concerning exposure to radon in non-occupational contexts.[54] One family living in a home contaminated with high levels of radon gas sued a company that operated a nearby uranium mine that produced the mill tailings placed in and around the foundation of their home.[55] The court agreed that the plaintiffs were entitled to a trial on whether the presence of the radon had forcibly evicted them from their home, agreeing that the defendant's actions may have "constituted a denial of physical access to the property." The court also permitted claims for punitive damages, and for chromosomal damage that occurred as a result of the radon exposure. Other suits also have been filed on behalf of plaintiffs owning homes built on uranium mill tailings.

In *Wayne v. Tennessee Valley Authority*,[56] homeowners sued a utility that had produced the phosphate slag used to manufacture the concrete blocks of which the plaintiffs had constructed their home in 1968. In 1979, the plaintiffs read a local newspaper report of radon emanation from phosphate slag, had their home tested, and found high radon levels. Following advice from the Tennessee Public Health Department and EPA, the plaintiffs left their home; the value of the house plummeted to "virtually nothing."[57] The plaintiffs sued TVA in 1981, eleven years after the concrete blocks were purchased, on implied warranty, negligence, and strict liability theories. The Fifth Circuit dismissed the case, based on the applicable statute of limitation.

At least one other radon lawsuit was filed on behalf of an owner whose home had elevated radon levels not attributable to mill tailings.[58] In that case, the homeowner was forced to expend substantial sums of money to isolate the source of and to reduce high radon concentrations in his energy-efficient home. The lawsuit was directed principally against the ventilating contractor, who had installed a defective ventilating system that permitted natural radon in the soil to be swept into the home's air supply. Suits also have been brought against real estate agents, builders, and previous owners for failure to notify buyers of the presence of high levels of radon.[59]

In September 2009, EPA announced that it had agreed to expand public participation and transparency as it reviews its monitoring of radon emissions from uranium mills. The agreement came as part of a settlement of a lawsuit which had been brought by several environmental groups.[59.1] The plaintiffs sued EPA in August 2008, seeking to compel the agency to revise radon emission permit regulations which have not been updated since 1989. Pursuant to the settlement, EPA agreed to hold at least four public presentations before publishing a proposed rule regarding the subsection at issue. The agency also agreed to create a website dedicated to the rule review, with access to background information the agency has

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[54] Numerous suits concerning radon exposure also have been litigated in the occupational context by miners or their estates. *See, e.g,* *Begay v. United States, 768 F.2d 1059 (9th Cir. 1985)*; *Vanadium Corp. of Am. v. Claimants in re Death of Garner, 39 Colo. App. 207, 565 P.2d 964 (1977)*; *Climax Uranium Co. v. Claimants in re Death of Smith, 33 Colo. App. 337, 522 P.2d 134 (1974)*; *McCormick v. United Nuclear Corp., 89 N.M. 740, 557 P.2d 589 (1976)*.

[55] *Brafford v. Susquehanna Corp., 586 F. Supp. 14 (D. Colo. 1984)*.

[56] *730 F.2d 392 (5th Cir. 1984)*.

[57] *730 F.2d at 395*.

[58] Nobel v. Marvin E. Kanze Inc., No 83-05253 (Montgomery County Pa. Ct. C.P., Civ. Div. filed Apr. 13, 1983).

[59] *See, e.g., Tanner v. Adams, 197 A.D.2d 785, 602 N.Y.S.2d 710 (1993)* (holding presence of radon gas in home, although a health hazard at high levels, was not a defect within meaning of sales contract and as such was not a ground for cancellation of contract); Wilson v. Koval, No. 88-201958 (Wash. Super. Ct. Spokane County 1990) (seeking compensation for contract price of home, diminished value of home, and damages for radon exposure where radon levels were found to be in the range of 12-30 pCi/L). *See generally* Paul Locke and Patricia Elliott, *Caveat Broker: What Can Real Estate Licensees Do About Their Potentially Expanding Liability for Failure to Disclose Radon Risks in Home Purchase and Sale Transactions*, *25 Colum. J. Envtl L. 71 (2000)* (analyzing potential legal liability for radon non-disclosure, misdisclosure, or negligent exposure from the perspective of real estate professionals).

[59.1] Colorado Citizens Against Toxic Waste, Inc. v. Jackson, No. 08-cv-01787 (D. Colo., settlement signed Sept. 3, 2009).

already compiled about the issue. Existing regulations limit radon-222 emissions from uranium mill tailings to no more than 20 picocuries per square meter per second. According to the suit, the two currently operational uranium mills in the United States—one in Utah and the other in Colorado—actually emit less radon than the permissible level, which the plaintiffs alleged proved that technology exists to reduce emissions below the current standards.

In 2020, the Second Circuit Court of Appeals allowed current and former inmates of a correctional institution in Connecticut to proceed with constitutional claims against corrections officials for acting with deliberate indifference towards the inmates' safety by exposing them to dangerous levels of radon.[59.2] The inmates—who asserted violations of the *Eighth* and *Fourteenth Amendments* as well as the Connecticut Constitution—alleged, among other things, that defendants knowingly selected a site for the correctional facility where radon levels would likely exceed the EPA action level if no mitigation system were installed and that 20 years later the defendants installed a mitigation system that excluded the cell block where inmates lived. The Second Circuit concluded that qualified immunity did not shield the officials from the inmates' claims. The Second Circuit also rejected the defendants' assertion that state sovereign immunity required dismissal of the plaintiffs' claims for prospective relief such as medical monitoring and facility radon testing.

[3] Asbestos

The term "asbestos" refers to a group of substances that are fibrous, flexible, incombustible, and durable.[60] Asbestos fibers remain airborne for long periods of time, are small enough to be inhaled deep into the lungs, and are durable even within human tissue. Asbestos was used in numerous building construction products, including thermal system insulation, structural fireproofing, acoustical and decorative finishes, sheet products, floor and ceiling tiles, and asbestos-containing felts.[61] It does not present a potential health hazard until the fibers become detached and are released into the air or water.

[a] Health Effects

The health effects of asbestos have been studied extensively and certain types of asbestos have been found to be human carcinogens.[62] No "safe level" of exposure has been identified. From all available evidence, the period between first exposure to asbestos and death from lung cancer appears to be related to the intensity of exposure. Asbestos-related disease has a 15- to 40-year latency period. The length of this latency period exacerbates the problems inherent in quantifying the relationship between exposure and disease.

[b] Standards and Regulations

Environmental exposure to asbestos has been measured in terms of fiber count or fiber mass. Recommended air concentration limits and standards adopted by different groups include:

Group	Year	Current Limit
ACGIH[63]	2001	0.1 fiber/cc[64]

[59.2] *Vega v. Semple, 963 F.3d 259 (2d Cir. 2020)*.

[60] *See generally ch. 36 infra.* Substances called asbestos have different chemical formulae, but usually are naturally occurring mineral fibers of relatively small diameter and long length. Asbestos materials in common use include serpentine, chrysotile, amosite, crocidolite, anthophyllite, and actinolite-tremolite. NAS/NRC Report, at 111.

[61] M. Lippmann, *Asbestos and Other Mineral Fibers, in* Environmental Toxicants: Human Exposures and Their Health Effects, 30, 33 (M. Lippmann ed., Van Nostrand Reinhold 1992).

[62] Asbestos exposure may cause or contribute to several forms of cancer, including mesothelioma, lung cancer, and gastrointestinal cancer.

Group	Year	Current Limit
OSHA[65]	2003	0.1 fiber/cc[66]
NIOSH[67]	1988	0.1 fiber/cc.[68]

Studies of asbestos exposure in schools and office buildings indicate relatively low exposure unless renovations or other activities dislodge the asbestos.[69] Concentration levels vary with the type of activity that occurs. For example, a bystander in a room being cleaned may be exposed to 0.3 fibers per milliliter of air (fiber/mL),[70] a person sweeping the floor may be exposed to 1.6 fiber/mL, a person repairing a ceiling containing asbestos may be exposed to about 18 fiber/mL, and a person stripping a ceiling can be exposed to over 80 fiber/mL.[71] Thus, exposures can exceed OSHA's standard of 0.1 fiber/cc on an eight-hour average.

Asbestos is regulated under a number of environmental statutes. Under the Clean Air Act, EPA established an asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP);[72] the Occupational Safety and Health Administration establishes permissible exposure limits (PELs) in the workplace;[73] the Asbestos Hazard Emergency Response Act requires schools to be inspected and appropriate response actions for asbestos in schools to be initiated;[74] asbestos is a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);[75] and the Hazardous Materials Transportation Act regulates the transport of more than one pound of friable asbestos.[76] Pursuant to its authority under the Toxic Substances Control Act (TSCA), EPA issued a final rule extending asbestos worker protections under OSHA to certain state and local government employees.[77]

[c] Litigation

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[63] American Conference of Governmental Industrial Hygienists. *See generally* § 17A.06[3] *infra.*

[64] ACGIH, *Asbestos: TLV-Chemical Substances (7th Edition), Documentation*, at 1 (2001).

[65] Occupational Safety and Health Administration. *See generally* § 17A.03[3] *infra.*

[66] 29 C.F.R. § 1910.1001(c).

[67] National Institute for Occupational Safety and Health. *See generally* § 17A.03[3] *infra.*

[68] NIOSH, *Occupational Safety and Health Guidelines for Asbestos, Potential Human Carcinogen*, at 1-2 (1988).

[69] NAS/NRC Report, at 31–32.

[70] One milliliter is equivalent to one cubic centimeter.

[71] NAS/NRC Report, at 118–19.

[72] *40 C.F.R. §§ 61.140*–61.157. *See § 36.03[1] infra.*

[73] *29 C.F.R. § 1910.1001(c)*. *See § 36.03[2] infra.*

[74] *15 U.S.C. §§ 2641–2656*; *See § 36.03[3] infra.*

[75] 42 U.S.C. §§ 9601-9675. *See also United States v. Nicolet Inc., 712 F. Supp. 1205 (E.D. Pa. 1989)* (asbestos is a hazardous substance under federal law). *See § 36.03[4] infra.*

[76] 49 U.S.C. § 1801. *See § 36.03[5] infra.*

[77] *65 Fed. Reg. 62210 (2000)*; *40 C.F.R. §§ 763.120*–763.123. The final rule also amended the regulations governing asbestos-containing material in schools,

In 2002, approximately 200,000 asbestos personal injury lawsuits were pending nationwide.[78] Suits concerning liability for the removal of asbestos in buildings have been called the "second wave"[79] of asbestos litigation.[80] Many of these "rip and replace" suits were filed on behalf of school districts. One of the largest was a class action filed in 1983 in federal district court in Philadelphia on behalf of all public school districts and private schools nationwide.[81] This litigation involved approximately 30,000 school districts, and sought $1.4 billion in compensatory and punitive damages. In 1994, the school districts reached a $200 million settlement with all but three of the defendant manufacturers of asbestos-containing building products.[82] Asbestos exposure in private buildings has not attracted as much public attention or concern,[83] and private parties have not undertaken asbestos removal activities that could result in property damage suits.[84]

Personal injury suits by individuals allegedly exposed to asbestos, principally in occupational settings, make up the large majority of asbestos litigation. For example, in *Swagger v. Waterman Steamship Corp.*[85] the court allowed shipowners to seek indemnification from manufacturers and distributors of asbestos put in ships. The shipowners reached a settlement with the estate of an engineer who had died of malignant mesothelioma allegedly caused by exposure to asbestos. In another case, a plaintiff recovered more than $500,000 from the original seller of a fireproofing material, for failure to warn that the asbestos material was dangerous.[86]

[4] Volatile Organic Compounds (VOCs)

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[78] Terry, *Huge asbestos trial to begin in W. Va.*, Reuters Health, Sept. 29, 2002.

[79] The "first wave" of asbestos litigation involved asbestos miners and workers in industrial settings who were heavily exposed to the fiber. The "second wave" of asbestos litigation also includes workers who used asbestos-containing products.

[80] Flaherty, *Second Wave of Litigation Hits Asbestos,* Nat'l L.J., Oct. 29, 1984, at 1, col. 1.

[81] *See* *In re Asbestos Sch. Litig., 977 F.2d 764 (3d Cir. 1992)* (documenting procedural history of the case).

[82] *Asbestos: Schools, Makers Reach $200 Million Accord in Abatement Case; Three Defendants Remain*, Toxics L. Daily (Nov. 17, 1994).

[83] However. the abatement process itself can give rise to legal liabilities. In 1999, a California fertilizer plant signed an administrative settlement under which it agreed to pay $750,000 for allegedly violating state hazardous control laws governing asbestos removal. The settlement amount was the largest the California Air Resources Board had ever obtained in an asbestos removal case. Whetzel, *Air Pollution: California Fertilizer Plant to Pay $750,000 in Asbestos Removal Case*, Toxics L. Daily (BNA) (July 23, 1999).

[84] At least one court decided that the presence of asbestos in a building does not give rise to a property damage claim under an insurance policy. U.S. Fidelity & Guar. Co. v. Wilkin Insulation Co., 84 CCH 11676 (Cir. Ct. Cook County 1987). In another case, hospitals were denied class action status in their suit against manufacturers to pay for the removal of asbestos that would result in property damage suits. Sisters of St. Mary v. Aaer Sprayed Insulation, No. 85CV5952 (Cir. Ct. Dane County Dec. 17, 1987). *But see* *T.H.S. Northstar Assocs. v. W.R. Grace & Co., 66 F.3d 173 (8th Cir. 1995)* (manufacturer of asbestos-laden fireproofing material used in office building liable to building purchaser for 60 percent of the costs of abatement and removal).

[85] *136 Misc. 2d 410, 518 N.Y.S.2d 715 (Sup. Ct. 1987)*, *aff'd,* *151 A.D.2d 100, 546 N.Y.S.2d 80 (1989)*.

[86] *Layne v. GAF Corp., 42 Ohio Misc. 2d 19, 537 N.E.2d 252 (1987)*. *Compare* ***Reid v. Georgia Pacific Corp., 212 A.D.2d 462, 622 N.Y.S.2d 946 (1995)*** (granting asbestos worker's claim for personal injuries allegedly caused by asbestos exposure in the workplace; worker identified specific brands of asbestos manufacturer's products that were in use at the work site during the period at issue and demonstrated that he was heavily exposed to asbestos dust at the site during that period) *with In re* New York City Asbestos Litig., N.Y.L.J., June 15, 1995, at 33, col. 1 (N.Y. App. Div. 1st Dept.) (denying asbestos worker's claim for personal injuries allegedly caused by asbestos exposure in the workplace; worker failed to specify the time periods during which he had worked in the buildings at issue and the nature of the work he performed in the buildings).

Volatile organic compounds (VOCs) are organic compounds that exist as a gas.[87] Building and furniture materials are known to emit VOCs, as are copy machines, printing machines, glue, spray cans, household cleaners and solvents, tobacco smoke, and human metabolism.[88] As many as 300 VOCs have been found in indoor air samples.[89] The concentrations of each of these compounds in non-industrial environments, however, usually does not exceed 50 micrograms per cubic meter ($\mu g/m^3$), which is 100 to 1,000 times lower than the threshold limit values (TLVs) set by the American Conference of Governmental Industrial Hygienists (ACGIH).[90]

[a] Health Effects

The health effects of exposure to nonindustrial VOCs are not yet well understood. The large number of chemicals found indoors makes it difficult to associate health effects with exposure to specific compounds. Some evidence suggests that the most frequent effects of low-level VOC exposure fall into three categories:[91]

(1) acutely perceived deterioration of the quality of the environment (such as recognition of odors, stinging, itching, tingling, or irritation);

(2) acute or subacute inflammatory-like reactions in skin or mucous membranes; and

(3) environmental stress reactions (for example, headaches, drowsiness, or mood changes). The intensity of these effects may be influenced by additional factors, such as age or smoking.

EPA has estimated cancer risks from various individual VOCs based on outdoor exposures.[92] One early New Jersey study found the additive average lifetime cancer risk from indoor concentrations of nine selected VOCs to be 1.9 to 3.0 in 100.[93]

[b] Standards and Regulations

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[87] Examples of VOCs include: acetone, acrolein, alcohols, ammonia, aromatichydrocarbons, benzene, chlorinated hydrocarbons, organophosphates, phenols, and toluene.

[88] Toxins also may be released into the air by appliances and processes that heat and spray water, meaning that dishwashers, washing machines, and showers can contribute to indoor air pollution. New permanent-press clothing and drapes can also release harmful vapors. Jaret, *Experts Are Turning Up Some Surprising Sources of Indoor Air Pollution*, 38 Nat'l Wildlife 18 (Feb.-Mar. 2000).

[89] L. Molhave, *Volatile Organic Compounds and the Sick Building Syndrome, in* Environmental Toxicants: Human Exposures and Their Health Effects 633, 637 (M. Lippmann ed., Van Nostrand Reinhold 1992).

[90] *Id.* at 638. *See* *§ 17A.06[3] infra.*

[91] *Id.* at 633, 640.

[92] *See* EPA, *Report to Congress on Indoor Air Quality,* 4-12 (1989). For example, the current unit risk classification for benzene is 7.8 in 1 million; for methylene chloride, the unit risk classification is 4.7 in 10 million; and for trichloroethylene (TCE) the unit risk classification is 2.0 in 1 million. *See also* U.S. EPA, *National-Scale Air Toxics Assessment for 1996: Estimated Emissions, Concentrations and Risk—Technical Fact Sheet* (May 31, 2002) (noting EPA plans to include an indoor air component in future national-scale toxics assessments).

[93] M. Tancrede, *The Carcinogenic Risk of Some Organic Vapors: A Theoretical Survey,* 21 Atmospheric Environment 2187 (1987). This study used very conservative assumptions and as a result may have overestimated the risk. *See also* EPA Report to Congress, at 4-23 through 4-26. A recent case study was conducted at a Swiss university where employees and students complained of headaches, nausea, and weariness following a building renovation. The study found elevated indoor air concentrations of total volatile organic compounds (TVOCs), probably related to PVC flooring. R. Reiser et al., *Indoor Air Pollution by Volatile Organic Compounds (VOC) Emitted from Flooring Material in a Technical University in Switzerland*, Proceedings: Indoor Air 2002 at 1004-09.

No regulatory standards have been set for VOCs in non-industrial indoor settings.[94] The National Institute for Occupational Safety and Health (NIOSH) and ACGIH have recommended occupational standards for many compounds. ASHRAE Standard 62-2001, established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., includes a rationale suggesting that, in the absence of better data, the ACGIH limits should be divided by 10 to account for possible continuous exposure to VOCs.[95]

[5] Formaldehyde

Formaldehyde is both a byproduct of combustion and a widely used industrial chemical present in many manufactured products. A surprising number of household items contain formaldehyde; according to the National Academy of Sciences, the main sources of formaldehyde in indoor air appear to be urea formaldehyde insulation, particleboard, and plywood.[96] Formaldehyde also is found in synthetic resins that serve as adhesives in particleboard, fiberboard, plywood, and furniture.[97] Products made with formaldehyde resins can emit formaldehyde gas, a colorless and strong-smelling substance.[98] Formaldehyde-generating activities include tobacco smoking and wood burning.[99]

Indoor formaldehyde concentrations tend to be higher than outdoor concentrations.[100] Studies have shown that indoor concentrations often exceed the 0.75 parts per million (ppm) permissible occupational exposure limit.[101] Levels are particularly high in energy-efficient residences and in mobile homes, which often have low ventilation rates and walls constructed from particleboard or plywood.[102]

[a] Health Effects

Formaldehyde is a respiratory and skin irritant, and has been classified as a carcinogen. Even low concentrations of formaldehyde affect human health. Exposure to formaldehyde in moderate concentrations produces rapid responses including eye (at 50-2,000 parts per billion (ppb)) and upper respiratory tract (at 100-25,000 ppb) irritation that can become intolerable.[103] The National Academy of Sciences has estimated

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[94] U.S. EPA, *Sources of Indoor Air Pollution—Organic Cases (Volatile Organic Compounds—VOCs)*, *at* http://www.epa.gov/iaq/voc.html.

[95] American Society of Heating, Refrigerating and Air-Conditioning Engineers, *Standard 62-2001: Ventilation for Acceptable Indoor Air Quality* (2001).

[96] Commission on Aldehydes, Board of Toxicology & Envtl. Health Hazards, Assembly of Life Sciences, National Academy of Sciences/National Research Council, *Formaldehyde and Other Aldehydes* (1981).

[97] NAS/NRC Report, at 84.

[98] *IAQ Fact Sheet: Formaldehyde*, Environmental Health Center, National Safety Council (2002).

[99] G. Leikauf, *Formaldehyde and Other Aldehydes, in* Environmental Toxicants: Human Exposures and Their Health Effects 299 (M. Lippmann ed., Van Nostrand Reinhold 1992) [hereinafter Leikauf].

[100] NAS/NRC Report, at 83, 86. Outdoor formaldehyde levels tend to be quite low, averaging approximately 0.0004 ppm. Formaldehyde is usually present at concentrations of less than 0.06 ppm in both indoor and outdoor air. U.S. Consumer Product Safety Commission, *An Update on Formaldehyde—1997 Revision*, Doc. No. 725, at 4 (1997) [hereinafter Update on Formaldehyde].

[101] NAS/NRC Report at 87; *29 C.F.R. § 1910.1048(c)* (OSHA occupational exposure standard). The OSHA regulations also establish a formaldehyde "action level" of 0.5 ppm; employee exposure at or above the action level triggers additional monitoring and medical surveillance requirements.

[102] The American National Standards Institute (ANSI) has established standards that specify lower formaldehyde emission levels for particleboard, medium density fibreboard (MDF), and hard plywood. *See* Update on Formaldehyde, at 10.

that, “on the basis of laboratory tests and various kinds of population surveys … perhaps 10–20% of the general population may be susceptible to the irritant properties of formaldehyde at extremely low concentrations.”[104] Formaldehyde also is suspected to be a human carcinogen based on genotoxic, animal inhalation, and human epidemiological evidence. Certain studies have found it to produce squamous carcinoma in the nasal cavity of laboratory animals at concentrations as low as 5 ppm.[105] In 2011, its status in the *Report on Carcinogens* prepared by the National Toxicology Program for the Secretary of Health and Human Services was changed to “known to be a human carcinogen” from “reasonably anticipated to be a human carcinogen.”[106]

[b] Standards and Regulations

In 1982, the Consumer Product Safety Commission banned the use of urea formaldehyde foam insulation in homes and schools.[107] This ban subsequently was overturned by the courts,[108] but publicity of concerns about health effects effectively destroyed the product. Current Department of Housing and Urban Development regulations governing the construction of manufactured homes specify that plywood materials may not emit formaldehyde in excess of 0.2 ppm and particleboard materials may not emit formaldehyde in excess of 0.3 ppm.[109]

In 2008, the California Air Resources Board issued formaldehyde emissions standards for hardwood plywood, particleboard, and medium density fiberboard sold, supplied, offered for sale, or manufactured for sale in California. The standards were to be phased in over several years, with the stringency of the standards increasing over the phase-in period. For hardwood plywood, the initial emissions standard was 0.08 ppm, decreasing to 0.05 ppm (with different phase-in period for veneer-core and composite-core hardwood plywood). For particleboard, the initial standard was 0.18 ppm, decreasing to 0.09 ppm. For medium density fiberboard, the initial standard was 0.21 ppm, decreasing to 0.11 ppm. CARB established a separate standard for thin medium density fiberboard, with an initial standard of 0.21 ppm, decreasing to 0.13 ppm.[109.1]

In 2010, the federal Formaldehyde Standards for Composite-Wood Products Act was enacted.[109.2] The law established limits, based on the CARB standards, for formaldehyde emissions from composite wood products: hardwood plywood, medium-density fiberboard, and particleboard.[109.3] In 2013, EPA proposed two sets of regulations, one to implement the statutory emissions standards[109.4] and one to establish a framework for a third-party certification program.[109.5]

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[103] Leikauf, at 307. Even at a concentration as low as 0.05 ppm, for example, formaldehyde can irritate the eyes. When present in the air at concentrations above 0.1 ppm, formaldehyde can result in watery eyes; burning in the eyes, nose and throat; nausea; coughing; tightness of the chest; wheezing; rashes; and allergic responses. Update on Formaldehyde, at 3.

[104] NAS/NRC Report, at 40.

[105] Leikauf at 317.

[106] *See* Nat’l Toxicology Program, Report on Carcinogens, 13th ed. (2014).

[107] *47 Fed. Reg. 14366 (1982)*.

[108] *See Gulf S. Insulation v. CPSC, 701 F.2d 1137 (5th Cir. 1983)*.

[109] *24 C.F.R. § 3280.308(a)(1)*, *(2)*. Additionally, the American National Standards Institute (ANSI) has established standards that specify low formaldehyde emission levels for particleboard, medium density fibreboard (MDF), and hard plywood. *See* Update on Formaldehyde, at 10.

[109.1] *Cal. Code Reg. tit. 17, § 93120.2(a)*.

[109.2] ***Pub. L. No. 111-199, 124 Stat. 1359***.

[109.3] TSCA § 601(b)(2), 14 U.S.C. § 2697(b)(2).

[109.4] *Formaldehyde Emissions Standards for Composite Wood Products, 78 Fed. Reg. 34820 (June 10, 2013)*.

[c] Litigation

Both before and in the wake of the ban, thousands of lawsuits were filed against manufacturers of formaldehyde, and against architects, builders, contractors, building product manufacturers, and real estate brokers in connection with urea formaldehyde foam insulation and particleboard in mobile homes.[110] Most cases that went to trial ended in defense verdicts.[111] In one case, however, the jury awarded $203,000 in compensatory damages and $16 million in punitive damages to a family that suffered health problems after moving into their newly constructed home.[112] Formaldehyde foam insulation has effectively remained off the market, and, as a result, the number of lawsuits has tapered off. In a suit alleging injury from formaldehyde emitted from paper, the court refused to admit the experts' testimony, finding the opinions lacked scientific rigor and failed to show causation.[112.1] In a West Virginia case, the state supreme court held that a state statute does not preempt homeowners' formaldehyde-based negligence claims arising against their home's manufacturer.[112.2]

[6] Biological Contaminants

Bioaerosols (also known as biological contaminants or biological pollutants) are a complex and varied set of airborne, biologically-derived organic structures, some of which are responsible for significant health effects in humans. Bioaerosols include bacteria, fungi, yeasts and mold,[113] pollen, dander, and insect parts. These particulates range from less than one micron to several microns in size. When airborne, they usually are attached to dust particles. A variety of illnesses are related to bioaerosols, including infectious processes (caused by bacteria and viruses), contact dermatitis (caused by allergic, toxic, or irritant effects following physical contact), acute or chronic local inflammatory reactions (such as sneezing, runny or stuffy nose, itching eyes, or earache), asthma, and inflammation of the air sacs in the lungs, as well as Legionnaires' disease (a bacterial pneumonia)[114] and other lower or upper respiratory tract illnesses. Indoor air pollution also can contribute to allergies, which may be manifested by symptoms of rhinitis, conjunctivitis, rash, cough, sore throat, and headache. In addition, bronchial asthma often is triggered by exposure to allergens.[115] The indoor air environment is the major source of pathogenic bioaerosols.

109.5 *Formaldehyde; Third-Party Certification Framework for the Formaldehyde Standards for Composite Wood Products, 78 Fed. Reg. 34796 (June 10, 2013)*.

110 In 1982, for example, some 2,000 formaldehyde suits were filed. Allegations generally referred to non-specific symptoms, *e.g.,* eye and nose irritation, sore throats, headaches, fatigue, and nausea. Kornreich, *Minimizing Liability for Indoor Air Pollution,* 4 Tul. Envtl. L.J. 61, 63 (1990).

111 Kornreich, *Minimizing Liability for Indoor Air Pollution,* 4 Tul. Envtl. L.J. 61, 63 (1990).

112 Pinkerton v. Temple Indus., Indoor Pollution L. Rep. 1 (Mar. 1990) (Mo. Cir. Ct., Clay City, Jan. 8, 1990).

112.1 *Ellis v. Appleton Papers, Inc., No. 94-CV-558(LEAD), 2006 U.S. Dist. LEXIS 7164 (N.D.N.Y. Feb. 14, 2006)*.

112.2 *Harrison v. Skyline Corp., 686 S.E.2d 735 (W. Va. 2009)*.

113 In recent years, mold cases have become a major component of indoor air quality litigation in the United States. For a comprehensive discussion of mold health effects and litigation, *see ch. 36C infra*.

114 Legionnaires' disease was first identified in 1976, during an epidemic at a convention in a Philadelphia hotel that affected 182 persons and caused 29 deaths.

115 *See* Consumer Product Safety Commission, and American Lung Association, *Biological Pollutants in Your Home*, EPA Pub. No. 402-F-90-102 (Jan. 1990).

Bioaerosols may enter the indoor air environment through natural outdoor sources, such as pollen and fungi. Bacteria and viruses usually are brought indoors by human hosts and spread from person to person.[116] Some bacteria and viruses can be excreted and lodge on fabrics or surfaces. Pathogenic organisms, especially bacteria and fungi, may enter ventilation systems and multiply.

Moisture is the major factor promoting indoor microbial growth in HVAC systems and on indoor surfaces.[117] Thus, water reservoirs associated with HVAC systems can create favorable habitats for microbial growth. Effective indoor-outdoor air exchange will dilute indoor concentrations of bioaerosols. It also affects humidity levels, thereby affecting the potential for microbial growth.

Bioaerosols in the indoor environment can be controlled through building design and construction. Factors that control moisture will be most effective. Proper maintenance, repair, and cleaning of HVAC systems also are important moisture-control strategies.[118] Removal of bioaerosols can be accomplished by increasing effective ventilation or air cleaning, or both.[119]

[7] Pesticides

Pesticides are widely used in homes and offices. As a result, it has been estimated that over 80% of non-occupational pesticide exposures result from indoor contamination.[120] Household use of pesticides may include the application of insecticides, termiticides, and fungicides. Many of the active ingredients and even some of the "inert" ingredients found in pesticides can be dangerous to human health if the products are not applied properly. Adverse health effects associated with pesticides include irritation of the eyes, nose, and throat, damage to the central nervous system, cancer, and even death. EPA withdrew from the market a family of termiticides known as cyclodienes due to their adverse health effects.[121]

Numerous suits were filed involving the termiticide chlordane. For example, in Georgia, a jury awarded a family $400,000 after their home became uninhabitable by the misuse of a pesticide containing chlordane and heptachlor.[122] The plaintiffs sued the exterminating company, claiming negligent application of the pesticides that resulted in family members experiencing headaches, blurred vision, watery eyes, runny noses, and sore throats. Similarly, an Arizona jury awarded a couple whose home was contaminated with chlordane $260,000 in compensatory damages, plus $500,000 in punitive damages.[123] In Tennessee, a jury awarded $10 million to a family after their property was sprayed with chemicals to control mildew.[124]

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[116] *See* World Health Organization, *Indoor Air Pollutants: Exposure and Health Effects*, *WHO EURO Reports and Studies 78* (1983); American Public Health Association, *Control of Communicable Diseases Manual* (17th ed. 2000).

[117] World Health Organization, *Biological Contaminants in Indoor Air, EURO Reports and Studies 113* (1990).

[118] Control of moisture is critical to combating indoor biological pollutants. *See, e.g.,* U.S. EPA, Office of Air and Radiation, *Indoor Air Facts No. 8: Use and Care of Home Humidifiers*, Pub. No. 402-F-91-101 (Feb. 1991) (reviewing steps to reduce dispersal of microorganisms and minerals in indoor air through proper use and care of home humidifiers); and U.S. EPA, Office of Radiation and Indoor Air, *Fact Sheet—Flood Cleanup: Avoiding Indoor Air Quality Problems*, Pub. No. 402-F-93-005 (Aug. 1993) (discussing ways to avoid microbial growth problems following home flooding).

[119] National Research Council, *Policies and Procedures for Control of Indoor Air Quality* (1987).

[120] F.B. Cross, *Legal Response to Indoor Air Pollution* 64 (Quorum Books 1990). For a general discussion of pesticides, *see* ch. 34 *infra.*

[121] EPA Report to Congress, at 46. Cyclodienes included chlordane, heptachloraldrin, and dieldrin. They can produce headaches, dizziness, muscle twitching, weakness, tingling sensations, and nausea, as well as damage to the liver and central nervous system, and they may possibly increase the risk of cancer.

[122] Radtke v. Arrow Exterminators, Inc., No. D-29055 (Fulton County Ct., Ga., Apr. 21, 1989).

[123] Hooper v. Truly Nolan, 4 Toxics L. Rep. 855, 862 (Jan. 3, 1990) (No. CV87-3381 Ariz. Super. Ct., Dec. 7, 1989). *See also* Wallace v. Lanier Exterminating Serv., Toxic Chem. Lit. Rep. at 11464 (Dec. 21, 1989) (Forsyth County Ct., Ga., Dec. 8, 1989) (family awarded $900,000 after negligent application of a pesticide caused elevated levels of chlordane and heptachlor in their home).

[8] Environmental Tobacco Smoke

Tobacco smoke is composed of a complex mixture of gases and particles, including nicotine, polycyclic aromatic hydrocarbons, carbon monoxide, acrolein, nitrogen dioxide, formaldehyde, benzene, tars, sulfur dioxide, and arsenic. EPA has reported that there are 43 carcinogenic compounds in tobacco smoke, as well as several mutagens. Concentrations of these substances in a room depend on the number of smokers, the intensity of smoking activity, the rate of exchange of indoor air with outdoor air, and the use of air-cleaning devices.

Environmental tobacco smoke, or "secondhand" smoke, consists of the sidestream smoke that is released from the cigarette's burning end and the mainstream smoke exhaled by the active smoker.[125] Sidestream smoke has higher concentrations of some toxic and carcinogenic substances than does mainstream smoke. EPA reports that studies show that, under typical conditions of smoking and ventilation, environmental tobacco smoke diffuses rapidly throughout buildings and homes, persists for long periods after smoking ends, and represents one of the strongest sources of indoor-air particulate pollution in buildings where smoking is permitted.[126]

[a] Health Effects

Active cigarette smoking has been recognized as a leading cause of mortality and morbidity. Responsible for more than 440,000 deaths per year in the United States, smoking is the most preventable cause of premature death.[127] In 1986, the report of the Surgeon General on smoking and health[128] and a report by the National Research Council[129] concluded that involuntary exposure to tobacco smoke causes disease in nonsmokers. Both of these reports concluded that exposure to environmental tobacco smoke can cause lung cancer in adult nonsmokers and that children of parents who smoke have increased frequencies of respiratory symptoms and lower respiratory tract infections. These effects are caused by tar particles that collect in the branches and air sacs in the lungs.

In 1993, EPA released an analysis of all available data on passive smoking.[130] Based on the weight of the available scientific evidence, EPA concluded that widespread exposure to environmental tobacco smoke in the United States presents a serious and substantial public health impact.[131] In adults, EPA found that

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[124] Ward v. Terminex Int'l, 4 Toxics L. Rep. 1123–24 (Mar. 7, 1990) (No. 87C-30933, Tenn. Cir. Ct., Davidson City, Feb. 23, 1990). The judge reduced the award to $6 million after finding no credible evidence to support proof of the injuries claimed by two members of the family.

[125] J.S. Samet, *Environmental Tobacco Smoke, in* Environmental Toxicants: Human Exposures and Their Health Effects 231 (M. Lippmann ed., Van Nostrand Reinhold 1992).

[126] U.S. EPA, *Indoor Air Facts No. 5: Environmental Tobacco Smoke* (1989) [hereinafter Indoor Air Facts No. 5].

[127] American Lung Association, *Fact Sheet on Smoking* (Nov. 2003); Centers for Disease Control, *Cigarette Smoking-Related Mortality* (June 2001); Centers for Disease Control, *Health Effects of Passive Smoking: Lung Cancer and Other Disorders* (1991).

[128] U.S. Department of Health & Human Services, *The Consequences of Involuntary Smoking* (1986).

[129] National Research Council, *Environmental Tobacco Smoke: Measuring Exposures and Assessing Health Effects* (1986).

[130] U.S. EPA, *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders,* Pub. No. 600/6-90/006F (1993) [hereinafter EPA, Health Effects of Passive Smoking].

[131] Soon after issuance of the EPA report, tobacco companies and trade groups brought a lawsuit challenging the legality of the report and its classification of secondhand smoke as a known human carcinogen. The district court denied EPA's motion to dismiss, holding that the report represented a final agency action. *Flue-Cured Tobacco Coop. Stabilization Corp. v. EPA, 857 F. Supp. 1137 (M.D.N.C. 1994)*. The court later held that EPA had violated a provision of the Radon Gas and Indoor Air Quality

environmental tobacco smoke is a human lung carcinogen, responsible for approximately 3,000 lung cancer deaths per year.[132] In children, exposure to environmental tobacco smoke was found to be causally related to increased risk of lower respiratory infections (*e.g.,* bronchitis and pneumonia); increased problems of fluid in the middle ear and upper respiratory tract infections; and additional episodes and increased severity of symptoms in children with asthma.[133] Subsequent reports and studies in the United States and abroad have reached similar conclusions about the adverse health effects of environmental tobacco smoke,[134] and the National Institutes of Health has formally listed environmental tobacco smoke as a "known human carcinogen."[135]

[b] Standards and Regulations

The only method that removes tobacco smoke completely from indoor air is the total elimination of smoking. In response to increased public concern over tobacco smoke, thousands of businesses and hundreds of cities, as well as 49 states and the District of Columbia, restrict smoking in various public places.[136] Most of these statutes generally ban or restrict smoking in public places such as stores and restaurants and in public buildings, including libraries, museums, theaters, and schools. A small but growing number of states,[137] along with several major cities,[138] have legislated comprehensive smoking bans that protect

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Research Act, Pub. L. No. 99-499, 2121 401-405, ***100 Stat. 1613*** (1986), which granted EPA its authority to issue the report, by excluding a tobacco industry representative from an advisory committee. Because the court believed that this violation affected the conduct and results of the research, it vacated sections of EPA's report. *Flue-Cured Tobacco Coop. Stabilization Corp. v. EPA, 4 F. Supp. 2d 435 (M.D.N.C. 1998)*. Ruling on cross-appeals challenging the district court's decision, the Fourth Circuit determined that there had been no final agency action reviewable under the Administrative Procedure Act, vacated the order of the district court, and remanded the case for dismissal for lack of subject matter jurisdiction. *Flue-Cured Tobacco Coop. Stabilization Corp. v. EPA, 313 F.3d 852 (4th Cir. 2002)*. The battle waged by EPA and the tobacco industry over this report has also been fought in the media, with EPA defending its research against what it has described as a "high profile advertising and public relations campaign by the tobacco industry." *See* U.S. EPA, Office of Air and Radiation, *Setting the Record Straight: Secondhand Smoke Is a Preventable Health Risk*, Doc. No. 402-F-94-005 (June 1994).

[132] EPA Health Effects of Passive Smoking, at 1-1. It is further estimated that secondhand smoke causes 35,000 heart disease deaths in non-smokers annually. *See* American Lung Association, *Fact Sheet on Secondhand Smoke* (Nov. 2003).

[133] *Id. See also* U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *Second National Report on Human Exposure to Environmental Chemicals*, Pub. No. 02-0716 (Rev. March 2003) ("[c]hildren are at particular risk from [environmental tobacco smoke] … ."); U.S. EPA, Office of Air and Radiation, *Children and Secondhand Smoke*, Doc. No. 402-F-99-003 (March 1999) (discussing reduction of children's health risks from environmental tobacco smoke).

[134] *See, e.g.*, Scientific Committee on Tobacco and Health (U.K.), *Report of the Scientific Committee on Tobacco and Health* (March 1998) (identifying environmental tobacco smoke as a cause of cancer and other disease in children and adults); National Health and Medical Research Council (Australia), *The Health Effects of Passive Smoking—A Scientific Information Paper* (Nov. 1997) (finding positive associations between "passive smoking" and an array of illnesses); World Health Organization, *Environmental Tobacco Smoke, in* Air Quality Guidelines for Europe (2d ed. 2000) (analyzing sources and effects of environmental tobacco smoke and collecting references); and California Environmental Protection Agency, *Health Effects of Exposure to Environmental Tobacco Smoke* (Sept. 1997) (providing a broad review of environmental tobacco smoke and its health impacts). *See also* Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, *Exposure to Environmental Tobacco Smoke and Cotinine Levels—Fact Sheet* (Oct. 2002) (involuntary exposure to environmental tobacco smoke remains "a common, serious public health hazard that is entirely preventable by adopting and enforcing appropriate regulatory policies").

[135] *See* U.S. Department of Health and Human Services, National Institutes of Health, *Tenth Report on Carcinogens* (Dec. 2002). The *Report* first listed environmental tobacco smoke in 2000.

[136] American Lung Association, *State Legislated Actions on Tobacco Issues (SLATI)—Overview* (2003), at http://slati.lungusa.org/reports.asp, *See also* Opderbeck, *Blowin' in the Wind: A Federal Answer to Environmental Tobacco Smoke,* 15 Seton Hall Legis. J. 213, 215 (1991).

employees from secondhand smoke in the workplace. A 2000 report of the Surgeon General on tobacco notes that public and private efforts to regulate environmental tobacco smoke have not only become more common—and restrictive—in recent years, but they have also met with far less resistance than prior efforts to regulate tobacco products directly.[139]

Although states and localities have been at the forefront of enacting legislation governing environmental tobacco smoke, the federal government has taken several significant steps. For example, smoking is prohibited on all domestic and international airline passenger flights operated by U.S. and foreign carriers.[140] Smoking has been banned in federally funded indoor facilities at which "children's services"—including health, day care, education, and library services—are provided.[141] By Executive Order, smoking is banned in federal workplaces and facilities.[142] In 1994, OSHA issued a proposed indoor air quality rule to protect workers from exposure to environmental tobacco smoke through the establishment of separately ventilated designated smoking areas.[143] OSHA withdrew the proposal in 2001, citing, among other things, the actions taken by state and local governments and private employers in the intervening years to curtail workplace smoking.[144]

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[137] *See, e.g.,* Cal. Labor Code § 6404.5; Del. Code tit. 16, §§ 2901 to 2907; ***Conn. Gen. Stat. §§ 19a-342***, 31-40q, & 31-40s; N.Y. Pub. Health Law §§ 1399-n to 1399-x; Me. Rev. Stat. tit. 22, §§ 1541–1542; and Fla. Stat. ch. 386.201 to 386.2125; Fla. Const. art. X, § 20. The Florida law implements a 2002 amendment to the Florida Constitution, passed by voter initiative, to ban smoking in the workplace. *See* Brent Kallestad, *Bush Signs Workplace Smoking Curbs*, Miami Herald, June 24, 2003, at 1B. The Massachusetts House and Senate have approved legislation that will ban smoking in nearly all public places in the state. *See* Scott Greenberger and Steven Smith, *Senate Assures Ban on Smoking*, Boston Globe, Nov. 20, 2003, at A1. The Governor has stated that he will sign the final version of the bill.

[138] One non-profit organization that supports non-smokers estimates that as of October 2003, over 1,600 U.S. municipalities had restricted where smoking was permitted. *See* American Nonsmokers' Rights Foundation, *Smokefree Ordinance Lists*, Oct. 2, 2003, *at* http://www.no-smoke.org/lists.html (collecting ordinances). Local efforts to restrict smoking have been challenged on a variety of grounds, with varying degrees of success. *See, e.g.*, Operation Badlaw, Inc. v. Licking County Gen. Health Dist. Board of Health, 866 F. Supp. 1059 (S.D. Ohio 1992), *aff'd*, ***991 F.2d 796 (6th Cir. 1993)*** (table) (upholding county health regulations governing smoking in public places against challenges based on equal protection, due process, right to privacy, the Commerce Clause, and the Contract Clause); Dutchess/Putnam Restaurant & Tavern Ass'n v. Putnam County Dep't Board of Health, 178 F. Supp. 2d 396 (S.D.N.Y. 2001) (holding that county board of health violated state separation of powers doctrine in enacting smoking regulations, but had not violated the right to equal protection or to freedom of association of restaurant and tavern association or restaurant owners). The passage of state preemption laws in many states has restricted the ability of localities to pass ETS ordinances that are more stringent than—or, in some instances, that merely differ from—state law. *See, e.g.* Centers for Disease Control and Prevention, *Preemptive State Tobacco Control Laws—United States, 1982-1998*, 47 Morbidity and Mortality Wkly. Rep. 1112 (Jan. 8, 1999) (documenting trends in preemptive tobacco-control legislation at the state level).

[139] U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *Reducing Tobacco Use: A Report of the Surgeon General*, at 193 (2000) [hereinafter 2000 Surgeon General's Report].

[140] 49 U.S.C. § 41706; 14 C.F.R. §§ 252.1 to 252.19; 14 C.F.R. § 129.29.

[141] 20 U.S.C. §§ 6081–6084 (Pro-Children Act of 1994); 20 U.S.C. §§ 7181–7184 (Pro-Children Act of 2001).

[142] Exec. Order No. 13,058, 62 Fed. Reg. 43451 (Aug. 9, 1997).

[143] 59 Fed. Reg. 15968 (April 5, 1994). The proposed rule, which is preceded by a lengthy background discussion of indoor air quality issues, also covers topics such as bioaerosols and sick building syndrome.

[144] ***66 Fed. Reg. 64946 (Dec. 17, 2001)***. It is also worth noting that in 1996, the Food and Drug Administration asserted jurisdiction over tobacco products. The Supreme Court ultimately ruled that Congress had not granted the FDA authority to regulate tobacco products. FDA v. Brown & Williamson Tobacco Corp., 529 U.S. 120 (2000). *See also* Steiner, Recent Case, FDA v. Brown & Williamson Tobacco Corp.FDA v. Brown & Williamson Tobacco Corp., 529 U.S. 120 (2000), 28 Ecology L.Q. 355 (2001), Congress has yet to pass legislation that would grant FDA such regulatory authority, and the debate rages on between health groups and the tobacco industry. *See* Josephine Hearn, *Grassley and Baucus Try to Smoke Out Senator Dole*, The Hill, Nov. 19, 2003.

The Framework Convention on Tobacco Control, which was unanimously adopted by the United Nations World Health Organization in May 2003, require parties to the instrument to adopt, implement, and promote legal mechanisms providing "protection from exposure to tobacco smoke in indoor workplaces, public transport, indoor public places and, as appropriate, other public places."[145] The convention is not yet in force,[146] and the United States has yet to sign or ratify it.

[c] Litigation

Suits by nonsmokers regarding environmental exposure to tobacco smoke have been filed under several theories of recovery, including the claim of a constitutional right to breathe clean air and to live in a clean and healthy environment, common law claims alleging the right to a safe working environment, claims for employment and disability compensation, and claims for personal injury. Nonsmokers have also pressed environmental tobacco smoke claims in landlord-tenant disputes and child custody battles.

[i] Constitutional Claims

[A] Constitutional Claims in General

Nonsmokers have urged courts to infer a constitutional guarantee of the right to freedom from tobacco smoke under the Ninth *Amendment, First* Amendment, the Due Process Clause, and even the *Eighth Amendment*. These cases have been largely unsuccessful. In *Gasper v. Louisiana Stadium and Exposition District*,[147] the United States Court of Appeals for the Fifth Circuit upheld the lower court's dismissal of the plaintiffs' claim that allowing smoking in the Louisiana Superdome was a violation of their fundamental right under the *Ninth Amendment* to breathe clean air. The court found no constitutional basis for the claim. Similarly, the Court of Appeals for the Tenth Circuit rejected a claim by an employee of the State of Oklahoma who alleged that his exposure to tobacco smoke at work violated his *First Amendment* rights.[148]

In an interesting turn of events, smokers brought suit claiming New York's indoor smoking bans violated their *First Amendment* rights of free association and assembly and free speech, their rights under the Privileges and Immunities Clause of the *Fourteenth Amendment*, and their rights under the *Equal Protection Clause of the Fourteenth Amendment*. Their claims were rejected on the basis that smoking was not a sufficiently expressive conduct to merit constitutional protection under the *First Amendment*, there was no implied agreement to smoke between a bar or restaurant owner and a smoker, and the state and city bans on smoking had a rational basis and smokers were not a protected class.[149] An unsuccessful suit by restaurant and bar owners claimed that New York's Clean Indoor Air Act was unconstitutionally vague because it allowed smoking in outdoor seating areas of restaurants but not in outdoor areas of bars.[149.1] In Colorado, bar and restaurant owners

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[145] WHO Framework Convention on Tobacco Control, *adopted* May 21, 2003, art. 8, § 2.

[146] As of late 2003, 77 countries had signed the convention and five had ratified it. World Health Organization, Tobacco Free Initiative, *Updated Status of the WHO Framework Convention on Tobacco Control*, Nov. 2003, *at* http://www.who.int/tobacco/fctc/signing_ceremony/countrylist/en/.

[147] *577 F.2d 897 (5th Cir. 1978)*, *cert. denied,* ***439 U.S. 1073 (1979)***.

[148] *Kensell v. Oklahoma, 716 F.2d 1350 (10th Cir. 1983)*.

[149] *NYC C.L.A.S.H. v. City of New York, 315 F. Supp. 2d 461 (S.D.N.Y. 2004)* (C.L.A.S.H. is an abbreviation of Citizens Lobbying Against Smoker Harassment).

sued when that state passed a no-smoking law. Their claim that the ban violated the *Equal Protection Clauses* of the state and federal constitutions failed.[149.2] Nonsmokers' common law right to a safe working environment and workers' compensation claims have met with more success.[150]

[B] Constitutional Claims Made by Prisoners

The Supreme Court has upheld a lower court's finding that, although there is no constitutional right to a smoke-free prison cell, prisoners may make a claim under the *Eighth Amendment* that involuntary exposure to tobacco smoke presents an unreasonable risk of harm to their health.[150.1] The *Helling* test has two prongs: an objective prong showing serious harm resulting from exposure to unreasonably high levels of smoke;[150.2] and a subjective prong showing that prison officials acted with deliberate indifference to inmate health or safety.[150.3] Inmates must also overcome the defense of qualified immunity if they sue individuals.[150.4] The Sixth Circuit has upheld an award of punitive damages to an inmate.[150.5]

Inmates have brought constitutional claims outside of the *Eighth Amendment* but without success. A § 1983 action claim that a Louisiana prison did not enforce its nonsmoking policy failed because the inmate did not file affidavits to support his claim.[150.6] A claim for relief under the *Fourteenth*

[149.1] *Empire State Restaurant and Tavern Association, Inc. v. New York, 360 F. Supp. 2d 454 (N.D.N.Y. 2005)* (also rejecting claims that state law was preempted by OSHA regulation). *See also Roark & Hardee LP v. City of Austin, 394 F. Supp. 2d 911 (W.D. Tex. 2005)* (rejecting preliminary injunction finding substantial likelihood that ordinance was not unconstitutionally vague nor violated the *Free Exercise Clause*).

[149.2] Coalition for Equal Rights, Inc. v. Owens, (D. Colo. Oct. 19, 2006) (finding that even though the law allowed smoking in cigar bars, airport lounges, and licensed casinos, the ban was rationally related to its stated purpose of protecting the health of its citizens).

[150] *See generally § 17A.09 infra.*

[150.1] *McKinney v. Anderson, 924 F.2d 1500 (9th Cir. 1991)*, *aff'd sub nom. Helling v. McKinney, 509 U.S. 25, 113 S. Ct. 2475, 125 L. Ed. 2d 22 (1993)*. *See also Halliburton v. Sunquist, 59 Fed. Appx. 781 (6th Cir. 2003)* (inmate failed to allege level of ETS created an unreasonable risk of serious damage to his health).

[150.2] *Larson v. Kempker, 414 F.3d 936 (8th Cir. 2005)* (prisoner failed to satisfy objective test that he was exposed to unreasonably high levels of ETS).

[150.3] *Lehn v. Holmes, 364 F.3d 862 (7th Cir. 2004)* (claims of risk of future injuries from ETS using *Helling test* satisfied Article III standing); *Atkinson v. Taylor, 316 F.3d 257 (3d Cir. 2003)* ("since 1993, almost every Court of Appeals that has addressed this issue has recognized that a prisoner's right to be free from levels of ETS that pose a unreasonable risk of future harm was clearly established by *Helling*"); *Jones v. Bayer, 56 Fed. Appx. 408 (9th Cir. 2003)* (deliberate indifference could be found in refusal to transfer inmate to non-smoking cell); *Garcia v. Maddock, 64 Fed. Appx. 10 (9th Cir. 2003)* (unpublished) (no deliberate indifference where administration issued directive to move inmate to nonsmoking housing); *Davis v. New York, 316 F.3d 93 (2d Cir. 2002)* (remanded for consideration of all facts under first prong of *Helling* test); *Sanders v. Kingston, 53 Fed. Appx. 781, 2002 U.S. App. LEXIS 26504 (7th Cir. 2002)* (remanded for evaluation whether inmate was exposed to second-hand smoke in violation of *Eighth Amendment* as a result of overcrowding); *Zaire v. Artuz, No. 99 Civ. 9817 (LTS), 2003 U.S. Dist. LEXIS 1386 (S.D.N.Y. 2003)* (unpublished, see local rules) (*Eighth Amendment* claim unsupported where inmate not exposed to unreasonably high levels of environmental tobacco smoke).

[150.4] *Atkinson v. Taylor, 316 F.3d 257 (3d Cir. 2003)* (prison officials not entitled to qualified immunity when they knew tobacco smoke was dangerous and they were deliberately indifferent to the inmate's medical needs); *Davis v. New York, 316 F.3d 93 (2d Cir. 2002)* (*Eighth Amendment* allows claims against state-employed defendants in their individual capacities).

[150.5] *Reilly v. Grayson, 310 F.3d 519 (6th Cir. 2002)* (punitive damages in the amount of $18,250 were justified by defendants' reckless disregard of the inmate's rights).

Amendment was rejected by the Sixth Circuit finding the inmate had no "protected liberty interest in a smoke-free prison."[150.7]

[ii] Personal Injury Claims

Smokers and nonsmokers have filed suit against the tobacco industry for injuries allegedly incurred from environmental tobacco smoke. In *Cippolone v. Liggett Group, Inc*.,[151] a long-time smoker alleged that the tobacco companies had failed to warn her of the risks associated with cigarette smoking and, as a result, she developed lung cancer. She also alleged that the companies were liable for fraud and misrepresentation and for conspiracy in concealing the health hazards of smoking. The tobacco companies argued that the Federal Cigarette Labeling and Advertising Act, which required tobacco companies to put warning labels on cigarettes, preempted state law claims. The Supreme Court, however, held that state law claims were not preempted by federal law and therefore would be allowed to go forward. Although *Cippolone* did not deal specifically with the hazards of environmental smoke, it opened the door for such cases to be brought.[152]

In another case, a nonsmoker who worked in smoke-filled barber shops for 37 years and developed lung cancer brought suit against the major tobacco companies. He alleged that the defendant-companies were negligent in designing, testing, manufacturing, fabricating, assembling, marketing, advertising, and distributing products in an inherently dangerous condition after they knew or should have known of their unreasonably dangerous nature. In addition, he alleged negligent failure to warn; breach of express and implied warranties; intentional and negligent misrepresentations; and fraud.[153] A jury found the non-settling tobacco industry defendants not liable.

In 1991, seven current and former flight attendants filed a class action suit against tobacco companies, alleging that they had contracted cancer, heart disease, and respiratory illnesses because they had been exposed to smoke from passengers' cigarettes.[154] The plaintiffs claimed that they had all contracted their ailments during their years as flight attendants before Congress outlawed smoking on all flights in the continental United States. The flight attendants alleged that the tobacco companies had failed to place warnings on their cigarette packages or their advertising to advise the public that constant and repeated exposure to cigarette smoke exposes nonsmokers to serious health risks. The court refused to certify the class, and the plaintiffs appealed.

The appeals court reversed the lower court's decision.[155] The court held that the fact that proposed class members resided in different states and countries and that alleged injuries varied in degree and severity did not foreclose class representation.[156] The parties settled the case during trial. The

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[150.6] *Roderick v. Stalder, 90 Fed. Appx. 711 (5th Cir. 2004)*.

[150.7] *Nwaebo v. Hawk-Sawyer, 100 Fed. Appx. 367 (6th Cir. 2004)*.

[151] *505 U.S. 504, 112 S. Ct. 2608, 120 L. Ed. 2d 407 (1992)*.

[152] *See, e.g.*, *Wolpin v. Philip Morris, Inc., 974 F. Supp. 1465 (S.D. Fla. 1997)* (claim that tobacco companies failed to warn non-smokers of dangers of secondhand smoke not preempted by FCLAA).

[153] Butler v. R.J. Reynolds, No. 92-73-361 (Hinds County, Miss. Cir. Ct. filed Oct. 21, 1992). In 1994, plaintiff voluntarily dismissed the Hinds County case and filed a wrongful death action in Jones County. Estate of Burl Butler v. Philip Morris, Inc., No. 94-5-53 (Jones County, Miss. Cir. Ct. filed May 12, 1994). *See also* *Buckingham v. R.J. Reynolds Tobacco Co., 713 A.2d 381 (N.H. 1998)* (holding that plaintiff estate of woman who died of lung cancer, allegedly resulting from secondhand smoke exposure, had properly stated claim for supplier negligence).

[154] Broin v. Philip Morris Cos., No. 91-49738 CA (Dade County Cir. Ct., Fla., filed Jan. 17, 1992).

[155] *Broin v. Philip Morris Cos., Inc., 641 So. 2d 888 (Fla. Dist. Ct. App. 1994)*.

settlement agreement contained an array of provisions, including the establishment of a $300 million research foundation for flight attendants, waiver by the defendant tobacco companies of the statute of limitations in cases brought by flight attendants, and waiver by flight attendants of the ability to seek punitive damages.[157] The agreement also provided that in future individual lawsuits, the burden of proof would be shifted to the tobacco companies to disprove general causation.[157.1]

In 2000, the Ninth Circuit Court of Appeals held that a state court class action brought by non-smoking flight attendants against their employer, Northwest Airlines, was not preempted by the Americans with Disabilities Act. Plaintiffs argued that the airline had breached its state law duty to provide a safe and healthy work environment for its employees by permitting smoking on most of its trans-Pacific flights, thereby exposing the flight attendants to secondhand smoke.[158]

Another ADA claim was brought by an employee of General Motors who claimed that exposure to ETS gave her asthma and that GM retaliated against her for complaining.[158.1] The ADA claim was dismissed as she was able to control her asthma and therefore was not disabled within the meaning of the act.[158.2]

In 2003, a New York jury awarded $5.2 million, including punitive damages of $2.6 million, to a former sales director at a modeling agency who alleged that her employer failed to accommodate her sensitivity to second-hand cigarette smoke, then fired her in retaliation when she complained. The high-profile lawsuit was brought under New York City and State human rights laws.[159] Although the plaintiff worked for the agency for only six weeks, she claimed that constant exposure to second-hand smoke led her to develop acute sinusitis, which aggravated her existing asthma condition and caused her to cough up blood. Prior to trial, defendants moved to preclude the testimony of plaintiff's expert witness based in part on the ground that such a brief exposure to smoke could not have resulted in sinusitis. The court denied the motion and ruled that, given the scientific consensus that tobacco smoke causes sinusitis, the issue of whether the duration of plaintiff's exposure was sufficient was a question of fact for the jury.[160] The trial judge ultimately reduced the verdict to $4.3 million,[161] but on appeal the verdict was vacated due to alleged jury tampering by a defendant.[161.1]

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[156] *But see* Badillo v. American Tobacco Co., 202 F.R.D. 261 (D. Nev. 2001) (proposed classes of nonsmokers exposed to secondhand smoke at Nevada casinos failed to satisfy class certification requirements of commonality, predominance, typicality, and adequacy).

[157] Broin v. Philip Morris Cos., Inc., No. 91-49738 (Dade County Cir. Ct., Fla., Feb. 3, 1998); Ramos v. Philip Morris Cos., 743 So. 2d 24 (Fla. 3d Dist. Ct. App. 1999) (affirming trial court ruling that settlement was "fair, adequate, and reasonable"). One of the post-*Broin* flight attendant cases has resulted in a jury award of $5.5 million against tobacco manufacturers. *See* Lebowitz, *$5 million victory for flight attendant*, Miami Herald, June 19, 2002. The court, however, reduced the award to $500,000. French v. Philip Morris, No. 00-0176-CA-22 (Fla. Cir. Ct. 11th Dist. Miami-Dade County Sept. 13, 2002); *Fla. Judge Reduces Flight Attendant's award by 90%,* 17 Tobacco Industry Litig. Rep. (Sept. 20, 2002).

[157.1] *See* Philip Morris, Inc. v. French, 897 So. 2d 480 (Fla. Dist. Ct. App. 2004) (reducing award of $5.5 million for flight attendant's smoke-induced sinusitis to $500,000 but holding the attendant was not required to prove all elements of her claims due to the class action settlement).

[158] Duncan v. Northwest Airlines, 208 F.3d 1112 (9th Cir.), *cert. denied*, ***531 U.S. 1058 (2000)***.

[158.1] Owens v. General Motors Corp., 2005 U.S. Dist. LEXIS 33484 (E.D. Mo. Sept. 7, 2005) (unreported) (after filing many complaints about being exposed to cigar and cigarette smoke at work, plaintiff was placed in a more physically difficult, less remunerative position).

[158.2] Owens v. General Motors Corp., 2005 U.S. Dist. LEXIS 33484 (E.D. Mo. Sept. 7, 2005) (unreported) (denying GM's motion for summary judgment on the retaliation claim).

[159] Gallegos v. Elite Model Mgmt. Corp., 195 Misc. 2d 223 (Sup. Ct. N.Y. County 2003).

[160] Gallegos v. Elite Model Mgmt. Corp., 195 Misc. 2d 223 (Sup. Ct., N.Y. County 2003).

[iii] Claims in Landlord-Tenant Cases and Custody Cases

Disputes over environmental tobacco smoke have arisen in a variety of other legal contexts as well. For example, an Ohio man, a tenant in a two-family house, brought an action to terminate his rental lease and recover the security deposit when smoke from his neighbor's unit seeped into his unit through a shared heating and cooling system. Plaintiff claimed that his landlord had breached the covenant of quiet enjoyment and other duties imposed by state law. The municipal court entered summary judgment in favor of the landlord, but the Ohio Court of Appeals reversed, ruling that reasonable minds could differ as to whether the presence of smoke in plaintiff's unit constituted a breach of the landlord's obligations to her tenant.[162]

In *In re Aubuchon*,[163] a custody case, the Kansas Court of Appeals affirmed a lower court order awarding custody to the father, finding that there was evidence that secondhand smoke resulting from the mother's smoking "aggravated the children's health problems and placed them at risk for further health problems."[164] To date, environmental tobacco smoke has played a role in child custody cases in more than 20 states.[165]

[9] Sick Building Syndrome and Related Illness

The term "sick building syndrome" (SBS) is used to describe situations in which a majority of building occupants experience similar complaints and symptoms that appear to be linked to time spent in the building, but for which no specific cause can be identified.[166] In contrast, "building related illness" (BRI) occurs when the complaints and symptoms of building occupants can be attributed directly to airborne contaminants, such as bacteria, fungi, and molds. Legionnaire's disease is an example of a BRI. In 1989, the World Health Organization (WHO) estimated that 30% of all modern buildings have indoor air pollution problems.[167] In 1993, NIOSH reported over 7,000 complaints from workers alleging building-related symptoms.[168]

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[161] ***Gallegos v. Elite Model Mgmt. Corp., 1 Misc. 3d 970A, 781 N.Y.S.2d 624 (Sup. Ct. N.Y. County 2004)*** (unpublished, see local rules) (ordering a new trial unless the plaintiff agreed to trim the verdict to $1.1 for pain and suffering, allowing $2.6 million in punitive damages), *appeal withdrawn* ***5 A.D.3d 1129, 774 N.Y.S.2d 852 (1st Dept. 2004)***.

[161.1] *Gallegos v. Elite Model Management Corp., 807 N.Y.S.2d 44 (App. Div. 1st Dept. 2005)* (two jurors were dismissed after learning from a defendant that the plaintiff had sued a former employer; the jurors were replaced after deliberations had started in violation of defendants' rights).

[162] *Dworkin v. Paley, 638 N.E.2d 636 (Ohio App. 8th Dist. 1994)*.

[163] *913 P.2d 221 (1996)*.

[164] *Id. at 223*.

[165] 2000 Surgeon General's Report at 248-49 (collecting cases). *See also* Hall, *Secondhand Smoke as an Issue in Child Custody/Visitation Disputes*, *97 W. Va. L. R. 115 (1994)*; *36 A.L.R. 5th 377 (1996)*. *Cf.* *In re In re Julie Anne, 780 N.E.2d 635 (Ohio Ct. C.P. (Juvenile) Lake County 2002)* (court in custody and visitation case raises *sua sponte* issue of whether parents and others should be restrained from smoking in presence of healthy minor child; taking judicial notice of scientific evidence on dangers of ETS, court issues restraining order).

[166] The term "sick building syndrome" was first defined by the World Health Organization in 1982. World Health Organization, *Indoor Air Pollutants: Exposure and Health Effects Assessment. Euro Reports and Studies No. 78: Working Group Report* (1982).

[167] World Health Organization, *Indoor Air Quality: Organic Pollutants. Report on a WHO Meeting, Euro Reports and Studies 111* (1989).

[a] Indicators

The symptoms associated with SBS are nonspecific and have many causes, ranging from psychological/emotional factors to infectious viruses and bacteria. WHO identified five categories of symptoms related to SBS:

(1) sensory irritation in eyes, nose, and throat (pain, sensation of dryness, smarting feeling, stinging, irritation, hoarseness, voice problems);

(2) neurological or general health symptoms (headache, sluggishness, mental fatigue, reduced memory, reduced capability to concentrate, dizziness, intoxication, nausea and vomiting, tiredness);

(3) skin irritation (pain, reddening, smarting or itching sensations, dry skin);

(4) nonspecific hypersensitivity reactions (running nose and eyes, asthma-like symptoms among non-asthmatics, sounds from respiratory system); and

(5) odor and taste symptoms (changed sensitivity of olfactory or gustatory sense, unpleasant olfactory or gustatory perceptions).[169] To diagnosis SBS, the symptoms must be observed in a large fraction of building occupants.[170]

[b] Causes

As noted above, whether SBS exists at all is controversial. Generally, it is impossible to identify any single cause of SBS. A large number of potential indoor air pollutants are present in a building and, in combination, these pollutants may have effects greater than any individual pollutant. Variations in climatic factors such as temperature, relative humidity, noise, and lighting also could be contributing factors, as are work-related and non-work-related psychosocial stresses, including ergonomic stressors, job-related psychosocial stressors (*e.g.*, overcrowding, labor/management problems), and other unknown factors.[171] The most common factors investigated include poorly designed, maintained, or operated ventilation systems that either facilitate the presence of chemical and biological contaminants or simply provide inadequate fresh air to building occupants.

[i] Heating, Ventilation and Air-Conditioning (HVAC) System Design and Maintenance

Several factors related to the indoor ambient air have been assumed to contribute to symptoms associated with SBS, with poor or inadequate ventilation being the most commonly investigated potential cause.[172] When insufficient outside air is distributed to building occupants, indoor air

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[168] Taylor, *NIOSH Deluged by Sick Building Complaints,* Indoor Air Review, Oct. 1993, at 1. *See also* National Institute for Occupational Safety and Health, *NIOSH Facts: Indoor Environmental Quality* (June 1997) (since 1990, requests to NIOSH for evaluation of indoor office environments have come to represent more than half of all requests for NIOSH investigations).

[169] World Health Organization, *Indoor Air Pollutants: Exposure and Health Effects Assessment. Euro Reports and Studies No. 78: Working Group Report* (1982).

[170] *Id.* When SBS is suspected, physicians may find it necessary to coordinate responses with clinicians consulted by the patient's co-workers, industrial hygienists, and public health officials. Consumer Product Safety Commission et al., *Indoor Air Pollution: Introduction for Health Professionals*, CSPC Doc. No. 455 (1994).

[171] EPA Report to Congress, at 3-10; U.S. EPA, *Building Air Quality: A Guide for Building Owners and Facility Managers* 11 (1991).

[172] In the early and mid-1900s, building ventilation standards required 15 cubic feet per minute of outside air for each building occupant (cfm/person). Energy conservation measures in the 1970s led to a reduction in the amount of outdoor air provided for ventilation to approximately 5 cfm/person. For some buildings, 5 cfm/person is not adequate. *See* U.S. EPA, *Sick Building*

contaminants are not diluted or removed from the environment.[173] The amount of outdoor air intake considered adequate for proper ventilation has varied substantially over time. ASHRAE Standard 62-2001 is the current indoor air quality ventilation standard, and it has been previously endorsed by EPA.[174]

Although ventilation is believed to be a contributing factor to SBS, this view is not supported by conclusive evidence. In fact, one study found no relationship between symptoms reported and dissatisfaction with the indoor air environment and the rates of ventilations with outdoor air in buildings whose ventilation rates were above 20 cubic feet per minute per person (cfm/person).[175] Similarly, European investigators have found that ventilation rates do not correlate with building-related symptoms.[176]

HVAC systems that do not function effectively, either through inadequate design or maintenance, also are considered factors in SBS claims. HVAC systems that are designed to operate at reduced or interrupted flow during certain portions of the day in response to thermal conditioning needs may cause elevated indoor contaminant levels or impair contaminant removal.[177] Disruption in air flow or uneven distribution of air flow also may increase contaminant levels. In addition, air supply vents located too close to a building's exhaust vents re-entrain contaminated exhaust air into the building.[178] Improperly maintained HVAC systems can become the source of contamination or can become clogged and reduce or eliminate air flow. For example, bioaerosols can grow in stagnant water that accumulates in ducts, humidifiers, and drain pans, or where water has collected on ceiling tiles, carpeting, or insulation. Insect or bird excretions that enter the HVAC system also can be sources of biological contamination.

[ii] Chemical and Biological Contaminants

Chemical and biological contaminants from both indoor and outdoor sources may be contributing factors in SBS claims. Indoor sources include building materials, furnishings, combustion devices, consumer and commercial products, as well as human occupants and their pets. For example, the effect of carpeting on indoor air quality has received a great deal of attention. Carpets are known to

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Syndrome, Indoor Facts No. 4 (1991). *See also* Polk County v. Reliance Ins. Co., No. 94-7135-CI-11 (Fla. Cir. Ct. Apr. 25, 1995) (requiring insurance company to pay $25.9 million to county for damages caused by design and construction flaws in county courthouse that, allegedly due to sick building syndrome, was unoccupied since 1992).

[173] In a suit seeking a permanent injunction to close the building housing the Norfolk County (Mass.) Family and Probate Court and relocate its occupants, the plaintiffs—including court employees, attorneys, and a Jane Doe representing the children, victims, and citizens who use the courthouse—established that the building had lacked an operable ventilation system for "many years." One of plaintiff's experts presented evidence that the building was sick and contributed substantially to the cause of illnesses. Following a trial, the trial court found that the building presented a "serious health hazard" to employees and the public, and ordered that the court be temporarily relocated. *Schmidt v. County of Norfolk, No. 0200614, 2002 Mass. Super. LEXIS 327 (Aug. 15, 2002)*. *See* Scally, *After a Successful Legal Challenge, the Dark Days of the Dilapidated Norfolk Probate Court Are Over—But Can Other "Sick" Courts Similarly Escape?*, Mass. Law. Wkly., Sept. 23, 2002.

[174] *See* U.S. EPA, *Building Air Quality: A Guide for Building Owners and Facility Managers* (1991). *See also* *§ 17A.06[2] infra*.

[175] Menzie, *The Effects of Varying Levels of Outdoor-Air Supply on the Symptoms of Sick Building Syndrome,* 328 New Eng. J. Med. 821 (1993).

[176] Finnegan, *The Sick Building Syndrome: Prevalence Studies,* 289 Brit. Med. J. 1573 (1984). *But see* Hedge, *Sick Building Syndrome and Office Ergonomics: A Targeted Work Environment Analysis* (Cornell 1998) (finding higher reports of SBS symptoms among workers in offices with higher carbon dioxide levels; carbon dioxide build-up often indicates poor ventilation); Seppanen and Fisk, *Relationship of SBS-Symptoms and Ventilation System Type in Office Buildings*, Lawrence Berkeley National Laboratory 50046 (March 2002) (available data suggest increased risk of SBS symptoms with simple mechanical ventilation as compared to natural ventilation).

[177] *See* U.S. EPA, *Ventilation and Air Quality in Offices, Indoor Air Facts No. 3* (1990).

[178] *Id.*

emit low levels of VOCs during the first several days after installation. In 1992, Anderson Laboratories published a study describing neurotoxicity, pulmonary irritation, and death in mice exposed to emissions from certain carpets, based on its testing of nine carpet samples taken from homes where occupants reported significant adverse reactions that they believed were caused by the carpeting. These studies received widespread media and congressional attention. The public health significance of these findings prompted EPA to attempt to replicate the studies. EPA was unable, however, to replicate the severe toxicity described by Anderson Laboratories. In fact, EPA did not produce any convincing signs of even mild toxicity attributable to carpet.[179] Nevertheless, class action suits were filed against carpet manufacturers and distributors alleging injuries from carpets installed in homes.[180]

Consumer products used in offices and residences may be released in the indoor air and have adverse impacts on human health. Aerosol spray products contain certain indoor air pollutants.[181] Activities such as grinding, sanding, and cleaning also are responsible for releasing potentially hazardous chemicals into the air. Plastics, paints, solvents, artificial fiber textiles, cleaners, bleaches, disinfectants, deodorizers, and other substances all emit pollutants, either through evaporation or "outgassing."[182]

Combustion generates carbon monoxide,[183] nitrogen oxides,[184] and other gaseous pollutants and particulates.[185] Although combustion products have been a primary concern in the outdoor environment, these pollutants can re-entrain into the indoor environment and sometimes create severe indoor air quality problems. In particular, air intake vents located near a roadway, parking lot, or loading dock may allow motor vehicle exhaust to enter a building.

Indoor fungal contamination has also been linked with sick building syndrome symptoms.[186]

[10] Trichloroethylene

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[179] *See* Testimony of Victor J. Kimm, Acting Assistant Administrator for Prevention, Pesticides and Toxics Substances, U.S. EPA, before the Subcommittee on Environment, Energy, and Natural Resources Committee on Government Operations, United States House of Representatives, June 11, 1993.

[180] *Howell v. Shaw Indus., No. 93-2068, 1993 U.S. Dist. LEXIS 13784 (E.D. Pa. Oct. 1, 1993)*; *Loy v. Armstrong World Indus., 838 F. Supp. 991 (E.D. Pa. 1993)*; *McBride v. Galaxy Carpet Mills Inc., No. 93-CV-2038, 1993 U.S. Dist. LEXIS 13784 (E.D. Pa. 1993)*. *See also* Beebe v. Burlington, 4 Toxics L. Rep. at 733–34 (Ohio Ct. C.P., Hamilton City, Oct. 24, 1984) (jury verdict in favor of carpet manufacturer in case where plaintiffs alleged headaches, dizziness, nausea, chronic sore throat, burning eyes, and itchy skin from newly installed commercial carpeting). Since 1992, the Carpet and Rug Institute has maintained an Indoor Air Quality Carpet Testing Program, under which carpet samples meeting criteria for low emissions receive a "green label" logo. For more information on the testing program, *see* the Carpet and Rug Institute web site at *http://www.carpet-rug.com/*.

[181] The active substances in aerosols include sodium or potassium hydroxide, ammonium hydroxide, morpholine, tetracholorethylene, toluene, xylene, methylchloride and pigments, hydrated aluminum chloride, vinyl acetate copolymer resins, dichlorvos (DDVP), and chlordane. NAS/NRC Report, at 102.

[182] *Id.* at 100–01.

[183] Carbon monoxide (CO) is an odorless gas released into the environment as one of the products of combustion from fuel-fired heating and cooling equipment such as heaters, water heaters, portable heaters, and central furnaces. CO also is released from burning charcoal and quickly reaches dangerous levels in areas with limited ventilation. Consumer Product Safety Commission, *Report to Congress on Indoor Air Quality* (1991) at 5–9.

[184] Nitrogen dioxide (NO_2) is a gas that is a product of combustion from kerosene heaters, unvented gas space heaters, and gas ranges. NO_2 is a respiratory irritant that also may interfere with the immune system. *Id.*

[185] *Id. at 134*. *See also* Consumer Products Safety Commission, *What You Should Know About Combustion Appliances and Indoor Air Pollution*, Doc. No. 452 (1993) (discussing indoor air pollution problems associated with combustion appliances).

[186] *The Source of Sick Buildings*, 107 Envtl. Health Persp. A-63 (1999) (discussing 1998 study linking SBS with elevated indoor levels of Penicillium and Stachybotrys in U.S. schools).

Trichloroethylene (TCE) is a common solvent used to clean and degrease machinery. It is also used as a chemical intermediate and extractant, and as a component in some consumer products. TCE may be released to indoor air by TCE-containing consumer products such as adhesives and tapes, volatilization from water supplies, and vapor intrusion through walls and floors from contaminated soil and groundwater.[186.1]

TCE has been regulated as a hazardous air pollutant under the Clean Air Act and under the Safe Drinking Water Act, pursuant to which a maximum contaminant level of 5 ppb has been set. The Occupational Safety and Health Administration has set TCE exposure limits for workplace air: a permissible exposure of limit of 100 ppm over an eight-hour workday, a 300 ppm maximum peak in any two-hour period.

EPA and the states have become embroiled in a debate over the regulation of (TCE), a Water or soil contaminated with TCE can lead to vapor intrusion, whereby polluted air seeps into buildings.[186.2] In 2001, EPA issued a draft study and proposed stringent new standards for TCE that would treat the contaminant as being up to 65 times more toxic than previously thought.[186.3] New Jersey, Colorado, and eight of ten EPA Regions supported the new standards, while EPA's Assistant Administrator for the Office of Research and Development pressed for a more moderate standard.[186.4] In 2011, EPA issued a final study that concluded that TCE was a human carcinogen and could harm fetal development.[186.5] For noncancer effects, EPA concluded that a concentration of 2 $\mu g/m^3$ TCE in indoor air was expected to be a reasonable maximum exposure condition for continuous chronic exposure to prevent risk of adverse health effects during a lifetime.

EPA's conclusions regarding TCE's toxicity led to the establishment of more stringent response action limits by some EPA regions and states, and to renewed focus on sites contaminated with TCE that may pose risks to indoor air, even sites that had previously been properly "closed" under earlier standards.[186.6] EPA Region 9, in particular, focused on indoor air TCE exposure. In 2014, the Director of Region 9's Superfund Division issued a

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[186.1] EPA, Toxicological Review of Trichloroethylene, CAS No. 79-01-6, at 12 (June 2011).

[186.2] EPA's guidance on vapor intrusion—which EPA describes as "a rapidly developing field of science and policy"—has proven controversial. *See* U.S. EPA, Office of Solid Waste and Emergency Response, *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (Nov. 2002); U.S. EPA, Office of Solid Waste and Emergency Response, *Evaluating the Vapor Intrusion into Indoor Air*, Doc. No. 530-F-02-252 (Nov. 2002). In 2015, EPA finalized this guidance. EPA, OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, OSWER Pub. 9200.2-154 (June 2015), http://www.epa.gov/sites/production/files/2015-09/documents/oswer-vapor-intrusion-technical-guide-final.pdf.; EPA, Technical Guide For Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Tank Sites, EPA 510-R-15-001 (June 2015), http://www.epa.gov/sites/production/files/2015-06/documents/pvi-guide-final-6-10-15.pdf.

[186.3] U.S. EPA, Office of Research and Development, *Trichloroethylene Risk Assessment: Synthesis and Characterization*, Doc. No. 600-P01-002A (External Review Draft Aug. 2001).

[186.4] *New Jersey Joins EPA Regions Adopting Strict Agency TCE Risk Data*, Inside EPA, Oct. 31, 2003, at 5.

[186.5] EPA, IRIS Toxicological Review of Trichloroethylene (Interagency Science Discussion Draft) (Sept. 2011).

[186.6] *See, e.g.*, Mass Dept. of Envtl. Prot., MassDEP Bureau of Waste Site Cleanup's Plan for Evaluating Potential Imminent Hazards from Trichloroethylene (TCE) Vapor Intrusion at Closed Sites (Apr. 2016), http://www.mass.gov/eea/docs/dep/cleanup/summary-of-tce-closed-sites-review.pdf; Mass. Dept. of Envtl. Prot., US EPA Trichloroethylene Toxicity Values and Office of Research and Standards Recommendations Regarding Remediation Targets and Timeframes to Address Potential Developmental Risks (Aug. 25, 2014), *available at* http://www.mass.gov/eea/docs/dep/cleanup/laws/tcevalsm.pdf; New Hampshire Department of Environmental Services, Waste Management Division Update, "Revised Vapor Intrusion Screening Levels and TCE Update" (Feb. 7, 2013), *available at* http://des.nh.gov/organization/divisions/waste/hwrb/documents/vapor_intrusion.pdf; New Jersey Dept. of Envtl. Prot., Vapor Intrusion Screening Level Tables, tbl. 2 (Mar. 2013), *available at* http://www.nj.gov/dep/srp/guidance/vaporintrusion/vig_tables.pdf.

memorandum that set forth interim action levels for residential and commercial buildings, exceedance of which could warrant immediate evacuation in some cases.[186.7]

Vapor intrusion is discussed in more detail in *Chapter 17B*.

End of Document

[186.7] Memorandum from Enrique Manzanilla to Region 9 Superfund Division Staff & Management Regarding EPA Region 9 Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion (July 9, 2014). *See also* EPA Region 10, OEA Recommendations Regarding Trichloroethylene Toxicity in Human Health Risk Assessments (Dec. 13, 2012).

§ 17A.03 Federal Regulation of Indoor Air

[1] Federal Authority to Regulate Indoor Air Is Governed by Several Statutes

There is no comprehensive federal program to regulate indoor air quality (IAQ) in private homes.[187] The federal authority that does exist to regulate indoor air pollution is scattered among a number of statutes, usually on a pollutant-specific basis.[188] Federal laws or regulations tend to target specific indoor air pollutants, such as asbestos, pesticides, and radon. For example, EPA has issued rules that regulate volatile organic compound emissions from various consumer products and paints.[189]

EPA has developed IAQ guidelines and educational programs,[190] and its authority to regulate ambient air under the Clean Air Act indirectly affects the quality of indoor air. The Occupational Safety and Health Administration regulates worker exposure to indoor air contaminants.

The federal regulations and guidelines that address IAQ generally fall within two categories: those promulgated to protect the public health and those addressing occupational exposures. Public health standards are health-based standards that address involuntary risks. They assume that exposure to a substance will occur 24 hours per day over a 70-year lifetime. In contrast, occupational standards consider the technical and economic feasibility of a regulation. Exposures are assumed to occur at eight-hour intervals, 40 hours per week.

[2] Clean Air Act

The Clean Air Act (CAA) gives EPA authority to regulate "ambient air."[191] Because the Act does not define that term, whether Congress intended it to include indoor air is not clear. It appears that Congress did not consider this question when it passed the Act in 1970 or when it amended it in 1977 and 1990. The express

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[187] *See* Arnold W. Reitze, Jr. and Sheryl-Lynn Carof, *The Legal Control of Indoor Air Pollution*, 25 B.C. Envtl. Aff. L. Rev. 247 (1998). *See also* Presidential/Congressional Commission on Risk Assessment and Risk Management, *Framework for Environmental Health Risk Management (Final Report)*, Vol. 2 (1997), at 119–20 ("No regulatory framework exists for addressing indoor air pollution concerns, and there are essentially no enforceable standards.") However, the U.S. Department of Housing and Urban Development (HUD) has established indoor air requirements for publicly owned and subsidized housing. Public housing owned by HUD-approved entities must be "decent, safe, sanitary and in good repair." This includes a requirement that the air quality pose no health or safety concerns, and that "dwelling units and common areas … have proper ventilation and be free of mold, odor … or other observable deficiencies." 24 C.F.R. §§ 5.703, 5.703(f). Government-subsidized, or "Section 8," housing units must be "free of pollutants in the air at levels that threaten the health of the occupants," which requires that the units "be free from dangerous levels of air pollution from carbon monoxide, sewer gas, fuel gas, dust, and *other harmful pollutants*." 24 C.F.R. § 982.401(h) (emphasis added).

[188] *See* Presidential/Congressional Commission on Risk Assessment and Risk Management, *Framework for Environmental Health Risk Management (Final Report)*, Vol. 2 (1997), at 119–20 ("No regulatory framework exists for addressing indoor air pollution concerns, and there are essentially no enforceable standards.") *See also* Interagency Committee on Indoor Air Quality Activities, *Current Federal Indoor Air Quality Activities*, No. 402-K-99-001 (March 1999).

[189] 40 C.F.R. pt. 59.

[190] EPA's IAQ programs are described on EPA's web site at www.epa.gov/iaq/. *See also* § 17A.04 *infra*.

[191] Clean Air Act (CAA) § 109; 42 U.S.C. § 7409. *See* ch. 17 *supra* for a discussion of the Clean Air Act.

purpose of the Act, to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population,"[192] could be read to justify the regulation of indoor as well as outdoor air.[193] Nevertheless, EPA has consistently limited its authority under the CAA to outdoor air.

In theory, EPA's existing statutory authority under the Clean Air Act could be extended to indoor air. EPA could apply either the National Ambient Air Quality Standards[194] or the National Emission Standards for Hazardous Air Pollutants[195] to the indoor air environment.

[a] National Ambient Air Quality Standards

The National Ambient Air Quality Standards (NAAQS) specify maximum permissible concentrations in the air for certain "criteria pollutants."[196] Criteria pollutants are pollutants that can reasonably be expected to "endanger public health or welfare," the presence of which results from "numerous mobile or stationary sources."[197] The list of criteria pollutants includes carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone, lead, and particulates.[198]

Primary standards are designed to protect the public health, while secondary standards are designed to protect the public welfare. These standards specify concentrations of pollutants that cannot be exceeded. Each state is responsible for deciding how to attain the NAAQS within its boundaries and must prepare, for EPA approval, a State Implementation Plan (SIP) that describes the controls the state will impose to attain these standards.[199] Although NAAQS have not been directly applied to the indoor air, they play an important role in enhancing indoor air quality because indoor air is exchanged with outdoor air.[200]

[b] National Emission Standards for Hazardous Air Pollutants

Section 112 of the Clean Air Act authorizes EPA to set National Emission Standards for Hazardous Air Pollutants (NESHAPs).[201] In 1990, Congress amended the Clean Air Act and listed 189 hazardous air pollutants for which EPA must promulgate emission standards.[202] These standards are applicable to new and existing sources of hazardous air pollutants. EPA is to promulgate emission standards based on

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[192] CAA § 101, *42 U.S.C. § 7401*.

[193] *See* Kirsch, *Behind Closed Doors: Indoor Air Pollution and Government Policy,* 6 Harv. Envtl. L. Rev. 339 (1982).

[194] CAA § 109, *42 U.S.C. § 7409*.

[195] CAA § 112, *42 U.S.C. § 7412*.

[196] CAA § 109, *42 U.S.C. § 7409*.

[197] CAA § 108, *42 U.S.C. § 7408*.

[198] 40 C.F.R. pt. 50.

[199] CAA § 110, *42 U.S.C. § 7410*.

[200] In fact, ASHRAE Standard 62-2001 (Ventilation for Acceptable Indoor Air Quality) draws directly on EPA's national primary ambient-air quality standards. *See § 17A.06[1] infra.*

[201] CAA § 112, *42 U.S.C. § 7412*.

[202] CAA § 112(b), *42 U.S.C. § 7412(b)*.

maximum available control technology (MACT). In the second stage of regulation under Section 112, EPA is to set standards adequate to protect public health within an ample margin of safety.[203]

EPA has used its authority under the NESHAP provisions of the Clean Air Act to address indoor air pollution. EPA curtailed the spraying of asbestos insulation and decorative material inside buildings.[204] It also has established an emission standard for radon applicable to an owner or operator of an active underground uranium mine.[205]

[3] Occupational Safety and Health Act

The Occupational Safety and Health Act (OSH Act)[206] requires the Secretary of Labor to set standards for toxic pollutants that assure safe and healthy working conditions. The Secretary, through the Occupational Safety and Health Administration (OSHA), must set a standard for toxic substances that "most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity even if such employee has regular exposure."[207] The standards take into consideration safety and health, as well as feasibility.

OSHA standards are expressed as "Permissible Exposure Limits" or "PELs." PELs are concentration limits usually determined on the basis of an eight-hour exposure to a particular substance.[208] Five-minute and fifteen-minute exposure limits also are set, depending on whether a substance can produce a toxic effect in a shorter period of time. Ceiling limits, levels that must never be exceeded, also are promulgated. In 1989, OSHA updated PELs for more than 400 substances in the workplace.[209] However, the Eleventh Circuit invalidated those PELs in 1992, forcing OSHA to return to its original 1971 PELs.[210] As of 2014, when OSHA initiated a review to consider, among other things, issues related to updating PELs, approximately 470 PELs had been established.[211] Most of these PELs were adopted in 1971, and the review initiated in 2014 did not lead to any

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[203] CAA § 112(d)(4), *42 U.S.C. § 7412(d)(4)*. These second-stage, or "residual risk," standards must be met if MACT allows a residual risk of greater than one in 1 million to the maximally exposed individual. CAA § 112(f)(2), *42 U.S.C. § 7412(f)(2)*.

[204] EPA banned the spraying of material containing more than one percent asbestos (on a dry weight basis) on "buildings, structures, pipes, and conduits." *40 C.F.R. § 61.148*.

[205] *40 C.F.R. § 61.20*. Emissions of radon-222 from an underground uranium mine to the ambient air cannot exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent to 10 millirems (mrem/yr). *40 C.F.R. § 61.22*.

[206] *29 U.S.C. §§ 651–678*.

[207] *29 U.S.C. § 655(b)(5)*. *See* Action on *Smoking & Health v. Dept. of Labor, 28 F.3d 162 (D.C. Cir. 1994)* (court refused to compel OSHA to promulgate separate standard, independent of existing standard on indoor air quality, for environmental tobacco smoke). In 1994, OSHA proposed an indoor air quality rule governing general performance standards and management practices for non-industrial buildings. The rule would apply to all non-industrial indoor or enclosed work spaces, including schools, offices, stores and hospitals. The rule also addressed environmental tobacco smoke and other individual indoor air contaminants, and was intended to clarify employer liability principles for regulatory and toxic tort purposes. *59 Fed. Reg. 15968 (1994)*. OSHA withdrew its proposed indoor air quality rule in 2001. ***66 Fed. Reg. 64946 (Dec. 17, 2001)***. *See also* Bryan-Jones and Bero, *Tobacco Industry Efforts to Defeat the Occupational Safety and Health Administration Indoor Air Quality Rule*, 93 Am. J. Pub. Health 585 (Apr. 2003); *§ 17A.02[8][b] supra*.

[208] PELs are determined on the basis of a time-weighted average. Therefore, a PEL may be exceeded for short periods of time, as long as the average concentration over the entire eight hours is not exceeded.

[209] ***54 Fed. Reg. 2332 (Jan. 19, 1989)***.

[210] *American Fed'n of Labor v. OSHA, 965 F.2d 962 (11th Cir. 1992)*. For more information on OSHA's air contaminants standards, *see § 28A.04[8] infra*.

[211] *79 Fed. Reg. 61384, 61418 (Oct. 10, 2014)*.

comprehensive proposal to update PELs. Currently OSHA has no regulation addressing PELs for environmental tobacco smoke.[211.1]

OSHA made an administrative claim against a company for exceeding PELs for silica and by failing to implement engineering or administrative controls.[211.2] The company made iron castings in sand molds, and as the castings were shaken away from the mold, the dust became airborne. Some 400 tons of sand an hour were used at the plant. The Seventh Circuit found OSHA had proven the claims.[211.3]

The National Institute for Occupational Safety and Health (NIOSH) is part of the United States Department of Health and Human Services' Centers for Disease Control and Prevention. Acting under the authority of the Occupational Safety and Health Act and the Mine Safety and Health Act of 1977,[212] NIOSH develops and periodically revises Recommended Exposure Limits (RELs) to potentially hazardous substances in the workplace. NIOSH submits RELs to the Department of Labor for consideration as PELs.

In formulating recommendations to the Department of Labor, NIOSH evaluates all known and available scientific information relevant to the potential hazard. RELs and appropriate preventative measures designed to reduce or eliminate adverse health effects associated with a substance are published in criteria documents.

OSHA's website acknowledges that many PELs are "outdated and inadequate for ensuring protection of worker health."[212.1] OSHA therefore has posted annotated tables that supplement the list of PELs with other selected occupational exposure limits: the California Division of Occupational Safety and Health (Cal/OSHA) PELs; the NIOSH RELs; and the American Conference of Governmental Industrial Hygienists Threshold Limit Values.

[4] Toxic Substances Control Act

The Toxic Substances Control Act (TSCA)[213] provides EPA with authority to require manufacturers and processors to develop data on the effects of chemical substances and mixtures on health and the environment.[214] EPA also has the authority to regulate chemical substances and mixtures that present an unreasonable risk of injury to health or the environment.[215] EPA is authorized to impose a number of restrictions, ranging from requiring labeling with instructions or warnings to prohibiting or limiting the manufacture, processing, or distribution of a chemical. Thus, TSCA gives EPA the authority to regulate the manufacture, distribution, labeling, and use of toxic chemical substances, many of which may be significant indoor air pollutants.[216] In addition, Title III of TSCA sets as a national goal that "air within buildings … be as free of radon as the ambient air outside of buildings."[217]

[211.1] *See* *Empire State Restaurant and Tavern Association, Inc. v. New York State, 289 F. Supp. 2d 252, 254–55 (N.D.N.Y. 2003)* (state smoking ban was not preempted by OSHA regulations because OSHA did not have any standards or regulations pertaining to tobacco smoke as a whole).

[211.2] *Chao v. Gunite Corp., 442 F.3d 550 (7th Cir. 2006)* (OSHA alleged employees were exposed to 1.6 times the PEL for silica).

[211.3] *Chao v. Gunite Corp., 442 F.3d 550 (7th Cir. 2006)* (the fact that the company provided individual respirators did not mean it no longer had to implement engineering or administrative controls).

[212] *30 U.S.C. §§ 801–962*. NIOSH's Pocket Guide to Chemical Hazards provides general industrial hygiene information for workers, employers, and occupational health professionals. It presents data on over 600 chemicals or substance groupings that are found in the workplace. The latest version of the Pocket Guide is available from NIOSH's web site at *www.cdc.gov/niosh/npg/*.

[212.1] *Permissible Exposure Limits—Annotated Tables*, OSHA, *https://www.osha.gov/annotated-pels*.

[213] TSCA §§ 2-412, *15 U.S.C. §§ 2601–2692*.

[214] *See generally ch. 27 infra.*

[215] TSCA § 6, *15 U.S.C. § 2605*.

[216] EPA, *Report to Congress on Indoor Air Quality,* 8-6 (1989) [hereinafter EPA Report to Congress].

The Energy Independence and Security Act of 2007 amended the Toxic Substances Control Act by creating a new title for "healthy high performance schools." This amendment requires EPA to develop within 18 months voluntary school site selection guidelines that account for the special vulnerability of children to pollution in any case for which the potential for contamination at a potential school site exists. The amendment also requires EPA to develop guidelines for an environmental health program for schools that take into account environmental problems associated with exposure to a range of environmental contaminants, as well as environmental justice issues, within two years of the law's enactment. The amendment authorizes a five-year grant program to provide states with funds to address environmental issues in schools.[217.1]

In 2010, the Formaldehyde Standards for Composite-Wood Products Act was enacted, adding a Title VI to TSCA.[217.2] The law establishes limits, based on standards in place in California, for formaldehyde emissions from composite wood products: hardwood plywood, medium-density fiberboard, and particleboard.[218] In 2013, EPA proposed two sets of regulations, one to implement the statutory emissions standards[219] and one to establish a framework for a third-party certification program.[220]

[5] Federal Insecticide, Fungicide and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[221] was enacted to ensure that the use of pesticides, in compliance with labeling instructions, will not cause "unreasonable adverse effects" to humans or the environment.[222] FIFRA is similar to TSCA in that it provides EPA with the authority to require the submission of chemical-specific data and to restrict the distribution and use of chemicals. Because many pesticides are used indoors, EPA effectively regulates these indoor air pollutants by banning or limiting their use and by establishing directions for safe use.[223]

[6] Safe Drinking Water Act

Under the Safe Drinking Water Act (SDWA)[224] EPA may regulate contaminants that "may have any adverse effects on the health of persons."[225] Contaminants found in drinking water may affect the indoor air environment. For example, radon contaminates drinking water in certain parts of the country and can potentially decay and be emitted into the indoor air.[226] Similarly, VOCs in water may volatilize to the indoor air. Therefore, the SDWA gives EPA the authority to set standards for indoor air pollutants emitted from drinking water.[227]

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[217] TSCA § 301, *15 U.S.C. § 2661*. *See § 17A.02[2][b] supra*.

[217.1] ***Pub. L. No. 110-140***, § 461 (2007).

[217.2] ***Pub. L. No. 111-199, 124 Stat. 1359***.

[218] TSCA § 601(b)(2), 14 U.S.C. § 2697(b)(2).

[219] *Formaldehyde Emissions Standards for Composite Wood Products, 78 Fed. Reg. 34820 (June 10, 2013)*.

[220] *Formaldehyde; Third-Party Certification Framework for the Formaldehyde Standards for Composite Wood Products, 78 Fed. Reg. 34796 (June 10, 2013)*.

[221] FIFRA §§ 2–34, *7 U.S.C. §§ 136–136y*. *See ch. 34 infra.*

[222] FIFRA § 3, *7 U.S.C. § 136a*.

[223] EPA Report to Congress, at 8-7.

[224] SDWA §§ 1401–1465, *42 U.S.C. §§ 300f to 300j-26*. *See ch. 20 infra.*

[225] SDWA § 1401(1)(B), *42 U.S.C. § 300f(1)(B)*.

[226] EPA Report to Congress, at 8-8.

[227] *Id.*

[7] Consumer Product Safety Act

The Consumer Product Safety Act (CPSA)[228] gives the Consumer Product Safety Commission (CPSC) authority to regulate "consumer products."[229] The CPSC can promulgate consumer product safety standards that are "reasonably necessary to prevent or reduce an unreasonable risk of injury associated with such product."[230] These risks may include health effects associated with contaminant emissions that affect indoor air quality.[231] The CPSC also can ban a consumer product that "represents an unreasonable risk of injury" when "no feasible consumer product safety standard … would adequately protect the public from the unreasonable risk of injury associated with such product."[232]

The CPSC has taken a number of actions to reduce contaminants in the indoor air. For example, the CPSC withdrew from the market hairdryers insulated with asbestos, required manufacturers of urea formaldehyde foam insulation to warn purchasers of its possible acute and chronic health effects, and proposed to ban benzene as an ingredient in consumer products.[233] In addition, the CPSC has developed methods of identifying and testing indoor air emissions.

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[228] *15 U.S.C. §§ 2051–2083*.

[229] *15 U.S.C. § 2053*. Consumer products are defined as "any article, or component part thereof, produced or distributed (i) for sale to a consumer for use in or around a permanent or temporary household or residence, a school, in recreation, or otherwise, or (ii) for the personal use, consumption or enjoyment of a consumer." *15 U.S.C. § 2052(a)(1)*.

[230] *15 U.S.C. § 2056*.

[231] EPA Report to Congress, at 8–12.

[232] *15 U.S.C. § 2057*.

[233] In response to the proposed ban, industry reformulated products to eliminate the use of benzene. Therefore, the CPSC withdrew the proposed ban. The CPSC also banned the sale of urea formaldehyde foam insulation for use in schools and residences. *47 Fed. Reg. 14366 (1982)*. The ban was subsequently overturned by the courts. *See Gulf South Insulation v. CPSC, 701 F.2d 1137 (5th Cir. 1983)*.

§ 17A.04 EPA's Indoor Air Quality Program

The Radon Gas and Indoor Air Quality Research Act[234] directs EPA to:

(1) gather data and information on all aspects of indoor air quality to contribute to the understanding of health problems associated with the existence of air pollutants in the indoor environment;

(2) coordinate federal, state, local, and private research and development efforts relating to the improvement of indoor air quality; and

(3) assess appropriate federal government actions to mitigate the environmental health risks associated with indoor air.

EPA implements this mandate by means of a non-regulatory approach, relying heavily on the development and dissemination of information to key audiences, including state and local government officials, architects and other design professionals, engineers, builders, building owners and managers, and building occupants.

Objectives of the program are to:

(1) establish effective partnerships with organizations representing the range of target audiences for indoor air quality;

(2) forge constructive alliances with other federal agencies to leverage resources and ensure that existing statutory authorities are used most effectively;

(3) develop practical guidance on indoor air quality;

(4) design market-based incentives for industries to lower chemical emissions from products;

(5) sharpen the focus of the chemical screening and risk management under TSCA and FIFRA;

(6) identify and fill research gaps to address outstanding indoor air quality policy issues;

(7) select appropriate environmental indicators to measure progress in reducing human exposure to indoor air quality problems;

(8) enhance scientific understanding and public awareness of the complex factors affecting indoor air quality; and

(9) reduce human exposure to indoor air pollutants.[235]

EPA has launched various initiatives to promote improved indoor air quality, both in the United States and abroad. For example, EPA's Environmental Air Quality Tools for Schools program assists schools in identifying indoor air

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[234] Title IV of the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499 (1986).

[235] U.S. EPA, Office of Air and Radiation, *Targeting Indoor Air Pollution: EPA's Approach and Progress*, Doc. No. 400-R-92-012 (March 1993). *See also* U.S. EPA, *Indoor Air Facts No. 1 (Revised): EPA and Indoor Air Quality* (Dec. 1991) (discussing EPA indoor air quality goals). In 2001, EPA released a report outlining its indoor environmental quality goals for the years to come. U.S. EPA, Office of Air and Radiation, *Healthy Buildings, Healthy People: A Vision for the 21st Century*, No. 402-K-01-003 (Oct. 2001).

quality problems and resolving them as inexpensively as possible.[236] The agency has a program to improve indoor environmental quality in commercial buildings.[237] EPA has also taken the lead in establishing the Partnership for Clean Indoor Air, the goal of which is to halve mortality related to indoor air pollution from the burning of traditional biomass fuels indoors for cooking and heating.[238]

In November 2011, EPA released its Healthy Indoor Environment Protocols for home energy upgrades to better integrate health protections into energy efficiency programs.[238.1] According to EPA, this guidance will provide the home energy industry the ability to identify, manage, and reduce health risks during home energy upgrades, retrofits or remodeling. These protocols describe a step-by-step process for conducting assessments to evaluate indoor air conditions and the potential for risks that may arise during residential energy upgrades. The protocols include recommended minimum specifications and best practices to maintain or improve indoor air quality. The protocols serve as a companion document to the Department of Energy's guidelines for home energy professionals.[238.2] These guidelines are intended to foster the growth of a skilled work force that will increase the homeowner's confidence in the retrofit industry and increase the demand for home energy retrofits.

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[236] U.S. EPA, *IAQ Tools for Schools*, Doc. No. 402-F-03-011 (March 2003). EPA's web site contains extensive IAQ Tools for Schools program resources. *See* http://www.epa.gov/iaq/schools/. EPA's program complements state and local efforts to build healthier schools, and to improve indoor air quality in existing schools. *See* Environmental Law Institute, *Building Healthy, High Performance Schools: A Review of Selected State and Local Initiatives* (Sept. 2003); Environmental Law Institute, *Healthier Schools: A Review of State Policies for Improving Indoor Air Quality* (Jan. 2002).

[237] U.S. EPA, *Indoor Air Quality Education and Assessment Model (I-BEAM)*, *at* http://www.epa.gov/iaq/largebldgs/index.html (billed as a comprehensive, state-of-the-art guidance and software for managing IAQ in commercial buildings).

[238] U.S. EPA, *Partnership for Clean Indoor Air Fact Sheet* (undated). For further information on this nascent program, *see* EPA's web site at http://www.epa.gov/iaq/index.html. Smoke from fires has been described as "[t]he single most pervasive and harmful indoor air problem worldwide." Samet & Spengler, *Indoor Environments and Health: Moving Into the 21st Century*, 93 Am. J. Pub. Health 1489, 1491 (Sept. 2003).

[238.1] These protocols are available at http://www.epa.gov/iaq/homes/retrofits.html.

[238.2] These guidelines are available at http://www1.eere.energy.gov/wip/retrofit_guidelines.html.

§ 17A.05 State Indoor Air Legislation

Although some state regulations have gone further than federal regulations, they often address only specific pollutants.[239] Other states, however, such as New Jersey, Maine, New Hampshire, and California, have promulgated broad-based indoor air quality regulations.[240] New Jersey's Indoor Air Quality Standard,[241] as amended, was enacted pursuant to the Public Employees' Occupational Safety and Health Act.[242] The regulations require employers to establish a preventive maintenance schedule for HVAC systems, and to use exhaust ventilation where housekeeping and maintenance activities could result in impermissible exposures of hazardous chemicals or particulate matter to employees elsewhere in the building.[243] The Air Quality Standard provides for control of environmental tobacco smoke, microbial contaminants, and "other indoor contaminants."[244] Employers are required to provide workers with protection during renovation and new construction work, and to become informed about chemicals and other construction materials that might emit indoor air contaminants. The regulations also require employers to give 24-hours' notice—or "prompt" notice in the event of an emergency—of work that may introduce air contaminants into employees' work areas.[245]

An employee may submit an indoor air quality complaint in writing to the New Jersey Department of Health and Senior Services ("Department").[246] Within 15 working days of receipt of notification of the complaint, the employer must respond to the Department in writing.[247] The response may include one or more of the following: (1) a statement that the complaint is unfounded; (2) a description of the remedial action taken; (3) an outline of remedial

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[239] For example, most states have some type of asbestos regulation. *See, e.g,* Conn. Gen. Stat. § 8-219e (financial assistance for removal of lead-based paint and asbestos); Ga. Code Ann. § 50-9-82 (hazardous material removal); Iowa Code § 88B.12 (pertaining to the removal and encapsulation of asbestos); Mo. Rev. Stat. § 643.253 et seq. (standards for asbestos removal). Cigarette smoking also has been a widely regulated activity. *See* discussion at § 17A.02[8][b] *supra*. Indoor air quality is also regulated at the state and local levels by housing codes and landlord-tenant laws. *See generally* Environmental Law Institute, *Improving Indoor Air Quality in Rental Dwellings: A Review of Policies in Five U.S. Localities* (June 2003) (discussing state and local policies that address indoor air quality in residential rental housing).

[240] *See also* Environmental Law Institute, *State and Local Indoor Air Quality Programs: Five Case Studies* (Nov. 1997) (analyzing the origins, scope, and evolution of indoor air quality programs in California, Florida, Minnesota, Vermont, and Montgomery County, Maryland).

[241] N.J. Admin. Code tit. 12, §§ 100-13.1 to 100-13.8.

[242] N.J. Stat. Ann. § 34:6A-25.

[243] N.J. Admin. Code tit. 12, § 100-13.3. This section sets forth additional ventilation rules to be followed by employers, including a requirement that the HVAC system be checked if the carbon dioxide level exceeds 1,000 ppm or if indoor temperatures are outside of the range of 68 to 79 degrees Farenheit. Employers must maintain for at least three years records describing maintenance on building systems. N.J. Admin. Code tit. 12, § 100-13.6.

[244] N.J. Admin. Code tit. 12, § 100-13.4.

[245] N.J. Admin. Code tit. 12, § 100-13.5.

[246] N.J. Admin. Code tit. 12, § 100-13.7.

[247] N.J. Admin. Code tit. 12, § 100-13.7.

measures planned, together with a timetable; or (4) a statement that the problem is being studied, again with a timetable.[248] The Department may also request from the employer documents and records relating to construction, HVAC systems, maintenance, water treatment, and training.[249]

California's regulations require that HVAC systems be maintained and operated to provide for the minimum ventilation specified by the state's building code at the time the building permit was issued.[250] In addition, HVAC systems must be inspected annually and problems found during these inspections must be corrected within a reasonable time.[251] Employers are required to keep records of HVAC inspections and maintenance and to provide these records to the Division of Industrial Safety on request. Maine requires all buildings occupied by state employees to comply with ASHRAE indoor air and ventilation standards; New Hampshire similarly requires state buildings to meet indoor air requirements.[252]

Colorado's Clean Indoor Air Act generally bans smoking in indoor areas, but it expressly exempts airport smoking concessions. The Tenth Circuit upheld the constitutionality of the law, holding that the Colorado legislature rationally distinguished those concessions from the majority of other indoor facilities in the state, where most patrons in airports are nonresidents and would otherwise have no other place to smoke because they have no real opportunity to travel to a location outside of the airport.[252.1]

Another way in which states are increasingly seeking to protect indoor air quality is by regulating contaminants in groundwater and soil that can "volatilize"—that is, convert from a solid or liquid into a gas—and seep into a building's interior. For example, regulations of the Massachusetts Department of Environmental Protection governing oil and hazardous substance disposal sites require the use of standards that will ensure that oil or other hazardous materials present in the groundwater below or near a building will not result in indoor air concentrations that pose "a significant risk of harm to health, public welfare or the environment."[253] Connecticut's regulations covering the remediation of polluted property establish "volatilization criteria" that limit contaminant concentrations in soil and groundwater.[254] Other states, including California, Michigan, and Pennsylvania, have promulgated regulations or developed agency guidance to regulate soil and groundwater contaminants that may volatilize.[255]

Many states have approached the problem of indoor radon contamination through a non-regulatory approach by establishing disclosure requirements in connection with the sale or rental of real property. Florida, for example, requires that real estate contracts and rental agreements give the purchaser or renter notice of the dangers of radon, the fact that radon is present at high levels in some Florida buildings, and the availability of additional

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[248] N.J. Admin. Code tit. 12, § 100-13.7.

[249] N.J. Admin. Code tit. 12, § 100-13.8.

[250] *Cal. Code Regs. tit. 8, § 5142*.

[251] *Cal. Code Regs. tit. 8, § 5142*.

[252] *Me. Rev. Stat. Ann. tit. 5, § 1742*; *N.H. Stat. Ann. § 10-B:2*.

[252.1] *Coalition for Equal Rights, Inc. v. Ritter, 2008 U.S. App. LEXIS 1939 (10th Cir. Jan. 29, 2008)*.

[253] Mass. Regs. Code tit. 310, § 40.0986.

[254] *Conn. Agencies Regs. §§ 22a-133k-1 to 22a-133k-3*. Connecticut's Department of Environmental Protection has proposed revisions to its volatilization criteria that would bring them more into line with EPA's draft guidance on this subject. Connecticut Department of Environmental Protection, Bureau of Water Management, Permitting, Enforcement and Remediation Division, *Proposed Revisions: Connecticut's Remediation Standard Regulations—Volatilization Criteria* (March 2003). *See § 17A.03[6] supra.*

[255] The web site for EnviroGroup Limited, a private consulting firm, contains links to guidance, regulations, and other materials for twelve states. *See* EnviroGroup Limited, *Useful Links*, at *http://www.envirogroup.com/links*.

information at county health departments.[256] In Maryland, sellers of certain residential real property must either issue a disclaimer as to the property's condition or provide a disclosure form listing defects or information about which the sellers have actual knowledge in relation to, among other things, radon.[257] South Dakota requires that the seller of residential real property furnish a buyer with a completed property condition disclosure statement before the buyer had made a written offer. This statement provides for disclosure of hazardous conditions such as "radon gas in the house or well."[258]

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[256] *Fla. Stat. § 404.056(5)*.

[257] *Md. Code, Real Prop. § 10-702*.

[258] *S.D. Codified Laws §§ 43-4-37 to 43-4-44*.

§ 17A.06 Voluntary and Consensus Indoor Air Quality Standards

[1] Several Organizations Have Established Voluntary Standards

A number of professional organizations, trade associations, and private interest groups have set voluntary standards for indoor air quality. The standards set by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) and the guidelines issued by the American Conference of Governmental Industrial Hygienists (ACGIH) have been the most widely recognized. In addition, Building Officials and Code Administrators, Inc. (BOCA) has a national building and mechanical code that specifies ventilation requirements which affect indoor air quality. The Southern Building Code Congress International, Inc. (SBCCI) develops building, fire, and mechanical codes specifying procedures that affect indoor air quality.[259]

[2] American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standards

Since 1973, ASHRAE has developed ventilation standards for the purpose of specifying "minimum ventilation rates and indoor air quality that will be acceptable to human occupants and that are intended to minimize the potential for adverse health effects." The current standard, ASHRAE Standard 62-2001, defines acceptable indoor air quality as "air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction."[260]

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[259] Other groups and organizations are producing non-binding standards, codes, and protocols bearing on indoor air quality. For example, every two years, EPA, the U.S. Department of Energy, ASHRAE, and a number of other domestic and international entities publish a framework and guidance document for the measurement and verification of building energy performance. Although this protocol focuses broadly on "indoor environmental quality"—which embraces not only indoor pollutant concentrations, but also thermal comfort, lighting conditions, and other environmental characteristics—it contains detailed recommendations for eliminating and controlling indoor air pollutants. *See* International Performance Measurement & Verification Protocol Committee, *International Performance Measurement & Verification Protocol: Concepts and Practices for Improved Indoor Environmental Quality (Volume II)*, DOE Doc. No. GO-102002-1517 (Revised March 2002). Founded in 2003, the Indoor Environmental Standards Organization (IESO) has three stated objectives: (1) to establish standardized procedures for assessing indoor air for contaminants; (2) to establish standards that protect building inhabitants and inspectors during assessments; and (3) to establish training and certification programs that promote compliance with the standards. *See* IESO web site at http://www.iestandards.org/index.aspx. IESO's inaugural conference met on February 6-8, 2004, in Las Vegas. The U.S. Green Building Council—a broad coalition of architectural and engineering firms, product manufacturers, environmental NGOs, building industry organizations, developers, retailers and building owners, financial institutions, and government agencies—has established the LEED Green Building Rating System, a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. The LEED (Leadership in Energy and Environmental Design) criteria include IAQ minimum performance standards covering a variety of indoor air contaminants and sources. The LEED criteria also require that buildings meet the ventilation requirements of ASHRAE 62-2001. *See* U.S. Green Building Council, *LEED Rating System Version 2.1* (Nov. 2002, Rev. March 2003).

[260] American Society of Heating, Refrigerating and Air-Conditioning Engineers, *Standard 62-2001: Ventilation for Acceptable Indoor Air Quality* (2001), at 3 [hereinafter ASHRAE 62-2001]. This and other standards are available from ASHRAE by telephoning 1-800-5ASHRAE or visiting ASHRAE's web site at www.ashrae.org.

ASHRAE Standard 62-2001 addresses outdoor air quality, ventilation rate procedures, indoor air quality procedures, and ventilation system construction, operations, and maintenance. Outdoor air must meet EPA's National Primary Ambient Air Quality Standards to be acceptable for the ventilation of indoor space. Ventilation rates are set in cubic feet per minute per person (cfm/person) for different applications (*i.e.,* office space, school rooms, etc.).[261] In addition, the standard specifies a performance analysis that can be conducted to determine the amount of air necessary for keeping concentrations of "known contaminants of concern" at acceptable levels. The standard identifies levels that have been established for a number of known contaminants.[262] For contaminants not contained in the standard, ASHRAE recommends that levels should not exceed one-tenth of the occupational standards used in industry.[263]

ASHRAE Standard 62-2001 also provides design standards for HVAC systems that will avoid entrainment of contaminated air, not foster growth of microorganisms, and provide reasonable access for maintenance and cleaning.[264] Documentation requirements for HVAC design specifications also are prescribed.[265] In 1997, ASHRAE implemented a new revision process by which the standard would be continuously revised through separately reviewed and approved changes or addenda. Since the issuance of Standard 62-2001, ASHRAE has approved a number of addenda. Addendum 62 *k*, for example, creates an appendix to the standard describing application of the standard to new and existing buildings. Addendum 62 *o* adds new, detailed material on ventilation in smoking areas. Addendum 62 *z* establishes air cleaning requirements for ozone.[266]

In 2003, ASHRAE introduced a new ventilation and indoor air quality standard designed solely for low-rise residential housing, the only standard of its kind.[267] ASHRAE 62.2-2003, which expands on the contents of ASHRAE 62-2001, covers single-family houses and certain multi-family structures. Rather than focusing on specific pollutant concentration levels, the new standard sets requirements for whole-house ventilation, local exhaust (*e.g*., from kitchens and bathrooms), and source control.[268]

ASHRAE Standard 55-1992, Thermal Environmental Conditions for Human Occupancy, covers several environmental parameters, including temperature, radiation, humidity, and air movement. The standard specifies thermal environmental conditions for human comfort in both summer and winter months. In addition, it

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[261] For example, office space with an occupancy of seven people per 1,000 square feet of space requires a ventilation rate of 20 cfm/person. *Id.* at 8.

[262] *Id.* at 13.

[263] *Id.* at 19.

[264] *Id.* at 4–5.

[265] *Id.* at 15.

[266] Other approved changes are contained in Addenda 62 *i* (modifying indoor air quality ventilation procedures); 62 *t* (adding new language on moisture management within air distribution systems); 62 *u* (adding requirements on ventilation system control); 62 *v* (adding requirements to ensure that air distribution systems properly deliver outdoor air to indoor spaces); 62 *ab* (adding language on local capture of contaminants); 62 *r* (modifying text on outdoor air quality assessment and cleaning requirements); 62 *ad* (updating material on air quality guidelines and regulations issued by entities other than ASHRAE); 62 *ae* (among other things, adding and modifying definitions); and 62 *af* (implementing changes to the purpose and scope of the standard). To date, ASHRAE has issued more than 40 interpretations of Standard 62-2001.

[267] American Society of Heating, Refrigerating and Air-Conditioning Engineers, *Standard 62.2-2003: Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings* (2003).

[268] A "source" is defined as an indoor object, person, or activity that can release contaminants, or a route of entry into the indoor environment for contaminants outdoors or in the soil beneath the building. ASHRAE 62.2-2003, at 4.

attempts to introduce limits on temperature variations within a given space. Guidelines also are provided for air movement, temperature cycling, temperature drift, and vertical temperature difference.[269]

[3] American Conference of Governmental Industrial Hygienists (ACGIH) Guidelines: Threshold Limit Values and Biological Exposure Indices

The American Conference of Governmental Industrial Hygienists (ACGIH) is an association of professional personnel in governmental agencies or educational institutions engaged in occupational health and safety programs. ACGIH has developed threshold limit values (TLVs) for airborne concentrations of more than 700 chemical substances and physical agents in the workplace, as well as biological exposure indices (BEIs) covering over 80 chemical substances. Each year, ACGIH publishes its TLVs and BEIs in a book.[270] TLVs and BEIs do not represent a "consensus" position that addresses all issues raised by all interested parties. Rather, TLVs and BEIs reflect a scientific opinion based on a review of peer-reviewed scientific literature. ACGIH bases its TLVs solely on health factors and does not consider economic or technical feasibility. Therefore, ACGIH does not believe that TLVs should be adopted as regulations without an analysis of other factors necessary to make appropriate risk management decisions. However, ACGIH does believe that regulatory bodies should consider TLVs as valuable input into the risk characterization process (hazard identification, dose-response relationships, and exposure assessment).[271]

ACGIH makes clear that TLVs are intended for use in the practice of industrial hygiene for the control of potential health hazards. TLVs are recommendations that should be used as guidelines for good practice; they are not to be used to evaluate continuous uninterrupted exposure of community air pollution nuisances.

End of Document

[269] American Society of Heating, Refrigerating and Air-Conditioning Engineers, *Standard 55-1992: Thermal Environmental Conditions for Human Occupancy* (1995).

[270] Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (2003). This publication is available from ACGIH by telephoning 1-513-742-2020 or visiting ACGIH's web site at www.acgih.org.

[271] ACGIH, Statement of Position Regarding the TLVs and BEIs (Mar. 1, 2002).

§ 17A.07 Parties to Indoor Air Quality Litigation

Individuals claiming to be injured by indoor pollutants in their homes or offices typically have been the main plaintiffs in indoor air pollution cases. However, commercial tenants and building owners have been thrust into the role of plaintiff as well, when their employees or occupants have raised serious concerns about the quality of indoor air.

One of the first sick building syndrome (SBS) lawsuits, *Buckley v. Kruger-Benson-Ziemer*,[272] illustrates how far liability for indoor air pollution can extend. In *Buckley,* a computer programmer sued approximately nine named and 280 unnamed defendants for the injuries he allegedly sustained from exposure to indoor air pollutants in his poorly ventilated, tightly enclosed workplace. The defendants included the architects; contractors; mechanical engineers; heating and air-conditioning manufacturers; distributors, sellers, and installers of the air-conditioning equipment, carpentry, and floor tiles; and the manufacturers, sellers, and distributors of certain chemicals commonly used in offices, including but not limited to toners used in duplicating machines. The plaintiff alleged that these defendants knew or reasonably should have known and had a duty to warn persons, including the plaintiff, of the poor air ventilation and dangerous chemicals and toxins in the air, carpet, tile, and office machinery. The case reportedly was settled for $622,500.

Similarly, in another California case, *Shadduck v. Douglas, Emmett and Co.*,[273] the plaintiff sued the building owner; leasing agent; architects; general contractors; air-conditioning designers, engineers, and installers; and maintenance workers for the building. In *Shadduck*, the plaintiff leased office space in the building and allegedly suffered an inordinate number of upper respiratory infections, coughing, eye and throat irritations, and headaches due to inadequate ventilation. An inspection of the building reportedly revealed a poorly constructed and/or maintained HVAC system, high levels of CO_2 concentrations, other airborne concentrations, air filters black with dirt, and closed ventilation louvers. The plaintiff claimed that her long-term exposure to these contaminants caused not only physical and mental injuries during the course of exposure, but also permanent mental and physical disorders. The case settled.[274]

In a widely publicized case that went to trial, *Call v. Prudential Insurance Co. of America*,[275] several tenants in an office building and their employees sued the building owner, as well as the building's architects, engineers, contractors, and 250 unknown defendants, to recover personal and business injuries allegedly resulting from sick building syndrome. The building at issue in *Call* was new and was promoted as "energy efficient and safe to occupy." Within a month after the first tenants moved in, employees began experiencing a variety of symptoms. According to the plaintiffs' attorney, the ventilation system allegedly recirculated noxious fumes coming from areas of the building still under construction because the design of the ventilation system allowed only a small amount of

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[272] No. 143393 (Super. Ct. Cal., Santa Barbara County filed Jan. 21, 1983).

[273] No. WEC 136229 (Super. Ct. Cal., Los Angeles County May 1989).

[274] *See also* Castelvestro v. Mills, No. CV-910320396S, 1997 Conn. Super. LEXIS 310 (Dist. New Haven Feb. 5, 1997) (unpublished) (denying defendants' motion for summary judgment where plaintiffs allege injuries resulting from defective HVAC system in the building where they worked).

[275] No. SWC 90913 (Super. Ct. Cal., Los Angeles County filed 1985) (settled Oct. 15, 1990 for an undisclosed amount). For further discussion of this case, *see* §§ 17A.08[2], 17A.08[3], and 17A.10[2][a] *infra.*

outside air exchange, which failed to dilute the construction contaminants in the system.[276] Conditions allegedly also were made worse by the installation of an air distribution system that leaked in the ductwork and further reduced the system's ability to provide adequate ventilation.[277] After one month of trial, the case was settled for an undisclosed amount.

The *Buckley*, *Shadduck*, and *Call* cases illustrate that no one is immune from an SBS lawsuit.[278] Professional liability can extend to almost anyone involved in the construction or repair of a structure subsequently found to be contaminated with toxic air pollutants. Typical defendants include developers, builders, architects, engineers, general contractors, and subcontractors.[279] In addition, sellers, real estate brokers, building owners, building operators, and HVAC system designers, engineers, and maintenance contractors frequently are named. Even air quality testing companies can face liability.[280]

Multiple defendants commonly are named in indoor air quality lawsuits because plaintiffs do not know what caused their alleged injuries. Numerous factors may contribute to indoor air pollution—for example, improper ventilation; fungi or other microorganisms on any number of interior surfaces; ventilation of automotive pollutants from the outdoors into the building through an air intake duct located near a loading dock; chemicals used in the office environment; and materials used in the building itself or in its furnishings. Thus, parties are sued not necessarily because they are blameworthy but because they are associated with the building, the plaintiffs believe they have money, and the plaintiffs simply do not know whom else to sue.

Insurance companies constitute another group faced with indoor air quality litigation. A variety of insurance policies provide building owners with protection against sick building claims, but many insurance companies attempt to avoid paying indoor air quality claims by arguing that pollution exclusion clauses bar coverage. Several courts have found that these pollution exclusion clauses do not apply to sick building syndrome claims. These courts sometimes reason that the terms "pollution" and "contamination" do not include products, such as lead paint, that are used legally. Courts have come out on both sides of the question whether pollution exclusion provisions bar coverage in the context of particular indoor air pollution cases.[281]

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[276] Eisenstein, *The Impact of the "Call" Case*, Indoor Pollution L. Rep., Dec. 1990, at 1, 5-7.

[277] *Id.*

[278] *See also* Elliot v. San Joaquin County Pub. Facilities, No. 244601 (Super. Ct. Cal., San Joaquin County 1991) (naming numerous defendants, including the building owner and manufacturers and suppliers of products used in remodeling the building).

[279] For example, architects and engineers may be liable for designing a building that is too "tight" or for designing an insufficient ventilation system. There also may be liability for the approval of products found to be hazardous to building occupants. *But see* Barnett v. City of Yonkers, 731 F. Supp. 594 (S.D.N.Y.1990) (architect could not reasonably have known of deleterious effects of asbestos between 1956 and 1959). *See generally* Ira Kustin, *Limiting Architects Liability for Indoor Air Pollution and Sick Building Syndrome*, 7 N.Y.U. Envtl. L.J. 119 (1999) (discussing effects of sick building syndrome litigation on architectural practice).

[280] *See, e.g.*, Cappelli v. York Operating Co., 711 A.2d 481 (Pa. Super. Ct. 1998). Employees alleging injuries sustained from poor air in their office building brought personal injury actions for negligence against the building's architect, the company that designed and installed the building's HVAC system, and an engineering firm whose air quality testing failed to detect the impurities.

[281] *See* Garfield Slope Housing Corp. v. Public Service Mutual Ins. Co., 973 F. Supp. 326 (E.D.N.Y. 1997) (pollution exclusion clause does not preclude coverage for injury from carpet fumes, which are not "environmental pollution" with which regulators are concerned); Bituminous Casualty Corp. v. Advanced Adhesive Technology, 73 F.3d 335 (11th Cir. 1996) (pollution exclusion clause does not preclude coverage for injuries resulting from an adhesive's emissions); Sullins v. Allstate Insurance Co., No. 7, 1995 Md. LEXIS 146 (Nov. 6, 1995) (insurance company has duty to defend and indemnify its policyholders in actions alleging injury from exposure to lead paint despite pollution exclusion clauses); General Accident Ins. of Am. v. Idbar Realty Corp., 163 Misc. 2d 809, 622 N.Y.S.2d 417 (Sup. Ct. Suffolk Co. 1995) (pollution exclusion clause does not bar from coverage claim

The meaning of "pollution" and "pollutant" is usually critical in these coverage disputes. In an indoor air case pending before the District of Columbia Court of Appeals, the court has requested briefing on whether, in interpreting the pollution exclusion clause at issue, the court may consider (1) the language of contemporary environmental legislation and provisions, or (2) the historical circumstances that preceded and allegedly led to the adoption of the exclusion.[282] In another important case, the Court of Appeals of New York held that an insurance policy's pollution exclusion endorsement did not absolve the insurer of the duty to defend the insured in a negligence action alleging injury from the inhalation of paint or solvent fumes in an office building where the insured, a painting subcontractor, was working.[283]

alleging lead poisoning of infant); South Central Bell Telephone Co. v. Ka-Jon Food Stores of Louisiana Inc., 644 So. 2d 357 (La. 1994) (absolute pollution exclusion excludes coverage only for intentional pollution or environmentally hostile conduct); Generali-U.S. Branch v. Caribe Realty Corp., 160 Misc. 2d 1056, 612 N.Y.S.2d 296 (Sup. Ct. N.Y. County 1994) (pollution exclusion clause does not limit liability for lead paint related injuries); Atlantic Mutual Insurance Co. v. McFadden, 413 Mass. 90, 595 N.E.2d 762 (1992) (lead-based paint is not a "pollutant" under pollution exclusion clause); Continental Casualty Co. v. Rapid-American Corp., 177 A.D.2d 61, 581 N.Y.S.2d 669 (1st Dept. 1992), *aff'd,* 593 N.Y.S.2d 966, 609 N.E.2d 506 (1993) (pollution exclusion does not apply to claims for injury from asbestos). *But see* Peace v. Northwestern Nat'l Ins. Co., 228 Wis. 2d 106 (Wis. 1999) (pollution exclusion clause in standard CGL policy excludes coverage for injuries caused by ingestion of lead from paint or dust); West American Ins. Co. v. Band & Desenberg, 138 F.3d 1428 (11th Cir. 1998) (affirming lower court ruling that pollution exclusion clause bars coverage for sick building syndrome injuries arising from a poorly-designed air conditioning system that allowed attic contaminants into building office space); American States Insurance Co. v. Nethery, 79 F.3d 473 (5th Cir. 1996) (absolute pollution exclusion clause bars coverage for personal injury claims arising from glue fumes); Whiteville Oil Co. v. Federated Mutual Insurance Co., 889 F. Supp. 241 (E.D.N.C. 1995) (policy does not cover damages arising from gasoline fumes); Oates v. State, 597 N.Y.S.2d 550 (1st Dept. 1993) (absolute pollution exclusion bars coverage for *in utero* injury from ingestion of lead paint). *See also* Berringer, *Don't Be Fooled: The "Absolute" Pollution Exclusion Is Not So Absolute*, 21 Andrews Hazardous Waste Litig. Rep. 9 (Dec. 26, 2000) (discussing absolute pollution exclusion in the context of sick building cases); Warshauer, "*Pollution Exclusion" Does Not Apply—Indoor Air Quality Claims Are Covered by Insurance*, 14 Envtl. Compliance & Litig. Strategy 5 (Feb. 1999) (pollution exclusion does not mention IAQ and not intended to apply to malfunctioning products or air circulation systems).

[282] Richardson v. Nationwide Mutual Ins. Company, 832 A.2d 752, 752 (D.C. Sept. 29, 2003) (granting rehearing *en banc*). The District of Columbia Court of Appeals is answering the following question certified by the U.S. Court of Appeals for the D.C. Circuit in the underlying declaratory judgment action brought by the insurer: "In light of the facts set forth below [omitted], does the pollution exclusion clause apply to injuries arising from alleged carbon monoxide poisoning?" Richardson v. Nationwide Mutual Ins. Co., 826 A.2d 310, 314 (D.C. June 12, 2003), *vacated in part by* Richardson v. Nationwide Mutual Ins. Company, 832 A.2d 752 (D.C. Sept. 29, 2003). The district court in the declaratory judgment action previously granted summary judgment on behalf of the insurer on the issue of whether it had the duty to defend or indemnify the manager of an apartment complex in a lawsuit brought by a security guard alleging brain damage from carbon monoxide fumes emitted from a leaking furnace.

[283] Belt Painting Corp. v. TIG Ins. Co., 100 N.Y.2d 377, 763 N.Y.S.2d 790, 795 N.E.2d 15 (2003).

§ 17A.08 Causes of Action

[1] Several Theories of Law Are Available

Individuals injured by indoor air pollution have available a number of legal theories under which they can sue for recompense. These include breach of express or implied warranties, misrepresentation or fraud, liability as a landowner, negligence, and strict liability. These theories overlap in many instances,[284] and different theories may permit recovery against different defendants. The most frequently employed theories, however, have been negligence and strict liability.[285]

[2] Negligence

Negligence simply is a failure to exercise due care, which is defined as the degree of care that would be exercised by a "reasonable person."[286] Individuals may be found negligent in the performance of services or in the manufacture of products. For example, in *Bloomquist v. Wapello County, Iowa*,[287] a jury awarded $1 million to three workers and their spouses to compensate them for injuries suffered as a result of repeated exposure to various pesticides in an office with a faulty HVAC system.[288] The plaintiffs claimed that the defendants were negligent in failing to provide them with a safe workplace, thereby causing them to suffer respiratory, immunological, and neurological damage, and to lose earnings and earning capacity. The plaintiffs alleged, among other things, that the defendants were negligent because they had failed to design an HVAC system for the building that met generally recognized safety standards; failed to provide an HVAC system of sufficient capacity to ventilate, heat, and cool the building; and failed to discover in a timely manner that the HVAC system was inadequate to process fresh air throughout the system. The judge, however, granted a judgment notwithstanding the verdict for the defendant, based on lack of sufficient evidence to support the verdict.[289]

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[284] *See, e.g.*, Beck v. A & D Limited Partnership, No. A-91-06574 (Ohio Ct. C.P. Hamilton County 1995) (class action on behalf of building tenants against landlord for alleged injuries resulting from poor indoor air quality included claims for breach of lease agreement, breach of warranties, and negligence).

[285] *See generally* Wright, *Indoor Air Quality Claims: Defining the Practical and Legal Issues*, *14 Nat. Resources & Env't 255 (Spring 2000)* (discussing common law remedies in IAQ cases).

[286] *See also ch. 16 supra* and *ch. 33 infra*.

[287] No. CL2785-0687 (D. Iowa filed May 9, 1990).

[288] The plaintiffs were allegedly exposed to the pesticide Dursban LO, which was absorbed by office carpeting and circulated through the HVAC system. *See also* Jackson v. Dow Chem., No. 6206/92 (N.Y. Sup. Ct. Albany County 1992) (suit filed alleging neurological and respiratory ailments from exposure to Dursban).

[289] In another pesticide case, improper application of the pesticide chlordane in the crawl space of a home caused a pest control company to be held liable for $760,000 in damages, including $500,000 in punitive damages. The company had violated both state and federal laws and regulations and a consent decree forbidding the use of chlordane. *Hooper v. Truly Nolen of Am. Inc., 171 Ariz. 692, 832 P.2d 709 (Ct. App. 1992)*.

Similarly, negligence was one basis of liability in *Call v. Prudential Insurance Co. of America*.[290] In *Call*, the plaintiffs alleged that the defendants were negligent because, among other things, they failed to properly evaluate, test, and investigate for toxic fumes, chemicals, and other substances that produced SBS; failed to balance the air conditioning system to produce a sufficient outside air/recycled air ratio spread adequately throughout the entire building; and failed to use building materials that were incapable of off-gassing formaldehyde and other noxious substances. Thus, failing to test for indoor air pollutants, failing to design an adequate HVAC system, and failing to use "safe" products in a building all constituted potential bases for legal liability.

In some situations, certain individuals can be held responsible for the negligence of others. For example, in one case a homeowner recovered damages from a builder for the asphyxiation of her husband from carbon monoxide leaking from a gas heater improperly installed by a subcontractor.[291] In another case, EPA employees filed suit against the owners and managing company of the EPA's Waterside Mall headquarters in Washington, D.C.[292] The plaintiffs alleged that the defendants had maintained the building without regard to the safety of EPA employees, and that certain modifications had disrupted ventilation throughout the complex, thereby releasing toxic chemicals and materials into the indoor environment and causing them neurological injuries.[293] Following a trial on the claims of five representative employee plaintiffs and one employee plaintiff's husband (loss of consortium), a jury awarded damages to all six plaintiffs in the aggregate amount of $948,000.[294] This case stands out in the history of indoor air litigation, because prior IAQ cases had focused on known contaminants—*e.g.*, asbestos, pesticides, and formaldehyde—whereas the EPA case involved exposure to a mix of toxic fumes, vapors, and dust, the effects of which were compounded by poor ventilation.[295]

Similarly, employees of the DuPage County Courthouse in Illinois brought suit against the builders and architects of the building, alleging negligence in its design and construction.[296] Over 400 of the 700 employees who worked at the year-old building allegedly reported various symptoms that could not be attributed to a specific cause.[297]

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[290] No. SWC 90913 (Super. Ct. Cal., Los Angeles County filed 1985) (settled Oct. 15, 1990 for an undisclosed amount). *See also* *§ 17A.07* *supra*, and *§§ 17A.08[3]* and *17A.10[2][a] infra* for further discussion of this case.

[291] *Dow v. Holly Mfg. Co., 49 Cal. 2d 720, 321 P.2d 736 (1958)*. *See also* *Hodge v. Lackey, No. 93-T-4947, 1995 Ohio App. LEXIS 1988 (Ohio App. 11 Dist. 1995)* *(unpublished), appeal not allowed,* ***655 N.E.2d 741 (Ohio 1995)*** (table) (holding that where malfunction of a furnace was the proximate cause of plaintiffs' carbon monoxide poisoning, and landlord had actual or constructive notice of the defect, landlord is liable for injuries resulting from his own negligence or that of independent contractor that repaired furnace).

[292] Bahura v. S.E.W. Investors, No. 90-CA 10594 (D.C. filed Oct. 12, 1990).

[293] The complaint charged the defendants with a duty to design, construct, and maintain the building in a safe manner for its occupants. It also alleged that the defendants had breached those duties by failing to provide adequate ventilation and appropriate air monitoring, using toxic cleaning products, failing to protect building occupants from toxic materials during renovation, and failing to respond to the occupants' complaints.

[294] *Bahura v. S.E.W. Investors, 754 A.2d 928, 931 (D.C. 2000)*. The trial court granted defendants' motion for a judgment notwithstanding the verdict as to five of the plaintiffs, but the jury's verdict was reinstated on appeal. *Id.* For further discussion of the *Bahura* decision, *see* *§ 17A.08[9]* *infra*.

[295] *Wright, Indoor Air Quality Claims: Defining the Practical and Legal Issues, 14 Nat. Res. & Env't 255 (Spring 2000)*. Indeed, the EPA case is the first IAQ lawsuit in which a "multifactorial" theory of causation led to a major jury award. *Id.*

[296] Bostik v. Jones, No. 9211685 (DuPage County Ct. 1992). The County of DuPage also sued the builders, architects, and a builders' bonding company for property damage. County of DuPage v. Hellmuth, Obata & Kassabaum, (Ill. App. 1996).

[297] *See also* Padgett v. Capital W. Assocs., No. 397573 (Conn. Super. Ct. filed June 13, 1991) (employees of a building's tenant alleged negligence, breach of contract, and misrepresentation against current and former owners and managing agent of a building in which they worked, stating that the building was operated and maintained in a hazardous condition).

One obvious difficulty is determining what constitutes due care.[298] In seeking to identify accepted norms, many attorneys turn to industry standards. For example, ASHRAE Standard 62-2001 sets air exchange rates for various facilities at 20 cfm/person.[299] Although this is a voluntary standard, standards are presumed to be known and followed by reasonable professionals in the field. If a court were to adopt the current ASHRAE standard as the legal standard of reasonable conduct, HVAC systems designed or maintained at an air exchange rate less than 20 cfm/person for these facilities might be subject to challenge.

The standard of due care also may be based on knowledge of a product's characteristics. For example, where scientific or industry literature establishes that certain products contribute or have a significant potential to contribute to indoor air pollution, use of those products in some circumstances may be considered unreasonable. An architect, designer, or contractor who does not know the risks associated with a particular product may still be sued on the theory that a professional in the industry *should have known* that the products presented a risk.[300] Similarly, where product testing establishes that products do not contribute in any significant way to poor indoor air quality, architects, designers, contractors, and building operators may gain protection by using those tested products.

[3] Strict Liability

Another common basis of liability for indoor air pollution is strict liability. Strict liability applies to liability for defective products and, unlike negligence-based theory, does not depend on "fault." Instead, the focus of legal inquiry for strict liability shifts from the conduct of a party to the product itself. The plaintiff must show that the defendant engaged in an unusually dangerous activity or designed or manufactured an unsafe product.[301]

A product can be defective either because of its manufacture or its design. For example, if urea formaldehyde foam insulation were to off-gas formaldehyde vapors because the constituent chemicals were not mixed in the proper proportions, the product would be considered to have a manufacturing defect. On the other hand, a mobile home that contains dangerous components or that does not permit sufficient ventilation may be deemed to have been defectively designed.[302] Similarly, a gas stove designed without direct venting may be defectively

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Five separate actions also were brought on behalf of employees of Bryn Mawr College alleging negligence and strict liability in using strong toxic chemicals in performing renovations, without heeding warning labels, inadequately ventilating the building, and failing to improve these conditions after receiving complaints from building occupants. Skoogfors v. Voith & MacTavish, No. 1956 (Ct. C.P. Phila. Jan. Term 1993); Bensing v. Voith & MacTavish, No. 0104 (Ct. C.P. Phila. Feb. Term 1993); Lazarus v. Voith & MacTavish, No. 1294 (Ct. C.P. Phila. Apr. Term 1993); Spungen v. Voith & MacTavish, No. 0180 (Ct. C.P. Phila. Mar. Term 1993); Karoll v. Voith & MacTavish & Bryn Mawr College, No. 1293 (Ct. C.P. Phila. Apr. Term 1993).

Negligence actions have severe drawbacks for both plaintiffs and defendants. The plaintiff must show that the defendant's conduct was unreasonable, that is, that the defendant failed to use due care. *See* City of Wichita v. United States Gypsum Co., 72 F.3d 1491 (10th Cir. 1996) (city could not recover asbestos removal and containment costs under its tort theories absent a present unreasonable risk of harm to building occupants).

[298] *See generally* Governo and Kavanagh, *Indoor Environmental Claims: Air Quality*, 5 Emerging Toxic Torts 18 (Mealey's) (1997) (discussing IAQ claims and theories of liability, including standards of care in negligence and product liability actions).

[299] ASHRAE 62-2001.

[300] In *Mackey v. TKCC, 894 P.2d 1200 (Or. App. 1995)*, *review denied*, *899 P.2d 1197 (Or. 1995)*, a building tenant's employee sued the building landlord and the contractor that built the building, alleging injuries from unsafe levels of VOCs. The court of appeals ruled that a landlord can be held liable not only for failure to remedy dangerous conditions that it knows about, but also those that it *should* know about. *Id. at 1204*. In *Burnworth v. Harper, 672 N.E.2d 241 (Ct. App. Ohio), appeal not allowed, **667 N.E.2d 987 (Ohio 1996)***, the court affirmed a grant of summary judgment on behalf of defendant landlord, where decedent's estate presented no evidence under Ohio landlord-tenant laws that the landlord had notice of the heating system defect that led to decedent's carbon monoxide poisoning. The court added that even if it were to hold that there existed a concomitant duty to inspect absent notice, the decedent's estate had provided no evidence that inspection would have uncovered the clogged flue that caused the injury.

[301] *See generally* *3 M. Searcy-Alford, A Guide to Toxic Torts § 35.07* (Matthew Bender).

designed if it allows hazardous levels of combustion pollutants to accumulate inside the building. If a product cannot be made safe, the manufacturer must provide adequate warnings that would render it safe for use.[303] The Connecticut Supreme Court has held that where a furnace manufacturer has a duty to warn homeowners of the necessity of thorough chimney cleaning (to allow for the proper venting of dangerous gases), the jury in a products liability case may properly consider the professional knowledge and skills of the plumber who installed the furnace—and gave warnings to the homeowners—in assessing whether the manufacturer discharged its own duty to warn.[304]

If a product is found to be defective and was the cause of the plaintiff's injuries, then liability may extend to every entity involved in the chain of distribution of that product. In accordance with this principle, the judge in the *Call* case ruled prior to trial that the designers, general contractors, and installers of the building's HVAC system could be held liable under a strict liability theory if the jury determined that the ventilation system was defective.[305] Thus, the HVAC system was deemed a "product," and every entity involved in the chain of designing, constructing, and installing the system would be potentially liable for the plaintiff's injuries, without regard to fault. Similarly, in some jurisdictions, a building itself may be deemed a product subject to strict product liability.[306]

Defendants in strict liability cases have frequently relied on a "state-of-the-art" defense, arguing that they had insufficient knowledge for liability to be appropriate. In a 1987 decision, the Supreme Court of Hawaii held that a defendant's knowledge is irrelevant in a strict liability case.[307] The court decided that because strict liability causes of action are based on the inherently dangerous nature of the product, the state-of-the-art defense is precluded. Thus, a manufacturer can be held liable to plaintiffs for injuries brought about by a defective product even where there was no knowledge of danger at the time of production.[308]

The relative ease of recovery under a strict liability theory makes product liability suits attractive to plaintiffs. Such suits are equally unattractive to defendants. The key limitation of strict liability in the indoor air environment is that it applies only to products. However, if and to the extent that courts are willing to deem an

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[302] *See* Heritage v. Pioneer Brokerage & Sales, 604 P.2d 1059 (Alaska 1979).

[303] *See, e.g.*, Wallinger v. Martin Stamping & Stove Co., 93 Ill. App. 2d 437, 236 N.E.2d 755 (1968) (manufacturer of gas heater held liable for failing to provide adequate warnings concerning proper height of the chimney, and a person who used the heater without a proper chimney died from asphyxiation). If a manufacturer actively concealed a product's dangers from the public, plaintiffs may have a cause of action for fraudulent concealment.

[304] Gajewski v. Pavelo, 670 A.2d 318 (Conn. 1996).

[305] Call v. Prudential Ins. Co. of Am., No. SWC 90913 (Super. Ct. Cal., Los Angeles County filed 1985) (settled Oct. 15, 1990 for an undisclosed amount). *See* Eisenstein, *The Impact of the "Call" Case,* Indoor Pollution L. Rep., Dec. 1990 at 6. *See also* §§ 17A.07 and 17A.08[2] *supra*, and § 17A.10[2][a] *infra* for further discussion of this case.

[306] McDonald v. Mianecki, 79 N.J. 275, 398 A.2d 1283 (1979). *See also* Blagg v. Fred Hunt Co., 272 Ark. 185, 612 S.W.2d 321 (1981) (holding that the word "product" is as applicable to a house as to an automobile).

[307] Johnson v. Raybestos-Manhattan, Inc., 69 Haw. 287, 740 P.2d 548 (1987). *See also* In re Asbestos Litig., 829 F.2d 1233 (3d Cir. 1987); Beshada v. Johns-Manville Prods. Corp., 90 N.J. 191, 447 A.2d 539 (1982); Carrecter v. Colson Equip. Co., 499 A.2d 326, 330-31 (Pa. Super. Ct. 1985).

[308] Jurisdictions differ in the extent to which state-of-the-art evidence is relevant and thereby admissible in strict liability actions. *See, e.g,* Bruce v. Martin-Marietta Corp., 544 F.2d 442 (10th Cir. 1976) (applying Maryland law admitting state-of-the-art evidence in design defect case); Cunningham v. MacNeal Memorial Hosp., 47 Ill. 2d 443, 266 N.E.2d 897 (1970) (excluding same); Bernier v. Raymark Industries, Inc., 516 A.2d 534 (Me. 1986) (defendant may raise state-of-the-art defense where product defect alleged is a failure to warn).

HVAC system or an entire building a product, exposure to indoor air quality liability becomes significantly greater for product designers and manufacturers, builders, and installers.[309]

[4] Breach of Express Warranties

Express warranties are positive representations made by the seller of a product to the purchaser. They can arise in any transaction between any two parties, and can appear in sales contracts, labels, advertising, or samples.[310]

Liability for breach of an express warranty, where such a breach can be proved, is appealing for plaintiffs because of its simplicity. Liability depends not on any particular knowledge of fault by the seller, but merely on the falsity of the representation.

Employers may seek to rely on express warranties in suing companies that have supplied products that pollute the workplace, in breach of affirmative representations. Cases in which injured individuals file lawsuits involving breaches of express warranties, however, are more likely to arise in the residential than in the commercial context. In the residential setting, the injured party is more likely to be the person to whom the warranty was extended.[311] In contrast, in the work environment, employees have more limited control over their surroundings. Because it is likely that they are not involved in purchasing decisions concerning the work environment, they would not be the direct recipients of express warranties. Thus, to succeed in this type of suit, employees would have to argue that they were the intended third-party beneficiaries of an express warranty made by the seller of a dangerous building product to the employer; such a showing might not be difficult where employees use dangerous products labeled by a manufacturer for the employees' safety.

[5] Breach of Implied Warranties

Even where the seller of goods makes no express representations, the courts imply certain fundamental warranties. For example, goods are implicitly warranted to be fit for the ordinary purpose for which they are used. Thus, a plaintiff who suffered respiratory injury from the release of irritating fumes while using a bathroom cleaner prevailed in a suit against the manufacturer because the product was not fit for ordinary use.[312]

Any product that creates noxious indoor pollutants may be argued to be unfit for its ordinary use. A kerosene heater that, in its normal operation, asphyxiates the occupants of a room clearly would not be fit for its ordinary use. Similarly, if urea formaldehyde foam insulation or particleboard releases formaldehyde gas into a building, rendering the indoor air dangerous, the product may breach its implied warranty. Nonetheless, courts are still wrestling with the precise bounds of implied warranty protection. In particular, courts have taken divergent views concerning liability for the reactions of individuals particularly sensitive to certain chemicals. In a case involving exposure to formaldehyde leading to severe and permanent asthma, a plaintiff was required to show that a reasonably foreseeable and appreciable number of users who are exposed to the product would suffer

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[309] Architects, real estate agents, or utilities may be able to avoid liability under a strict liability theory on the ground that they are not within the chain of distribution of a product.

[310] *Alfieri v. Cabot Corp., 17 A.D.2d 455, 235 N.Y.S.2d 753 (1962)*, *aff'd, 13 N.Y.2d 1027, 245 N.Y.S.2d 600, 195 N.E.2d 310 (1963)* (holding express warranty breached where charcoal bag represented that charcoal was "ideal" for cooking indoors or out-of-doors and persons were injured from carbon monoxide poisoning when charcoal used indoors); Bradly v. Brucker, 69 Pa. Montg. County L. Rptr. 38 (1952) (finding breach of express warranty where seller warranted that basement would be dry except for condensation).

[311] Sellers and real estate brokers commonly are sued on theories of breach of express or implied warranties. *See, e.g.,* Uricam Corp. v. Partridge Inv. Co., No. CJ882691 (Okla. Dist. Ct. filed Mar. 10, 1988) (owner of asbestos-contaminated building sued building's former owner alleging breach of seller's representations and warranties).

[312] *Shirley v. Drackett Prods. Co., 26 Mich. App. 644, 182 N.W.2d 726 (1970)*. *But see Troensegaard v. Silvercrest Indus., 175 Cal. App. 3d 218, 220 Cal. Rptr. 712 (1986)* (upholding jury award for injuries due to formaldehyde fumes).

some ill effect; however, it was not necessary to show that other users would suffer as severe a reaction as that experienced by the plaintiff.[313]

Using a theory that cuts against traditional notions of *caveat emptor*, some courts have decided that buildings themselves carry implied warranties of fitness for human habitation.[314] Such warranties usually run from the original builder or vendor of the building. In many states, the warranty is not limited to the first purchaser. For example, in one case the third buyers of a house were awarded damages from a builder when they discovered strong formaldehyde odors from the original carpet and padding installed by the builders. The odors made the house uninhabitable, breaching the warranty of habitability.[315]

It is uncertain, however, whether implied warranties of habitability apply to commercial as well as residential property. In at least some jurisdictions, the services of architects and engineers are subject to their own implied warranties: the courts often deem that architects and engineers impliedly warrant that the plans and specifications they produce will yield a structure reasonably fit for its intended purpose.[316]

In some states, such as California, the implied warranty of fitness for human habitation has been extended to relationships between landlords and tenants, allowing tenants to sue for injuries caused by unfit housing owned by the landlord. Some states impose this obligation by statute.[317] In such states, injured employees may be able to sue their employer's landlord, alleging a breach of the implied warranty of habitability by the commercial landlord. Buildings that do not provide for adequate ventilation or that contain products emitting hazardous fumes may subject their owners to liability. However, some states require a showing that the landlord had knowledge of the condition before awarding judgment for the plaintiffs.[318]

[6] Misrepresentation/Fraud

In general, a seller and the seller's real estate agent must not misrepresent any important fact about the property being sold. Innocent as well as knowing misrepresentations may trigger liability.[319] Silence often is insufficient; sellers generally are obligated to disclose serious latent defects in the property, regardless of whether the buyer asks about them.[320] Moreover, sellers cannot make statements recklessly. Even a general

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[313] *Tiderman v. Fleetwood Homes, 102 Wash. 2d 334, 684 P.2d 1302 (1984)*.

[314] *See Jones v. Gatewood, 381 P.2d 158 (Okla. 1963)*; *Elderkin v. Gaster, 447 Pa. 118, 288 A.2d 771 (1972)*; *Waggoner v. Midwestern Dev., 83 S.D. 57, 154 N.W.2d 803 (1967)*; Annot., *25 A.L.R. 3d 383 (1969)*; Davis & DeLaTorre, *A Fresh Look at Premises Liability as Affected by the Warranty of Habitability, 59 Wash. L. Rev. 141 (1984)*.

[315] *Blagg v. Fred Hunt Co., 272 Ark. 185, 612 S.W.2d 321 (1981)*. *Cf. Tiderman v. Fleetwood Homes, 102 Wash. 2d 334, 684 P.2d 1302 (1984)* (mobile home implicitly warranted to be fit for the purchaser to live in). *See also Drexel Properties, Inc. v. Bay Colony Club Condominium, Inc., 406 So. 2d 515 (Fla. Dist. Ct. App. 1981)* (implied warranties of substantial compliance with applicable building codes and of fitness and merchantability); *Moxley v. Laramie Builders, Inc., 600 P.2d 733 (Wyo. 1979)* (the structure and all of its components and related facilities are the subject matter of the implied warranty).

[316] *See, e.g., Bloomsburg Mills v. Sordoni Constr. Co., 401 Pa. 358, 164 A.2d 201 (1960)*.

[317] *See, e.g.,* ***Minn. Stat. § 504B.161***.

[318] *See, e.g., Meyer v. Parkin, 350 N.W.2d 435 (Minn. 1984)* (affirming dismissal of case alleging breach of warranty of habitability by high formaldehyde exposures leading to myoclonusopsoclonus encepholopathy, permanent physical and mental neurological damage, because injured party failed to show that the landlord had knowledge of defect in rental premises).

[319] *See, e.g., Spargnapani v. Wright, 110 A.2d 82 (D.C. 1954)*.

[320] *See, e.g, Cooper v. Jevne, 56 Cal. App. 3d 860, 128 Cal. Rptr. 724 (1976)* (substandard construction); *Maples v. Porath, 638 S.W.2d 337 (Mo. Ct. App. 1982)* (termite infestation); *Weintraub v. Krobatsch, 64 N.J. 445, 317 A.2d 68 (1974)* (roaches); *Roberts v. Estate of Barbagallo, 366 Pa. Super. 559, 531 A.2d 1125 (1987)* (broker found liable for intentionally not disclosing nature of risks associated with home containing urea formaldehyde); *Quashnock v. Frost, 445 A.2d 121 (Pa. Super. Ct. 1982)*. *But see Diaz v. Keyes Co., 143 So. 2d 554 (Fla. Dist. Ct. App. 1962)* (no obligation to disclose). In 1996, the Environmental

statement that “everything’s fine” with the property can give rise to liability when that statement was made in reckless disregard of the truth.[321]

Employers may sue the prior owners of the business property (or their agents) for misrepresentation or fraud in the purchase of the land. It is likely that similar suits could be filed against landlords by employers who lease their property. Whether injured employees have standing to sue based on misrepresentations made to their employers, however, is somewhat more speculative.

[7] Landowner or Land Occupier Liability

Owners or occupiers of land have an obligation to protect their business invitees on the land. This obligation extends not only to dangers actually known to the owner or occupier, but also to defects discoverable through the exercise of reasonable care.[322] For example, if a customer of a business were injured by indoor air pollution while in the business premises, the business could be liable if it knew or should have known of the danger, regardless of whether the business owned the premises or leased them.[323]

Whether the landlord of property leased to a business remains liable for the condition of the property is a separate question. Although lessors of land traditionally did not owe any obligations to their lessees, the traditional rules have been changed by the application of implied warranties of habitability to the lessor-lessee relationship. Even under the more traditional doctrine, landlords are obligated to disclose concealed dangerous conditions unknown to the lessee. Furthermore, landlords can remain liable for injuries on land leased for public admission, on the theory that they should not be able to shift to the tenant their obligations to the public. Finally, landlords remain liable for parts of the premises that remain under their control, such as hallways or lobbies.[324]

Thus, employees injured by indoor air pollution may be able to sue the owners of the business premises in which they work, assuming that the property is owned by someone other than the employer.[325] Moreover, under the dual capacity doctrine discussed above, employees may attempt to file suits directly against the employer

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Protection Agency and the Department of Housing and Urban Development issued a joint rule requiring disclosure of known lead-based paint or lead-related hazards to prospective buyers or renters. The rule was promulgated pursuant to the Residential Lead-Based Paint Hazard Reduction Act of 1992, ***Pub. L. No. 102-550***, tit. X, Oct. 28, 1992; ***Pub. L. No. 104-134***, tit. I, § 101(e), April 26, 1996. Under the rule, sellers and lessors of housing built before 1978 must disclose the presence of lead-based paint or lead-based paint hazards, provide available records or reports on the hazards, distribute a federally approved lead hazard information pamphlet to prospective buyers and renters, allow prospective buyers a 10-day opportunity to conduct a risk assessment or inspection prior to making the final sale, and add disclosure and acknowledgement language to sales and leasing contracts. *See* 24 C.F.R. pt. 35 (HUD regulations), 40 C.F.R. pt. 745 (EPA regulations). The EPA rule further requires building contractors, renovation companies, and certain property management companies who plan to renovate or remodel housing built before 1978 to disclose possible lead-based paint hazards. These companies must distribute an EPA pamphlet on lead-based paint hazards to occupants before renovation or remodeling. 40 C.F.R. §§ 745.80-745.88. EPA has estimated that the rule will affect 12 million projects annually. *63 Fed. Reg. 29907 (June 1, 1998)*.

[321] *Hammond v. Matthes, 109 Mich. App. 352, 311 N.W.2d 357 (1981)*.

[322] *E.g.*, *F.W. Woolworth Co. v. Williams, 41 F.2d 970 (D.C. Cir.1930)*.

[323] *But see* *Bonzo v. LaQuinta Realty Corp., No. Civ. A. 92-2564, 1993 U.S. Dist. LEXIS 2658 (E.D. La. 1993)* (hotel has no duty to warn guest with preexisting lung condition of fresh paint and carpet in hotel room when hotel knew that room had been freshly painted and carpeted).

[324] *See generally* Prosser and Keeton on Torts § 63 (5th ed. 1984).

[325] As an initial matter, a plaintiff seeking to sue a building owner for negligence must determine who owned the building at the time the plaintiff’s symptoms occurred. In *Pettitte v. SCI Corp., 893 S.W.2d 746 (Tex. Ct. App. 1995)*, an SBS case, the building owner was granted summary judgment on a negligence claim as to a plaintiff occupant who resigned from her job in the building four months before defendant purchased it. Three other plaintiffs, however, raised a genuine issue of material fact as to the time of their injuries, where they presented evidence that their SBS symptoms continued after the date defendant purchased the building. *Id.*

based on the employer's obligations as an owner or occupier of the property. Such suits are more likely to prevail where the business premises are open to the general public.

Commercial leases and sale contracts often contain provisions disclaiming any obligations by the landlord or buyer; other provisions require that the tenant or buyer must indemnify the current owner for any liability relating to the property. Although the courts have not hesitated to invalidate disclaimer provisions, on the ground of unconscionability, when applied to homeowners who were not aware of the meaning of the provisions, there is greater judicial reluctance to interfere when more sophisticated commercial concerns agree to disclaimers.[326] Nonetheless, disclaimers might serve only to prevent suits by the employer against its landlord and might not affect suits by other injured individuals. Similarly, indemnification provisions would not affect the liability of the landlord but might give the landlord certain rights to sue the tenant—the employer—to recover any judgments paid to injured employees. The permissibility of such a claim generally is governed by workers' compensation statutes, as the claim would make the employer liable for the injuries of its employees.[327] Commercial leases also typically require both parties to maintain insurance, which may cover all or part of the loss.

[8] Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Section 113(f) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[328] allows private parties to recover, in contribution, the costs associated with remediating hazardous substances from any other person who is liable or potentially liable for such costs within the meaning of the statute.[329] In the indoor environment, a number of CERCLA actions have been brought to recover from manufacturers of asbestos the costs associated with asbestos removal. However, courts generally have not allowed these claims, in many cases construing the statute not to apply to the installation of building materials. For example, the Court of Appeals for the Fifth Circuit held that CERCLA allows recovery of the costs incurred in response to the "disposal" of hazardous substances, and the sale of useful building material does not constitute disposal within the meaning of the statute.[330]

Cost recovery under CERCLA has been allowed for cleaning up indoor environments where radon from spent radium tailings seeped into a building.[331] In another case, the State of Vermont recovered the costs of cleaning up mercury-contaminated homes from a manufacturer of mercury thermometers whose employees allegedly transported mercury from the factory to their homes.[332]

[9] Miscellaneous Legal Theories

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[326] *Cf.* U.C.C. § 2-719 (unconscionability of limitations on consequential damages for personal injury).

[327] *See generally* Weisgall, *Product Liability in the Workplace: The Effect of Workers' Compensation on the Rights and Liabilities of Third Parties,* 1977 Wis. L. Rev. 1035.

[328] *42 U.S.C. § 9613(f)*. *See generally* ch. 31 *infra.*

[329] Section 107(a) provides that owners and operators of facilities where hazardous substances were disposed of and generators and transporters of such hazardous substances are liable for the costs of removal or remedial action. *42 U.S.C. § 9607(a)*.

[330] *Dayton Indep. Sch. Dist. v. U.S. Mineral Prods. Co., 906 F.2d 1059, 1065 (5th Cir. 1990)*. *See also First United Methodist Church v. U.S. Gypsum Co., 882 F.2d 862, 868 (4th Cir. 1989)*, *cert. denied,* ***493 U.S. 1070 (1990)*** (relying on legislative history of the Superfund Amendments and Reauthorization Act of 1986 to hold that CERCLA does not allow recovery for response to indoor release of hazardous materials from building components); *3550 Stevens Creek Assocs. v. Barclays Bank, 915 F.2d 1355 (9th Cir. 1990)*, *cert. denied,* ***111 S. Ct. 2014 (1991)*** (recovery of costs for asbestos removal not permitted by plain language of statute); *Corporation of Mercer Univ. v. National Gypsum Co., No. 85-126-3-MAC, 1986 U.S. Dist. LEXIS 28425 (M.D. Ga. 1986)*. *But see National R.R. Passenger Corp. v. New York Hous. Auth., 819 F. Supp. 1271 (S.D.N.Y. 1993)* (allowing CERCLA claim for presence of asbestos on undersides of building and support pillars).

[331] *T & E Indus. v. Safety Light Corp., 680 F. Supp. 696 (D.N.J. 1988)*.

[332] *Vermont v. Staco, 684 F. Supp. 822 (D. Vt. 1988)*.

Some employees have brought suit alleging that their sensitivity to indoor air pollution is a handicap that entitles them to protected status. The court in *Vickers v. Veterans Administration*[333] agreed that an employee who was "unusually sensitive to tobacco smoke" was handicapped within the meaning of the Vocational Rehabilitation Act.[334] The court further held, however, that because the Veterans Administration had made reasonable accommodation efforts, no discrimination had occurred.

Assault and battery is another theory of liability that plaintiffs have used to try to obtain redress for their injuries from indoor air pollution. Such a claim was made by an employee who was subjected to cigar smoke. The court held, however, that consent to such ordinary contacts was assumed.[335] In *Leichtman v. WLW Jacor Communications*,[336] the court held that plaintiff, a "nationally known anti-smoking advocate," had successfully stated a claim for battery. Plaintiff alleged that he was invited to appear on a radio talk show to discuss the effects of secondhand smoke, and that one of the show's hosts—at the other host's urging—lit a cigar and repeatedly blew the smoke in plaintiff's face.

Other possible claims for plaintiffs in indoor air pollution cases include nuisance,[336.1] negligent or intentional infliction of emotional distress,[337] conspiracy, and even denial of constitutional rights.[338]

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[333] *549 F. Supp. 85 (W.D. Wash. 1982)*.

[334] *See generally § 17A.09[2] infra.*

[335] *McCracken v. Sloan, 40 N.C. App. 214, 252 S.E.2d 250 (1979)*. *See also Bell v. Elmhurst Chicago Stone Co., 919 F. Supp. 308 (N.D. Ill. 1996)* (dismissing plaintiff's claim that employer committed battery "by authorizing his co-workers to inflict their cigarette smoke on him").

[336] *634 N.E.2d 697 (Ohio App. 1st Dist. 1994)*.

[336.1] *See Paul v. 370 Lex LLC, 7 Misc. 3d 747, 794 N.Y.S.2d 869 (Sup. Ct. N.Y. County 2005)* (tenant's nuisance claim for neighbor's smoke, as well as constructive eviction action against landlord, survived summary judgment motion and advanced to trial).

[337] In a case involving injuries to employees caused by contaminated air at EPA's headquarters in Washington, D.C., the trial evidence supported a finding that some of the employee plaintiffs suffered from somatoform disorder, whereby physical symptoms are the result of psychological or emotional factors. *Bahura v. S.E.W. Investors, 754 A.2d 928 (D.C. 2000)*. Plaintiffs' symptoms included "debilitating fatigue, loss of motor control, persistent cognitive problems, extreme depression sometimes approaching paranoia, flu-like pains, shortness of breath, and a variety of other symptoms." *Id. at 938*. Although plaintiffs' counsel did not specifically claim that plaintiffs suffered from somatoform disorder or were entitled to damages for it (and indeed did not even raise the possibility until closing argument), the D.C. Court of Appeals analyzed the evidence presented at trial under a theory of negligent infliction of emotional distress. The court noted that somatoform disorder is a recognized medical condition; that plaintiffs' conditions were not transitory, non-recurring, or inconsequential; and that, as a result, the jury could reasonably find that the injuries suffered by these plaintiffs were serious, verifiable, and compensable. *Id. at 937-39*. For further discussion of the *Bahura* decision, *see § 17A.08[2] supra*.

[338] In class actions brought by prison detainees against New York City and city officials to improve environmental and health conditions in city jails, the Second Circuit affirmed the district court's conclusion that inadequate ventilation at eleven facilities violated prisoners' constitutional due process rights. *Benjamin v. Fraser, 343 F.3d 35 (2d Cir. 2003)*.

§ 17A.09 Liability for Indoor Air Pollution in the Workplace

[1] Workers' Compensation Scheme

Before states enacted workers' compensations statutes, injured employees could obtain compensation for occupational injuries through suits at common law. Under early law governing the relationship between master and servant, employers were obligated to provide a safe place to work, to provide safe tools for the work, and to warn of dangers of which employees might be unaware.[339] The employee had the burden of proving the employers' negligence, and employers had substantial defenses to liability at their disposal.

State workers' compensation statutes gave employees the benefit of a speedy and simplified system for the resolution of claims for occupational injuries. Under workers' compensation laws, liability is not based on fault. Employees are not required to prove any negligence on the part of the employer, nor can employers assert their common law defenses.[340] To recover benefits, the employee is required to prove only that she was injured on the job or that, in the course of employment, she has contracted one of the diseases listed in the statute. In return for these benefits, workers' compensation statutes limit the dollar amount of employee recovery. The much smaller awards available under workers' compensation schemes often create an incentive for employees to circumvent the system by filing common law suits against the employer. Workers' compensation statutes generally preclude such suits; the workers' compensation remedy is the employees' exclusive remedy against the employer.[341]

Most workers' compensation claims are based on sudden, accidental injuries. Injuries from indoor air pollution in the office environment normally would not fall within this category, but at least one court has found that an office worker suffered a compensable occupational injury and awarded benefits under the workers' compensation statute because she developed bronchial asthma from excessive environmental tobacco smoke and dust in her office.[342] In another case, *Barth v. Firestone Tire and Rubber Co.*,[343] however, the court held that the plaintiff's injuries did not fit within the definition of injury provided in the workers' compensation statute because there was no present impairment of earning capacity and no clearly perceptible manifestation of physical dysfunction or disease. The plaintiff in *Barth* had alleged exposure to benzene, heavy metal compounds, and other industrial toxins subsequently linked to the development of such potentially lethal diseases as leukemia, cancer, and immune-system disorders. The court concluded that the alleged injury was outside of the contemplation of the legislature at the time the statute was

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[339] *See, e.g,* Armour v. Golkowska, 202 Ill. 144, 66 N.E. 1037 (1903); Toy v. United States Cartridge Co., 159 Mass. 313, 34 N.E. 461 (1893); Engelking v. City of Spokane, 59 Wash. 446, 110 P. 25 (1910).

[340] *See, e.g,* D.C. Code Ann. §§ 32-1501 to 32-1545; N.Y. Work. Comp. Law §§ 1 to 401. As a result, workers' compensation claims can be difficult to defend—even more so when the claims involve injuries resulting from IAQ problems. *See Litigating the Indoor Air Quality Claim*, 19 Workers' Comp. Monthly 21 (1999) (recommending approaches for defense counsel).

[341] *See, e.g,* D.C. Code Ann. § 32-1504; N.Y. Work. Comp. Law § 29(6).

[342] ***Johannesen v. New York City Dep't of Hous. Preservation & Dev., 80 N.Y.2d 1023, 592 N.Y.S.2d 672, 607 N.E.2d 819 (1992)***. *But see* Vernoi v. National Council on Compensation Ins., No. 57018 (N.Y. Sup. Ct. App. Div. Feb. 2, 1989) (rejecting attorney's claims for benefits for disability finding allergic reaction to dust was not an occupational disease).

[343] (N.D. Cal. 1987).

passed. However, the court ruled that direct injury to the plaintiff's immune system and the presence of diseases in their latency period constitute a current, physical injury upon which relief may be based.

Illness resulting from indoor air pollution is more likely to be considered an occupational disease resulting from ongoing exposure. Indeed, most states have broadened the scope of their workers' compensation statutes to include coverage for occupational disease. States vary considerably, however, in the extent of the coverage and the requisites for recovery.[344] Nevertheless, compensation awards have been made in indoor air pollution cases. One court awarded compensation benefits to an employee who was allergic to smoke and had to terminate her employment because the employer failed to enforce a nonsmoking policy.[345] Similarly, Wisconsin's Labor and Industry Review Commission awarded $29,500 to a worker who claimed permanent disability from exposure to environmental tobacco smoke.[346]

Difficulties in showing that particular diseases meet the statutes' conditions, however, restrict the benefits of workers' compensation systems in addressing occupational disease.[347] It often is difficult to show that an occupational disease was caused by employment rather than by some other cause. Some courts, for instance, have denied compensation to radon-exposed uranium miners with lung cancer when the miners also smoked.[348]

Claims for occupational disease also are more likely to be contested than are claims for accidental injury. For example, insurance carriers have challenged benefits for disease resulting from formaldehyde exposure.[349]

[a] Circumventing the Exclusive Remedies of Workers' Compensation Acts

Low ceilings on workers' compensation recovery have resulted in some judicial sympathy for employees seeking to circumvent the exclusive nature of the remedies available under state workers' compensation statutes. Although direct suits against employers are rare, employees have successfully justified common law or statutory actions against their employers in particular circumstances. Some employees have succeeded in convincing the courts that the workers' compensation system simply does not apply to their

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[344] For example, Connecticut defines "occupational disease" as "any disease peculiar to the occupation in which the employee was engaged and due to causes in excess of the ordinary hazards of employment as such." *Conn. Gen. Stat. § 31-275*. The District of Columbia includes within the definition of "injury" any "occupational disease … as arises naturally out of such employment." *D.C. Code Ann. § 32-1501(12)*. Some states define "injury" narrowly; for example, to exclude "a disease in any form except where it results naturally and unavoidably from the accident." *See Ga. Code Ann. § 34-9-1(4)*. In contrast, the California workers' compensation statute has few restrictions. *See Cal. Lab. Code §§ 3200-6149*.

[345] *Hammond v. Matthes, 109 Mich. App. 352, 311 N.W.2d 357 (1981)*.

[346] Kufahl v. Wisconsin Bell, Inc., No. 88-000676 (Wis. Labor & Industry Review Comm'n Dec. 11, 1990).

[347] *See McCreary v. Industrial Comm'n, 172 Ariz. 137, 835 P.2d 469 (1992)* (chemical sensitivity did not result from causes and conditions characteristic of and peculiar to employment as computer engineer); *Weekley v. Industrial Comm'n, 245 Ill. App. 3d 863, 615 N.E.2d 59 (1993)* (claimant suffering from sick building syndrome and chemical sensitivity not covered by workers' compensation act); *Palmer v. Del Webb's High Sierra, 108 Nev. 673, 838 P.2d 435 (1992)* (disease claimed to be caused by environmental tobacco smoke present in workplace not covered by workers' compensation act).

[348] *See, e.g., Harrison v. Industrial Comm'n, 578 P.2d 510 (Utah 1978)*; *Garner v. Hecla Mining Co., 19 Utah 2d 367, 431 P.2d 794 (1967)*; *Olson v. Federal Am. Partners, 567 P.2d 710 (Wyo. 1977)*. *But see Climax Uranium Co. v. Death of Smith, 522 P.2d 134 (Colo. Ct. App. 1974)*; *McCormick v. United Nuclear Corp., 89 N.M. 740, 557 P.2d 589, 594 (1976)* (exposure "of a kind contributing to the disease" is sufficient to create liability).

[349] *See, e.g., Fletcher v. Farm Bureau Ins. Co., 10 Ark. App. 84, 661 S.W.2d 431 (1983)*; *Babcock-Bucklin v. Workers' Compensation Appeals Bd., 156 Cal. App. 3d 135, 202 Cal. Rptr. 670 (1984)*; *Robinson v. State Accident Ins. Fund Corp., 69 Or. App. 534, 686 P.2d 1053 (1984)*; Robertson v. Firestone Tire & Rubber Co., slip op. (Tenn. Dec. 10, 1984); *Mutual of Omaha Ins. Co. v. Kerr, 1984 Tenn. App. LEXIS 2897 (May 25, 1984)*. Insurance coverage is discussed in greater detail in *ch. 8 supra*.

claims.[350] Even where workers' compensation would apply, employees have attempted to carve exceptions into the bar against direct suits.

Employees have successfully avoided the limitations of workers' compensation schemes by alleging that their injuries have been inflicted not by their employer's negligence but by the employer's intentional conduct. For example, in *Blackenship v. Cincinnati Milacron Chemicals*,[351] eight employees sued their employer for injuries from exposure to fumes and other dangerous characteristics of chemicals in the workplace, alleging that the employer knew of the dangers but intentionally and maliciously failed to warn the employees. Intentionally inflicted injuries, the court reasoned, cannot be injuries contracted in the course of employment.[352] Moreover, affording an employer immunity from suit for intentional behavior frustrates one of the purposes of the workers' compensation statute, *i.e.*, the promotion of a safe work environment.[353]

Injuries inflicted by the employer's recklessness also may fall outside of the workers' compensation scheme.[354] Some courts, however, have sought to distinguish intentionally inflicted injury from injury resulting from reckless conduct, by denying recovery for the latter while hinting that recovery for the former might not be precluded.[355] The kind of "willful intent" required to bring a case outside of the workers' compensation scheme is unclear. In *Prescott v. United States*,[356] the court held that intentionally exposing an employee to radiation was not the same as intending that the employee become sick, and that the latter type of intent was required to pierce the exclusivity of workers' compensation remedies.[357]

In *Leth v. IBM*,[358] a California jury is hearing evidence in a case in which two former IBM employees allege that they developed breast cancer and non-Hodgkins lymphoma, respectively, as a result of working in IBM's San Jose, California semiconductor plant. The plaintiffs worked in "clean rooms," manufacturing facilities that are kept free of dust and particulate matter in an effort to protect sensitive computer components. They claim that the chemicals used to keep these rooms clean caused their illnesses, and that IBM fraudulently concealed the fact that its employees were being harmed by these chemicals.[359] More than 200 "clean room" law suits are now pending around the country.

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[350] *See, e.g.,* Barth v. Firestone Tire & Rubber Co., (N.D. Cal. 1987).

[351] 69 Ohio St. 2d 608, 433 N.E.2d 572 (1982), *cert. denied,* ***103 S. Ct. 127 (1983)***.

[352] *433 N.E.2d at 576*.

[353] *433 N.E.2d at 577*. *See also* McCarthy v. Dept. of Social & Health Servs., 110 Wash. 2d 812, 759 P.2d 351 (1988) (action against employer for negligent failure to provide smoke-free environment not barred by workers' compensation act if disease falls outside coverage of act).

[354] *See* Artonio v. Hirsch, 3 A.D.2d 939, 163 N.Y.S.2d 489 (1957). *See also* Peaspanen v. Board of Education of Ashtabula Area City School Dist., 669 N.E.2d 284 (Ohio App. 1995) (finding triable issue of fact as to whether school district knew that injuries to employee librarian were certain or substantially certain to result from use of urethane floor coating and on her office shelves in a poorly ventilated area).

[355] *See, e.g.,* Austin v. Johns-Manville Corp., 508 F. Supp. 313, 316 (D. Me. 1981).

[356] 523 F. Supp. 918 (D. Nev. 1981).

[357] *See also* Evans v. Allentown Portland Cement Co., 433 Pa. 595, 252 A.2d 646 (1969); Castelbury v. Frost-Johnson Lumber, 283 S.W. 141, 143 (Tex. Civ. App. 1926). *See also* James v. Southern California Edison Co., No. 94-1085-J(RBB) (S.D. Cal. Oct. 25, 1995) (rejecting worker's claim of damages for exposure to radiation while working at nuclear power plant).

[358] No. 98-CV-772093 (Super. Ct. Cal., Santa Clara County filed Feb. 18, 1998).

[359] *See* Flynn, *I.B.M. Toxic-Chemical Suit Heads to Court*, N.Y. Times, Oct. 13, 2003.

Employees have been able to sue their employers directly by alleging fraudulent concealment of a hazardous condition in the workplace. For example, in *Johns-Manville Products Corp. v. Superior Court of Contra Costa County,*[360] the court held that an employee could sue his employer based on an allegation that the employer had fraudulently concealed its knowledge that the employee was suffering from a disease caused by the ingestion of asbestos and had fraudulently concealed the hazardous nature of the asbestos to which the employee was exposed.[361] This exception has by no means been uniformly adopted by the courts, however. Many courts continue to hold that allegations of fraudulent concealment do nothing to interfere with exclusive workers' compensation remedies.[362]

In some jurisdictions, an employee who has ties with the employer beyond the scope of the employer-employee relationship may sue the employer. The employer may be a manufacturer of a product that injures the employee, or may be a landowner, tenant, or physician, and these relationships may create independent obligations to the employee. Under the dual capacity doctrine, an employee may be permitted to sue the employers for acts unrelated to the employer-employee relationship or for employment-related injuries that are aggravated by the employer's conduct in another capacity. For example, in *Duprey v. Shane*,[363] an employee of a chiropractor was injured in the course of his employment, and then treated by the chiropractor. The court held that the employer-employee relationship did not bar a suit based on medical malpractice for aggravating the employee's injury.[364]

Some state courts have gone further, permitting recovery even for injuries resulting from the employer-employee relationship. Thus, in *Douglas v. E. & J. Gallo Winery*,[365] employees sued for personal injuries sustained from the collapse of scaffolding on which they were working. The defendant-employer also manufactured the scaffolding for sale to the public and, on this basis, was subject to suit. The court stated that as long as the employer's second relationship "generates obligations unrelated to those following from the first, of the employer,"[366] the employer-employee relationship does not bar recovery. If the injured individuals had not been employees, their injuries would have been compensable; to deny recovery

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[360] *27 Cal. 3d 465, 165 Cal. Rptr. 858, 612 P.2d 948 (1980)*.

[361] *See also Barth v. Firestone Tire & Rubber Co., 673 F. Supp. 1466 (N.D. Cal. 1987)*; *McDaniel v. Johns-Mansville Sales Corp., 487 F. Supp. 714 (N.D. Ill. 1978)*; *Smith v. Onondaga Pottery Co., 164 Misc. 883, 300 N.Y.S. 298 (N.Y. Civ. Ct. 1937)*, *aff'd sub nom.* ***In re Nelepovitz' Estate, 255 A.D. 931, 8 N.Y.S.2d 1012 (1938)***; *Delamotte v. Unitcast Div. of Midland Ross Corp., 64 Ohio App. 2d 159, 411 N.E.2d 814 (1978)*. *Cf. Baker v. American States Ins. Co., 428 N.E.2d 1342 (Ind. 1982)* (claim against employer's workers' compensation carrier not barred by statute because of allegations of fraudulent concealment).

[362] *See, e.g., Phifer v. Union Carbide Corp., 492 F. Supp. 483 (E.D. Ark. 1980)*; *Copeland v. Johns-Manville Prods. Corp., 492 F. Supp. 498 (D.N.J. 1980)*; *Miller v. Ensco, Inc., 286 Ark. 458, 692 S.W.2d 615 (1985)*; *Kofron v. Amoco Chems. Corp., 441 A.2d 226 (Del. 1982)*; *Ryherd v. Growmark, Inc., 156 Ill. App. 3d 667, 509 N.E.2d 113 (1987)*; *Abbott v. Gould, Inc., 232 Neb. 907, 443 N.W.2d 591*, *cert. denied,* ***493 U.S. 1073 (1989)***. *See also Fried v. Sungard Recovery Servs., Inc., 900 F. Supp. 758 (E.D. Pa. 1995)* (Pennsylvania Workers' Compensation Act bars claims for fraudulent inducement and unjust enrichment as a result of construction workers' exposure to asbestos).

[363] *241 P.2d 78 (Cal. Ct. App.)*, *aff'd,* ***39 Cal. 2d 781, 249 P.2d 8 (1952)***.

[364] *See also Panagos v. North Detroit Gen. Hosp., 35 Mich. App. 554, 192 N.W.2d 542 (1971)* (hospital employee could sue based on injury from foreign particle in piece of pie bought in hospital cafeteria, because of vendor-vendee relationship); *Vesel v. Jardine Mining Co., 110 Mont. 82, 100 P.2d 75 (1940)*; *Guy v. Arthur H. Thomas Co., 55 Ohio St. 2d 183, 378 N.E.2d 488 (1978)*; *Tatrai v. Presbyterian Univ. Hosp., 497 Pa. 247, 439 A.2d 1162 (1982)*. *But see McCormick v. Caterpillar Tractor Co., 85 Ill. 2d 352, 423 N.E.2d 876 (1981)* (opposite result in case factually similar to *Duprey*). *See generally* Comment, *The Dual Capacity Doctrine: Piercing the Exclusive Remedy of Workers' Compensation,* 43 U. Pitt. L. Rev. 1013 (1982).

[365] *69 Cal. App. 3d 103, 137 Cal. Rptr. 797 (1977)*.

[366] *69 Cal. App. 3d at 109, 137 Cal. Rptr. at 800*.

because of employment status "would inflict 'a harsh and incongruous result' in the form of an inadequate recovery for injuries received."[367]

This rule applies only where the "employee is exposed to the same risk to which the public is exposed. Where the public does not share in the risk, it is a risk unique to the employment and workers' compensation is the exclusive remedy against the employer."[368] The *Douglas*, *Bell*, and *Perry* cases could possibly apply to employees exposed to indoor air pollution in public areas of buildings owned by the employer. For example, if a bank employee is exposed to indoor air pollution to the same extent as is a member of the public in the bank lobby, the injured employee may be able to sue the bank in its capacity as building owner, even though the injury was sustained in the course of employment. Similarly, an injured schoolteacher may be able to sue the school district for exposure to asbestos in the school building.

In *Niles-Robinson v. Brigham and Women's Hospital*,[369] plaintiff-employees sued their employer, claiming injury from faulty ventilation and indoor air quality problems in their workplace. Defendant moved to dismiss on the ground that the state workers' compensation laws provided their sole remedy. Plaintiffs creatively sought to circumvent the workers' compensation bar by arguing that the multiple chemical sensitivity disorder (MCS), which they claimed to have, was not a "personal injury" within the scope of the Massachusetts workers' compensation laws. The court held that the term was to be broadly construed and granted the motion to dismiss.

[b] Suit for Injunctive Relief

An employee suit over allegedly hazardous ongoing indoor air pollution may not be precluded by workers' compensation statutes where the suit seeks, in lieu of a monetary award, an injunction ordering the employer to abate the hazard. In *Shimp v. New Jersey Bell Telephone Co.*,[370] the plaintiff, a telephone company secretary who was allergic to cigarette smoke, sued her employer for an injunction against cigarette smoking in the area in which she worked. The New Jersey court granted the injunction, basing its holding on the common law right to a safe work environment.[371] The court stated that suits for injunctions are not barred by the state workers' compensation statute because they are not intended to secure money recoveries: "The act becomes the exclusive remedy for the employee when the hazard has ripened to injury."[372] This result is curious, in that it permits suits before, but not after, workers have been injured.

In the *Shimp* case, the court pointed out that the company

> already ha[d] in effect a rule that cigarettes may not be smoked around the telephone equipment. The rationale behind the rule is that the machines are extremely sensitive and can be damaged by the smoke. Human beings are also very sensitive and can be damaged by cigarette smoke. Unlike a piece of machinery, the damage to a human is all to [sic] often irreparable.[373]

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[367] *Bell v. Industrial Vangas, Inc., 30 Cal. 3d 268, 282, 179 Cal. Rptr. 30, 637 P.2d 266 (1981)*.

[368] *Perry v. Heavenly Valley, 163 Cal. App. 3d 495, 209 Cal. Rptr. 771 (1985)*.

[369] *1997 Mass. Super. LEXIS 586, 6 Mass. L. Rep. 340 (1997)*.

[370] *145 N.J. Super. 516, 368 A.2d 408 (Ch. Div. 1976)*.

[371] *See also Smith v. Western Elec. Co., 643 S.W.2d 10 (Mo. Ct. App. 1982)* (injunctive relief may be appropriate remedy for plaintiff who is unusually sensitive to cigarette smoke); *McCarthy v. Department of Social & Health Servs., 110 Wash. 2d 812, 759 P.2d 351 (1988)* (Washington State, as employer, had duty to provide reasonably safe workplace free from environmental tobacco smoke).

[372] *368 A.2d at 412*.

[373] *368 A.2d at 416*.

The court further noted that "[t]he portion of the population which is especially sensitive to cigarette smoke is so significant that it is reasonable to expect an employer to foresee health consequences and to impose upon him a duty to abate the hazard which causes the discomfort."[374] This duty seemingly may be applied to other indoor irritants, such as formaldehyde.[375]

[2] Americans with Disabilities Act (ADA)

The Americans with Disabilities Act of 1990 (ADA),[376] was enacted on July 26, 1990. The ADA is a broad statute, with sweeping requirements designed to ensure that disabled individuals (as defined by the Act) have access to equal employment opportunities, public accommodations, government services, and telecommunications. In a somewhat controversial application of the ADA, persons claiming to have multiple chemical sensitivity disorder (MCS)[377] are asserting that they are "disabled" within the meaning of the Act.[378] If their allegations prevail, employers, builder owners and operators, architects, and contractors could be obligated under the ADA to make "reasonable accommodation" to provide these individuals with an indoor environment in which they can function.[379]

[a] "Disability" Under the ADA

The ADA derives its definition of "disability" from the Rehabilitation Act, which originally used the term "handicap" rather than "disability."[380] According to the legislative history of the ADA, Congress was sensitive to the concern of disability rights groups that "handicap" was a patronizing term.[381] The definition of

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[374] *368 A.2d at 415-16*.

[375] The *Shimp* result has been followed in at least one other case. *Smith v. Western Elec. Co., 643 S.W.2d 10 (Mo. Ct. App. 1982)* (also holding that offer of a job in a smoke-free environment at substantial salary cut and offer of use of a respirator at current job location do not satisfy obligation to provide reasonably safe workplace).

[376] *42 U.S.C. §§ 12101–12213*.

[377] *See § 17A.01[1][c] supra.*

[378] For a discussion of the scientific debate on multiple chemical sensitivity, *see § 17A.01[1][b] supra. See generally* Kaswan, *The Americans With Disabilities Act as a Weapon Against Indoor Pollution,* 4 Envtl. L. in N.Y. 97 (Matthew Bender July 1993) and 4 Envtl. L. in N.Y. 113 (Matthew Bender Aug. 1993).

[379] Indoor air quality suits have been brought under the public accommodation requirements of the ADA. In *Staron v. McDonald's Corp., 51 F.3d 353 (2d Cir. 1995)*, four plaintiffs sued McDonald's, Burger King, and Wendy's, claiming that the presence of cigarette smoke in the air in defendants' restaurants denied the plaintiffs—all of whom have adverse reactions to the presence of cigarette smoke—the opportunity to participate in or benefit from the goods, services, or accommodations of the defendants. The district court granted a motion to dismiss, but the court of appeals reversed, ruling that the plaintiffs had stated a claim under the ADA. *See also Emery v. Caravan of Dreams, 879 F. Supp. 640 (N.D. Tex. 1995)* (sensitive plaintiffs had not been "screened out" by the application of eligibility criteria from full enjoyment of a musical venue that permitted smoking; case should have been styled as an ADA public accommodations case).

[380] *29 U.S.C. § 705(9)*. *Compare 41 C.F.R. § 60-741.2(n)* (example of Rehabilitation Act regulations defining "individual with a disability" (formerly "handicapped individual")) *with 29 C.F.R. § 1630.2(g)* (ADA regulations defining "disability"). Similarly, *see* Link v. Long & Levitt, No. 962218 (Cal. Super. Ct. June 5, 1995) (dismissing claim that employer failed to accommodate plaintiff's disability, which allegedly was caused by sick building syndrome; court refrained from ruling on whether sick building syndrome qualified as a disability under California's Fair Employment and Housing Act).

[381] Sen. Rep. No. 116, 101st Cong., 1st Sess. (1989) at 21. Similarly, the Rehabilitation Act has been amended to replace the term "handicap" with "disability."

"disability" under the ADA also is substantially the same as the definition of "handicap" under the Fair Housing Act.[382]

Under the ADA, "disability," with respect to an individual, is defined as follows:

> (A) a *physical or mental* impairment that *substantially* limits one or more of the *major life activities* of such individual;[383]
>
> (B) a record of such an impairment; or
>
> (C) being regarded as having such an impairment.[384]

The Equal Employment Opportunity Commission (the federal agency with jurisdiction over the ADA) has defined "major life activities" to include caring for oneself, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, and, most significantly, working.[385]

Part (B) of the definition of disability provides that an individual with a *record* of significant impairment of one or more life activities is covered by the ADA. Part (C) expands the concept of disability to include individuals who are *regarded* as having a major physical or mental impairment. Thus, persons may be protected under the Act even though they do not *actually* have an impairment. Under Part (C) of the definition, for instance, if an individual's employer thinks that the individual has an impairment, the individual would be protected under ADA even though the individual may not actually have the impairment.

[b] Multiple Chemical Sensitivity and Environmental Illness as Disabilities Under the ADA

One court has defined MCS as

> [A]n acquired disorder characterized by recurrent symptoms, referable to multiple organ systems, occurring in response to demonstrable exposure to many chemically unrelated compounds at doses far below those established in the general population to cause harmful effects. No single widely accepted test of physiological function can be shown to correlate with symptoms.[386]

Although there is considerable disagreement among courts and medical experts as to the definition—and indeed, the existence—of MCS, the term "MCS" generally is used to refer to a condition that causes a person to have a severe hypersensitive reaction to a number of different common substances.

Given the substantially identical definitions of "disability" under the ADA and the Rehabilitation Act, and "handicap" under the Fair Housing Act, case law interpreting implementing regulations under those acts provides insight into whether MCS may be considered a disability under the ADA. In interpreting the Rehabilitation Act regulations, the Supreme Court has stated that the the Department of Health and Human Services "found that a broad definition, one not limited to the so-called 'traditional handicaps,' is inherent in

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[382] *42 U.S.C. § 3602(h)*.

[383] Courts have held that sensitivity to environmental tobacco smoke can contribute to a finding of disability under the ADA. *See, e.g.*, *Homeyer v. Stanley Tulchin Associates, 91 F.3d 959 (7th Cir. 1996)* (noting on review of lower court's grant of a motion to dismiss, "we cannot say at this stage that it would be impossible for [plaintiff] to show that her chronic severe allergic rhinitis and sinusitis either alone or in combination with ETS substantially limits her ability to breathe"); *Muller v. Costello, 997 F. Supp. 299 (N.D.N.Y. 1998)* ("ample evidence" to support jury finding of plaintiff's disability to perform jobs requiring that he come into contact with smoke or other asthma-inducing substances).

[384] *42 U.S.C. § 12102(2)* (emphases added).

[385] *29 C.F.R. § 1630.2(i)*. *See* U.S. Equal Employment Opportunity Commission and the U.S. Department of Justice, *Americans With Disabilities Act Handbook,* I-27 (Oct. 1992) [hereinafter ADA Handbook].

[386] *Ruether v. State, 455 N.W.2d 475, 476 n.1 (Minn. 1990)* (construing the Fair Housing Act).

the definition."[387] A number of courts have determined that individuals with MCS are "handicapped" under the Rehabilitation Act.[388]

Similarly, the United States Department of Housing and Urban Development (HUD) analyzed whether MCS was or could be considered a "handicap" within the meaning of the Fair Housing Act.[389] HUD concluded, as a matter of policy, that MCS can constitute a handicap under that Act.[390] In contrast, ordinary allergies generally would not be considered a handicap because they are not severe and do not substantially limit a major life activity.[391]

Individuals with MCS generally have attempted to meet the definition of "handicap" under the Fair Housing Act by maintaining that their condition constitutes a *physical or mental impairment* that *substantially limits* one or more of their *major life activities.* They allege that MCS can affect a person in a number of different ways, in that it can cause blurred vision, seizures, muscle aches, fatigue, shortness of breath, damage to the pancreas, and extreme sensitivity to various chemicals, which can be life-threatening. Under the ADA, a "major life activity" includes employment,[392] and an impairment is "substantially limiting" if it "significantly restricts" the "condition, manner, or duration" in which an individual can perform the activity in comparison

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[387] *School Bd. v. Arline, 480 U.S. 273, 279 (1987)*.

[388] *Rosiak v. Department of the Army, 679 F. Supp. 444 (M.D. Pa. 1987)*, *aff'd,* ***845 F.2d 1014 (3d Cir. 1988)*** (carpentry worker who was hypersensitive to "hydrocarbon-type fumes or dust" resulting from initial exposure to contact cement was handicapped under the Rehabilitation Act); *Vickers v. Veterans Admin., 549 F. Supp. 85, 86-7 (W.D. Wash. 1982)* (Veterans Administration employee who was hypersensitive to tobacco smoke was handicapped under the Rehabilitation Act). *Cf. Walders v. Garrett, 765 F. Supp. 303, 305 n.4 (E.D. Va. 1991)* (Chronic Fatigue Syndrome fits within the definition of "handicap" under the Rehabilitation Act). For a discussion of MCS and indoor air pollution claims under the ADA, *see generally* A. Kaswan, *The Americans With Disabilities Act as a Weapon Against Indoor Air Pollution,* 4 Envtl. L. in N.Y. 97 (1993) (Part I); 4 Envtl. L. in N.Y. 113 (1994) (Part II).

[389] *See* Memorandum from George L. Weidenfeller, Deputy General Counsel, HUD, to all Regional Counsel (Apr. 14, 1992) [hereinafter HUD Memorandum].

[390] *Id.* HUD had made such determinations prior to the announcement of its policy. *See, e.g.,* Corcelli v. Gilbane Properties, Case Nos. 01-90-0255-1-5, 01-90-0512-1 (HUD Office of General Council Determination Dec. 11, 1990) (determining that a person suffering from environmental illnesses, immune dysfunction syndrome, and chronic fatigue was handicapped under the Act).

[391] State courts have found chemical sensitivities disabling under similar state laws, as have the Social Security Administration and other federal agencies under narrower definitions of "disability." *See* state court cases cited in HUD Memorandum, at 13–14, including: *County of Fresno v. Fair Employment & Hous. Comm'n, 226 Cal. App. 3d 1541, 1550, 227 Cal. Rptr. 557, 563 (1991)* (hypersensitivity to tobacco smoke is a handicap under the California Fair Employment and Housing Act); *Kallas Enters. v. Ohio Civil Rights Comm'n, 1990 Ohio App. LEXIS 1683 (Ohio Ct. App. Summit County May 2, 1990)* ("occupational asthma" and "sensitivity to chemicals" are handicaps within the meaning of the Ohio Civil Rights Act); *Kent State Univ. v. Ohio Civil Rights Comm'n, 64 Ohio App. 3d 427, 581 N.E.2d 1135 (1989)*; *Lincoln Realty Management Co. v. Pennsylvania Human Relations Comm'n, 143 Pa. Commw. 54, 598 A.2d 594 (1991)* (tenant unable to tolerate various chemical compounds is handicapped under Pennsylvania act). *See also* Social Security cases cited in HUD Memorandum at 11–12, including: *Kouril v. Bowen, 912 F.2d 971, 974 (8th Cir. 1990)* (woman with MCS disabled under the Social Security Act); *Kornock v. Harris, 648 F.2d 525, 527 (9th Cir. 1980)* (person with severe asthma disabled under the Social Security Act).

[392] *29 C.F.R. § 1630.2(i)*. The determination of whether there is an impairment in an individual's ability to perform a job is substantially more difficult than determining whether other major life activities, such as walking, hearing, seeing, or breathing, are impaired. The Department of Justice, in promulgating regulations implementing the ADA's public accommodations provisions, indicated that the determination of whether MCS substantially impairs a major life activity must be made on a case-by-case basis. *See 56 Fed. Reg. 35549 (1991)*.

with the average person.[393] Thus, MCS advocates argue that the employment provisions of the ADA are triggered when employees have or develop MCS and it substantially limits their ability to perform their jobs.

[c] Employment Provisions

The core prohibition of the ADA is that no employer may discriminate against a qualified individual because of a disability with regard to job application procedures, hiring, advancement, discharge, compensation, job training, or other terms of employment.[394] However, the anti-discrimination provisions of the ADA will not be triggered unless the allegedly injured individual is qualified for the job in question.[395] A qualified individual with a disability is one who satisfies the requisite skill, experience, education, and other job-related requirements, and, with or without reasonable accommodation, can perform the essential functions of the job.[396] Job descriptions written before advertising or interviewing job applicants are considered evidence of the essential functions of the job, as are any applicable collective bargaining agreements.[397] If an individual cannot meet one of the requirements and believes that the requirement is itself discriminatory, the employer must demonstrate that the requirement is "job related … and is consistent with business necessity … ."[398]

[d] Employers' Obligations Under the ADA

The ADA applies to both public and private employers with 15 or more employees. Under the ADA, employers are required to engage in "reasonable accommodation" in determining whether an individual with a disability is qualified to perform a job.[399] The law requires employers to modify the work environment or "the manner or circumstances under which the position held or desired is customarily performed, that enable a qualified individual with a disability to perform the essential functions of that position."[400] This obligation to "reasonably accommodate" can include altering physical structures, providing assistance or specialized equipment for an individual, reorganizing job duties, or adjusting or modifying examinations, training materials, or policies.[401] Reasonable accommodations also are required to enable a qualified

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[393] *29 C.F.R. § 1630.2(j)(1)*.

[394] *42 U.S.C. § 12112(a)*.

[395] *42 U.S.C. § 12112(a)*.

[396] An employer cannot discriminate against an individual who can perform the job's "essential" functions, even if that individual cannot perform its "marginal" functions. The regulations set forth several criteria for determining whether a job function is essential, including whether the position "exists to perform that function," the number of employees available to perform that function, whether the function is "highly specialized," and whether the individual was hired for his ability to perform that particular function. *29 C.F.R. § 1630.2(n)(2)*.

[397] *29 C.F.R. § 1630.2(n)(3)*.

[398] *29 C.F.R. § 1630.10*. The concept of "business necessity" is drawn from the Rehabilitation Act, which provides: "If a test or other selection criterion excludes an individual with a disability *because of* the disability and does not relate to the *essential functions of the job,* it is not consistent with business necessity." ADA Handbook, at I-66.

[399] *42 U.S.C. § 12111(8)*; *29 C.F.R. § 1630.2(m)*.

[400] *29 C.F.R. § 1630.2(o)(1)(ii)*. *See also, e.g., Harmer v. Virginia Electric and Power Co., 831 F. Supp. 1300 (E.D. Va. 1993)* (holding that employee not entitled to a *complete* smoke-free work environment to accommodate his pulmonary disability, where employee could perform essential functions of his position based on existing accommodations made by employer); *Muovich v. Raleigh County Board of Education, 58 Fed. Appx. 584, 2003 U.S. App. LEXIS 3569 (4th Cir. 2003)* (unpublished) (affirming jury award of $560,000 for compensatory damages, back pay, emotional distress, fees, and costs in indoor air case brought under state law "failure to accommodate" provision,)

[401] *29 C.F.R. § 1630.2(o)(2)(ii)*.

individual with a disability to "enjoy equal benefits and privileges of employment as are enjoyed by … similarly situated employees without disabilities."[402] This may include "accessible break rooms, lunch rooms, training rooms, restrooms, etc."[403] "Reasonable accommodation" must take into consideration the specific abilities and functional limitations of a particular applicant or employee with a disability, and the specific functional requirements of a particular job.

An employer's failure to reasonably accommodate the known disabilities of an employee is employment discrimination unless the employer can demonstrate that accommodation would impose an "undue hardship" on the employer's business operations.[404] "Undue hardship" is defined as an action requiring "significant difficulty or expense."[405]

[e] Summary

The ADA prohibits discrimination against individuals with disabilities. Whether MCS exists—and the extent to which it is disabling—remains an area of controversy. Based on case law (under the Fair Housing Act and the Rehabilitation Act), however, MCS advocates argue that MCS should be considered a disability within the meaning of the ADA. Employers with employees who have or acquire MCS, or employers who accept applications from potential employees with MCS, must make reasonable accommodations for these employees. Accommodations may include, for example, preventing exposure to certain chemicals by providing special work areas, diligently maintaining the HVAC to prevent introduction of chemicals or bacteria into the system, notifying the employees of any instances where chemicals may be introduced into the facility (*e.g.,* pesticide spraying), and allowing these employees to be absent from work when such chemicals are introduced. One commentator on the applicability of the ADA to those with MCS noted: "providing access to those with MCS boils down to providing good IAQ. In IAQ terms, access … means reducing the build-up and circulation of chemical emissions within the building."[406]

Employers may need to pay special attention to the presence of tobacco smoke in the indoor air. In one case decided under the Rehabilitation Act, an employee who was hypersensitive to tobacco smoke was found to be handicapped.[407] The court also found that the employer had made "reasonable accommodations" for the employee's handicap, which included installing additional ceiling vents, offering to install a floor-to-ceiling partition with a door around the employee's desk, offering to assign the employee to another job, allowing the employee to move his desk to another part of the office closer to a window, allowing the employee to seek voluntary agreements with other employees not to smoke in their offices, and allowing the employee to use an air purifier in the office. The extent to which the employer will be required to take reasonable accommodation measures will be determined by the nature and cost of the accommodation, the financial resources of the facility involved, the number of persons employed at the facility, the impact of the accommodation on expenses and resources at the facility, overall financial

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[402] *29 C.F.R. § 1630.2(o)(1)(iii)*.

[403] ADA Handbook, at I-42.

[404] *42 U.S.C. § 12112(b)(5)(A)*.

[405] 42 U.S.C. § 1211(10)(A). Factors considered include: (1) the nature and the net cost of the accommodations, taking into account available net tax credits, deductions, and outside funding sources; (2) the employer's financial resources overall and at the particular facility, the number of persons employed at the facility, and the effect on expenses and resources, as well as the overall size and resources of the covered entity, including the number of employees and the type and location of the facilities; and (3) the nature of the operation involved, including the type of operation, structure and functions of the workforce, geographic separateness and administrative or fiscal relationship of the facility, impact on the operation of the facility, and impact on the ability of others to do their job. *29 C.F.R. § 1630.2(p)(2)*.

[406] Kosta, *Access for the Disabled: Americans With Disabilities Act & Multiple Chemical Sensitivity,* Indoor Air Review, Oct. 1992 at 6.

[407] *Vickers v. Veterans Admin., 549 F. Supp. 85, 86-7 (W.D. Wash. 1982)*.

resources, overall size, the total number of employees of the employer, the type of business involved, and the degree of operations integration between separate facilities.

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§ 17A.10 Practical Considerations in Prosecuting or Defending an Indoor Air Quality Case

Litigants seeking compensation for personal injury or property damages caused by inadequate indoor air quality face all the barriers normally attendant to parties to toxic tort actions.[408] Both plaintiffs and defendants face substantial difficulties involving the investigation, proof, and presentation of highly complex technical issues at the frontiers of scientific knowledge. The parties face other theoretical and practical hurdles, as well.[409]

[1] Statute of Limitations

Long latency periods for the manifestations of some diseases bring plaintiffs' claims into conflict with applicable statutes of limitations that require suits to be filed within a certain time of the injury. The critical distinction with which courts have wrestled is whether the time period starts to run from the exposure to a hazardous substance or from the date of discovery of the injury. Some states have changed their statutes of limitations for toxic tort litigation so that plaintiffs have a better chance of having their claims heard.

Questions as to whether the statute of limitations has run can become quite complex. In *Vincent v. A.C. & S., Inc.*,[410] the United States Court of Appeals for the Fifth Circuit had to decide whether a settlement between the plaintiff and several asbestos manufacturers constituted a "voluntary dismissal" that would time-bar the plaintiff from amending the complaint to add claims against other manufacturers. Under state law, Louisiana's one-year statute of limitations is interrupted by a suit on the same cause of action and resumes once the suit is no longer pending, unless the suit is "voluntarily dismissed" by the plaintiff. The *Vincent* court ruled that the settlement was not a "voluntary dismissal."

Wilson v. Devonshire Realty of Danville[411] involved a dispute over when the statute of limitations began to run—an issue that is likely to recur in indoor air quality cases. In February 1998, plaintiff brought a negligence action against her employer and a contractor that had performed renovation in her building. She claimed to have developed symptoms of occupational asthma and MCS sometime in 1995, as a result of being exposed to chemicals in her workplace. The trial court granted summary judgment to defendants on the grounds that the two-year statute of limitations had run prior to plaintiff filing her complaint. On appeal, plaintiff argued that while she may have sustained injury as early as 1995, she did not realize that it was wrongfully caused until April 1997 when she was diagnosed with a pulmonary illness and told that workplace irritants could be the cause. She also argued that her employer had fraudulently concealed the cause of her injury by repeatedly assuring her that air quality testing performed in January 1995 demonstrated that the building could not be the cause of her symptoms.

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[408] *See generally ch. 33 infra.*

[409] *See generally Wright, Indoor Air Quality Claims: Defining the Practical and Legal Issues, 14 Nat. Resources & Env't 255 (Spring 2000)* (discussing common law liability arising from IAQ problems).

[410] *833 F.2d 553 (5th Cir. 1987)*.

[411] *718 N.E. 2d 700 (Ill. App. 1999)*, *appeal denied,* ***724 N.E. 2d 1275 (Ill. 2000)*** (table decision).

The appellate court affirmed, finding that plaintiff knew she had developed symptoms in January 1995 and, in August 1998, raised the question of whether the building might be the cause. Once plaintiff was aware of her injury and its possible cause, the court ruled, she was aware of her right to sue.[412] The court further held that plaintiff had failed to state a *prima facie* case of fraudulent concealment, absent proof that she had been "prevented" from obtaining the results of the environmental testing.[413]

In *Huff v. Fiberboard Corp.*,[414] a widow filed suit in 1979, within two months of her husband's death from asbestosis. The United States Court of Appeals for the Tenth Circuit ruled that the husband should have known of his condition as of 1975, when he visited a doctor about lung problems. The court held that the widow's claim was time-barred by Oklahoma's two-year statute of limitations.

In another case, the New York Court of Appeals upheld a lower court's ruling that the plaintiffs' claim for damages, allegedly caused by emissions from urea formaldehyde, was time-barred.[415] The plaintiffs experienced respiratory and other problems after urea formaldehyde foam was installed in their home in 1977, but they learned of the hazards of the substance four years later, when urea formaldehyde foam was banned by the CPSC. New York's three-year statute of limitations was found to run from the date of injury.

[2] Proving Causation of the Alleged Injury

Plaintiffs must prove that the injury from which they claim to suffer was inflicted by the cause alleged. The ease with which such showings can be made varies with the particular source of injury: proof of a causal relationship between asbestos exposure and asbestosis or mesothelioma may be far simpler than proof of a relationship between tightly insulated homes and radon exposure, and, in turn, between radon exposure and lung cancer. Similarly, proof of the causation of nose or throat irritation from formaldehyde vapors or passive cigarette smoke may be difficult. As scientific knowledge grows, and as additional cases are litigated, the burden of proving causality may ease. Yet, proof of causation is always a major roadblock in toxic tort cases. Various proposals have been made to ease this burden, by shifting presumptions in favor of the plaintiff after the plaintiff makes a limited threshold showing of injury.[416]

Proof of causation can be difficult in the indoor environment.[417] In *Hardcastle v. International Paper Co.*,[418] the court granted summary judgment for the defendant, holding that the plaintiffs had failed to demonstrate that their alleged illnesses were caused by exposure to the pesticide pentachlorophenol. Expert testimony presented by the plaintiffs was insufficient to demonstrate medical causation.[419]

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[412] *See also* Cappelli v. York Operating Co., 711 A.2d 481, 486 (Pa. Super. Ct. 1998) (holding that "critical" statute of limitations inquiry in negligence suit by sick building employees against air testing company is the point at which the employees, through the exercise of "reasonable diligence," should have known that the air testing company's alleged negligent inspections were causing them additional harm).

[413] *Id*. One judge issued a dissenting opinion. Id. at 706-09.

[414] 836 F.2d 473 (10th Cir. 1987).

[415] Snyder v. Town Insulation, Inc., 81 N.Y.2d 429, 599 N.Y.S.2d 515, 615 N.E.2d 999 (1993) (holding claims for injuries allegedly caused by emissions from urea formaldehyde insulation time-barred).

[416] *See, e.g,* Trauberman, *Statutory Reform of "Toxic Torts:" Relieving Legal, Scientific and Economic Burdens on the Chemical Victim,* 7 Harv. Envtl. L. Rev. 177 (1983).

[417] *See, e.g.,* Bloomquist v. Wapello County, Iowa, No. CL2785-0687 (D.C. Iowa filed May 9, 1990) (granting judgment notwithstanding the verdict on ground that plaintiffs failed to prove either that pesticides or faulty HVAC system were cause of injuries).

[418] No. 86-1110 0204/88 (D. Ill.).

[419] *Accord* Patterson v. Liberty Mut. Ins. Co., 723 N.E.2d 1005 (Mass. Ct. App. Suffolk 2000).

In addition, given the large number of parties potentially responsible for high levels of indoor pollution in a building, a plaintiff may have difficulty showing that any individual defendant should be liable. For example, the courts will have to decide who should bear the burden of injuries from high levels of combustion pollutants in a well-insulated structure: the manufacturers of the gas stove and furnace, the architect who designed the tightly insulated building, the builder who built it, or the owner of the structure who directed that the building be energy-efficient. From a technical standpoint, each of these actors might be viewed as partially responsible for the ambient levels of pollutants allegedly causing harm.

[a] Novel Theories of Causation

Recognizing these difficulties, plaintiffs may attempt to prove causation under one of several novel theories of causation. In contrast to traditional principles of causation, where one substance is causally linked through scientific evidence to the injuries alleged, the "clinical ecology theory" assumes that exposure to a number of substances in a multi-chemical mix results in a synergistic effect that causes injury to the central nervous system and/or the immune system, creating subsequent persistent symptoms. Thus, no single substance is identified as the source of the alleged injuries. In *Call v. Prudential Insurance Co. of America*,[420] the defendant anticipated that this theory would be asserted and filed a motion *in limine* arguing that the plaintiff should not be allowed to advance the clinical ecology theory because it was experimental and could not provide the basis for expert testimony.[421] The defendant relied on a case decided by the United States Court of Appeals for the Sixth Circuit, which noted that clinical ecology was an "unproven methodology."[422] The court found that "[w]ithout the requisite clinical tests and a widely accepted medical basis for reaching its conclusions, plaintiffs' experts' opinions are insufficient to sustain plaintiffs' burden of proof."[423] Thus, the defendant was successful in maintaining that the causal link between emissions and injury must be established by scientific studies or by an analysis on the specific plaintiff's exposure.

The plaintiffs in *Call* also asserted "causation-by-inference," attempting to establish through expert testimony that the building was suffering from sick building syndrome.[424] If the building was labeled "sick," the plaintiff wanted the jury to be able to infer that the plaintiffs became sick as a result of exposure to the building, without identifying any particular causative substance. The plaintiff's expert testified in deposition that he believed that the building was sick because the number and type of complaints received from building tenants were similar to complaints made by individuals in other buildings that the expert considered sick. His diagnosis of SBS was not based on an analysis of what substances, if any, were involved. The court refused to allow the expert to testify at trial. In essence, the court rejected the expert's epidemiological approach to diagnosing the building's problems in the absence of any foundation that the buildings being compared were similar in terms of their ventilation systems, building materials, and ambient air levels. Thus, the defendant in *Call* was successful in forcing the plaintiffs to proceed under traditional evidentiary and causation rules.[425] The case subsequently settled for an undisclosed amount.

In exceptional circumstances, courts have relaxed the requirement that the plaintiff must establish who or what caused the alleged injury and have shifted the burden of establishing causation to clearly culpable

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[420] No. SWC 90913 (Super. Ct. Cal. County of Los Angeles filed 1985) (settled Oct. 15, 1990 for an undisclosed amount). For additional discussion of this case, *see* §§ 17A.07, 17A.08[2], and 17A.08[3] *supra.*

[421] Caudle, *Fighting Allegations of SBS,* 4 Indoor Pollution L. Rep. 1, 4-5 (1991).

[422] *Sterling v. Velsicol Chem. Corp., 855 F.2d 1188 (6th Cir. 1988)*.

[423] *855 F.2d at 1209*.

[424] Caudle, *Fighting Allegations of SBS,* 4 Indoor Pollution L. Rep. 1, 4-5 (1991).

[425] The Supreme Court's 1993 decision in *Daubert v. Merrill Dow Pharmaceuticals, 509 U.S. 579 (1993)*, may be making it easier for plaintiffs to assert these novel theories of causation. *See § 17A.10[3] infra.*

defendants.[426] In *Sindell v. Abbott Laboratories*,[427] the California Supreme Court pioneered a derivative of this form of burden-shifting by creating the theory of "market share" liability. In *Sindell*, the daughters of women who had ingested the drug DES during pregnancy brought a class action suit against manufacturers that had produced a "substantial share" of DES during the relevant time period. They alleged that their *in utero* exposure to DES caused a rare form of cancer, and that the defendants had been negligent in failing to adequately test the drug or warn of its potential hazards. The plaintiffs could not, however, identify which particular DES manufacturer had supplied the drug that caused the injury. Recognizing that traditional tort principles would foreclose the plaintiffs from recovering, the court allowed the suit on the basis of market share liability for public policy reasons.

In general, under a theory of market share liability, a plaintiff "need only allege inability to identify the actual manufacturer, and join as defendants those manufacturers that compose a "substantial share" of the market."[428] Once the plaintiff establishes negligence, the burden of exculpation shifts to the defendants.[429] For those defendants ultimately found liable, the court will apportion damages based on each defendant's share of the market.[430] Thus, under a market share theory, "a particular defendant's potential liability is proportional to the probability that it caused the plaintiff's injury."[431]

Courts that have accepted market share liability have generally done so in the context of DES cases.[432] In the indoor air context, market share liability has been asserted against asbestos manufacturers for injuries allegedly sustained as a result of asbestos exposure. However, courts have been reluctant to apply market share liability in these cases.[433] Market share liability also has been rejected in cases against lead paint and pigment manufacturers where plaintiffs were allegedly poisoned by lead paint in their homes.[434]

[b] Use of Testing to Establish Cause and Effect

To establish that particular emissions caused the plaintiff's alleged injuries, parties will often rely on scientific testing. These tests may or may not be a reliable indicator of the actual effects of any given

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[426] *See* Summers v. Tice, 33 Cal. 2d 80, 199 P.2d 1 (1948) (where two defendants negligently fired shots, only one of which hit plaintiff, burden shifts to defendants to prove lack of causation). The rationale behind this theory of alternative liability "is the injustice of permitting proved wrongdoers, who among them have inflicted an injury upon the entirely innocent plaintiff, to escape liability merely because the nature of their conduct and the resulting harm that has made it difficult or impossible to prove which of them has caused the harm." ***Restatement (Second) Torts § 433B, cmt. f (1976)***.

[427] 163 Cal. Rptr. 132, 607 P.2d 924, *cert. denied,* ***449 U.S. 912 (1980)***.

[428] Hannon v. Waterman S.S. Corp., 567 F. Supp. 90, 91 n.1 (E.D. La. 1983).

[429] *See* Sindell v. Abbott Labs., 163 Cal. Rptr. 132, 607 P.2d 924, 936-37 (1980).

[430] McCormack v. Abbott Labs., 617 F. Supp. 1521, 1525 (D. Mass. 1985).

[431] Martin v. Abbott Labs., 102 Wash. 2d 581, 689 P.2d 368, 382 (1984).

[432] *See, e.g.,* McCormack v. Abbott Labs., 617 F. Supp. 1521, 1525 (D. Mass. 1985); McElhaney v. Eli Lilly & Co., 564 F. Supp. 265 (D.S.D. 1983); Conley v. Boyle Drug Co., 570 So. 2d 275 (Fla. 1990); Hymowitz v. Eli Lilly & Co., 73 N.Y.2d 487, 541 N.Y.S.2d 941, 539 N.E.2d 1069, *cert. denied,* ***493 U.S. 944 (1989)***; Martin v. Abbott Labs., 102 Wash. 2d 581, 689 P.2d 368 (1984).

[433] *See, e.g.,* Bateman v. Johns-Manville Sales Corp., 781 F.2d 1132 (5th Cir. 1986); Thompson v. Johns-Manville Sales Corp., 714 F.2d 581 (5th Cir. 1983), *cert. denied,* ***465 U.S. 1102 (1984)***; White v. Celotex Corp., 907 F.2d 104 (9th Cir. 1990); Blackston v. Shook & Fletcher Insulation Co., 764 F.2d 1480 (11th Cir. 1985); Benshoof v. National Gypsum Co., 761 F. Supp. 677 (D. Ariz. 1991); University Sys. v. United States Gypsum Co., 756 F. Supp. 640 (D.N.H. 1991). *But see* Board of Educ. v. Celotex Corp., No. 84-42963NP (Wayne County Mich. Cir. Ct. Feb. 1, 1988) (court allowed claim for market share liability).

[434] *See* Monica Santiago v. Sherwin Williams Co., 3 F.3d 546 (1st Cir. 1993).

substance. The parties need to evaluate the validity of these tests and the extent to which the tests have been accepted by the scientific community.

Testing conducted on VOC emissions from carpeting illustrates how reliance on test data to establish causation may not be appropriate.[435] A laboratory published the results of its tests on nine samples of used carpet submitted by people who experienced adverse health reactions after the carpet was installed in their home or workplace. The carpets were tested using a modified version of the ASTM bioassay for respiratory irritation. Several test animals (mice) unexpectedly died during the tests. Other mice displayed unusual neurological responses not typically seen during tests conducted on many other products. The laboratory used these results to suggest that the carpet emissions were extremely toxic.

Scientists criticized many aspects of the carpet assay tests, and EPA has not been able to replicate the test results. A frequently expressed criticism was that the laboratory used the ASTM mouse bioassay, which measures respiratory irritation, to test for toxicity; this bioassay has not been validated for such use and no published papers exist on using the test for toxicity purposes. Another criticism was that the mouse assay, validated for use in testing exposures to known concentrations of chemical substances under controlled conditions, was being used very differently in the carpet assay, which does not even identify the particular substances present, much less their concentrations. Thus, the results of such tests must be interpreted extremely cautiously and, more important, are subject to challenge as a basis for establishing any cause and effect relationship between carpet emissions and human health effects.

[3] Use of Experts and Admissibility of Scientific Evidence

[a] The *Daubert* Standard

In a highly technical field such as indoor air quality, both plaintiffs and defendants often rely on expert testimony to prove or challenge causation. Under Rule 702 of the Federal Rules of Evidence, an expert is a person who may give testimony in the "form of an opinion or otherwise" where she is qualified "by knowledge, skill, experience, training or education," if "scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue."[436] Under the common law, several tests have been developed to determine whether scientific evidence is sufficiently reliable to assist the trier of fact. Until the Supreme Court's decision in *Daubert v. Merrill Dow Pharmaceuticals*,[437] the majority of jurisdictions followed the standard set forth in *Frye v. United States*.[438]

In *Frye,* the court affirmed the conviction of a defendant who had offered in evidence the results of a polygraph test. In sustaining the trial court's refusal to admit this evidence, the *Frye* court said that scientific evidence is admissible only if the principle on which it is based is "sufficiently established to have gained general acceptance in the particular field in which it belongs."[439] Thus, under the *Frye* test, novel theories of causation or results of scientific testing generally would not be admissible if it were shown that such theories and tests were not generally accepted by the scientific community.

In *Daubert*, the Supreme Court held that the *Frye* test had been superseded by the Federal Rules of Evidence and therefore no longer was the standard for determining the admissibility of scientific evidence.[440] In *Daubert*, the parents of two children with birth defects sued the manufacturer of the drug

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[435] *See* *§ 17A.02[9][b][ii] supra.*

[436] *Fed. R. Evid. Rule 702* (Testimony by Experts).

[437] *509 U.S. 579 (1993)*.

[438] *293 F. 1013 (D.C. Cir. 1923)*.

[439] *293 F. at 1014*.

Bendectin, which was used to combat the nausea that frequently occurs during the first trimester of pregnancy, claiming that the mother's ingestion of the drug during the pregnancies caused the children's birth defects. In support of its motion for summary judgment, the defendant's expert testified by affidavit that there was no causal connection between Bendectin and birth defects. The expert's opinion was based on a review of every available epidemiological study of the alleged connection between Bendectin and birth defects. In opposition to the motion, the plaintiffs offered an unpublished reanalysis, prepared for litigation, of a single published animal study as evidence of the causal connection. The district court granted summary judgment for the defendant, and the Court of Appeals for the Ninth Circuit affirmed, holding that the plaintiffs' expert testimony was not admissible, based on the *Frye* general acceptance rule.[441]

In *Daubert*, the Supreme Court directed trial judges applying the Federal Rules to "ensure that any and all scientific testimony of relevance admitted is not only relevant, but reliable."[442] The Court stated:

> [T]he trial judge must determine at the outset … whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology can be applied to the facts in issue.[443]

The Court provided some guidance for determining whether scientific testimony is reliable, including whether a particular theory or technique had been tested, whether such theories or techniques had been subject to peer review and publication, and what the known or potential rate of error of the particular test was, as well as the existence and maintenance of standards controlling the technique's operation.

The inquiry under the Federal Rules was envisioned to be "a flexible one."[444] In allowing for flexibility, the Court did not share the concerns raised by the parties and *amici* in the case, that abandoning the *Frye* test would result in a "'free-for-all' in which befuddled juries are confounded by absurd and irrational pseudoscientific assertions."[445] Rather, the Court stated that "[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."[446]

In 1997, the Supreme Court in *General Electric Co. v. Joiner*[447] held that *Daubert* rulings would be reviewed on appeal under an abuse of discretion standard. Because this standard affords such deference to trial court rulings on the admissibility of scientific expert witness testimony, plaintiffs in indoor air quality cases faced with complex scientific issues are unlikely to find much help on appeal if the district court excludes

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[440] *Daubert, 509 U.S. at 588-89*.

[441] *727 F. Supp. 570 (S.D. Cal. 1989)*, *aff'd, 951 F.2d 1128 (9th Cir. 1991)*. The Ninth Circuit determined that general acceptance in the scientific community of the plaintiffs' reanalysis of epidemiological studies required that the reanalysis be subjected to peer review.

[442] *509 U.S. at 589*.

[443] *509 U.S. at 592-93* (footnote omitted).

[444] *509 U.S. at 594*. Some jurisdictions that did not follow the *Frye* test had taken such an approach. *See, e.g., Paoli R.R. Yard PCB Litig., 916 F.2d 829 (3d Cir. 1990)* (*Fed. R. Evid. 702* and *703* were designed to facilitate admission of evidence in highly technical cases and exclusion of evidence at pretrial stage is extreme measure that rarely is necessary); *Ferebee v. Chevron Chem. Co., 237 U.S. App. D.C. 164, 736 F.2d 1529 (D.C. Cir. 1984)* (as long as methodology used by expert is sound, scientific certainty not required).

[445] *509 U.S. at 595*.

[446] *509 U.S. at 596*.

[447] *522 U.S. 136 (1997)*.

their experts. In the 1999 case of *Kumho Tire Co. v. Carmichael*,[448] the Supreme Court held that the *Daubert* inquiry into relevance and reliability applies not just to "scientific" testimony, but to *all* expert testimony. Thus the trial court had not abused its discretion by excluding, under *Daubert*, the expert testimony of an engineer who sought to opine about the reasons for a tire failure. The fact that the witness had relied on personal observations—which included a visual and tactile inspection of the tire—rather than on scientific principles alone did not preclude the trial court from analyzing the reliability and relevance of his proposed testimony.[449]

[b] Post-*Daubert* Litigation

In an Indiana case, a trial judge had to rule on a *Daubert* motion to exclude the testimony of a witness offered to testify about the levels of formaldehyde in a family's manufactured home. The witness, a professor of environmental studies at Ball State University, had used a formula called the "Berge equation" to correct the formaldehyde concentrations he found in the home to levels he would expect at a higher temperature. The court was prepared to allow the witness to testify about the levels of formaldehyde in the ambient air, but not his use of the "Berge equation," which, the court ruled, was not generally accepted in the scientific community for use in measuring ambient air in homes. Rather, the accepted use of the equation was in the context of carefully controlled testing of component materials used in the construction of manufactured homes.[450]

While not strictly an indoor air quality case, *Sanderson v. International Flavors & Fragrances*[451] suggests that plaintiffs alleging Multiple Chemical Sensitivity (MCS) still face an uphill battle under *Daubert*. In *Sanderson*, the plaintiff brought a products liability action against fragrance manufacturers, claiming that she was injured by aldehydes present in their perfumes. The court granted defendants' motion to exclude the testimony of plaintiff's experts about her alleged MCS, ruling that such "cannot possibly be based on 'scientific knowledge' under *Daubert*."[452] The court noted that it could find no case in which MCS had been recognized as a legitimate medical condition.[453] Other courts have reached similar conclusions.[454]

In *Theresa Canavan's Case*,[455] the Massachusetts Supreme Judicial Court followed both *Joiner* and *Kumho Tire* in an MCS worker's compensation case. At issue on appeal was whether the administrative

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[448] *526 U.S. 137 (1999)*.

[449] *Id. at 151-54*.

[450] Wallace v. Meadow Acres Manufactured Housing Inc., No. 02D01-9410-CP-1501 (Ind. Super. Ct., 38th Jud. Cir. Allen County, June 7, 1999), *in* 17 Andrews Hazardous Waste Litig. Rep. 6 (Aug. 13, 1999). *See also* *Heller v. Shaw Industries, No. Civ. A.95-7657, 1997 U.S. Dist. LEXIS 12399 (E.D. Pa. Aug. 18, 1997)* (unpublished) (expert testimony excluded under *Daubert* in carpet emissions case where expert's VOC calculation methodologies untested for reproducibility, and hence unreliable).

[451] *950 F. Supp. 981 (C.D. Cal. 1996)*.

[452] *Id. at 1001*.

[453] *Id. at 1001–02*. The *Sanderson* court also excluded plaintiffs' expert testimony under *Daubert* on other grounds. *See also* Johnson, *When Science Is Too Daunting: Multiple Chemical Sensitivity, Federal Courts, and the Struggling Spirit of* Daubert, *11 Vill. Envtl. L. J. 273, 329 (2000)* ("Not a single district court has admitted causation testimony regarding MCS … .").

[454] *See, e.g.*, *Zwillinger v. Garfield Slope Housing Corp., No. CV-94-4009, 1998 U.S. Dist. LEXIS 21707, *70 (E.D.N.Y. 1998)* (holding that MCS plaintiff "has failed to demonstrate that [her expert's] methodology is reliable under *any* of the factors set forth by the Supreme Court [in *Daubert*]") (emphasis in original); *Frank v. New York, 972 F. Supp. 130 (N.D.N.Y. 1997)* ("The materials submitted by defendants establish that the theory underlying MCS is untested, speculative, and far from general acceptance in the medical or toxicological community.").

[455] *733 N.E.2d 1042 (Mass. 2000)*.

judge had properly admitted the testimony of the claimant's treating physician, who had diagnosed her with MCS and testified that it resulted from chemical poisoning in her work environment. The court held that appellate review of the judge's admissibility determination should be under an abuse of discretion, rather than a *de novo*, standard,[456] and that expert witness conclusions based upon observations and clinical experience were not immune from a reliability inquiry.[457] Applying these rules, the court determined that the judge had abused his discretion by admitting the treating physician's diagnosis testimony, as "[t]here was no evidence in the record to show that [he] used a reliable methodology to transform his general finding of chemical exposure to his more specific diagnosis of MCS."[458]

[4] Damages

Measuring damages caused by indoor air pollution is difficult because the possible injuries are numerous and the health effects often are difficult to measure. A plaintiff may seek potential damages for property damage, economic losses, compensation for physical injury, increased risk of cancer or other diseases, emotional distress, and future medical monitoring. Property damages are mea sured by the reduced value of a building or the cost of mitigating the indoor pollution problem. Physical injuries are compensable.[459] However, the measurement of these damages is complicated by the long latency periods associated with many indoor air pollutants and the difficulty in proving that symptoms or diseases that can be caused by many factors were in fact caused by a particular indoor air pollutant.

Damages for increased risk of cancer or other diseases also are difficult to prove. The general rule is that damages for future consequences of tortious injury are recoverable only where consequences are reasonably certain, that is, where future consequences are more likely than not to occur.[460] Thus, courts have permitted recovery for fear of a future disease or condition where physical injury also exists.[461] Courts are split, however, on whether plaintiffs also may seek damages for emotional distress due to a reasonable fear of future injury. In *Potter v. Firestone Tire & Rubber Co.*,[462] an appellate court upheld an award of compensatory and punitive damages for the negligent infliction of emotional distress resulting in fear of cancer, psychological damage, and

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[456] *Id. at 1049*.

[457] *Id. at 1050*.

[458] *Id. at 1050–51*.

[459] Damages in indoor air quality cases sometimes extend beyond those for personal injury and property damage. For example, in *Commonwealth v. TLT Constr. Corp., 10 Mass. L. Rptr. 213, 1999 Mass. Super. LEXIS 252 (1999)*, Massachusetts brought an action against various defendants for negligent waterproofing of the exterior of the Suffolk County Courthouse. The substance used in the waterproofing work, Duramem, allegedly caused sickness in court employees, damaged the courthouse exterior, and rendered parts of the building temporarily unusable. Among the damages sought by the state was the sum of $700,000 expended on full wage compensation voluntarily paid to its employees who had become too incapacitated by Duramem fumes to work. Defendant TLT argued that the state's claim for reimbursement would duplicate defendant's liability in the case of employees who had brought private suits against the defendant. Finding genuine issues of fact as to the nature of the workers' claims, and the extent to which the wage payments represented the state's expenses for property damage and business interruption, as well as a reasonable attempt to mitigate damages, the court denied defendant's motion for summary judgment.

[460] *See Hagerty v. L&L Marine Servs., 788 F.2d 315 (5th Cir. 1986)*. "Reasonable certainty" usually requires that the probability of occurrence be greater than 50%. *Herber v. Johns-Manville Corp., 785 F.2d 79 (3d Cir. 1986)*.

[461] *See 50 A.L.R. 4th 13 (2003)*; Gale & Goyer, *Recovery for Cancerphobia and Increased Risk of Cancer*, 15 Cumb. L. Rev. 723 (1985); Dworkin, *Fear of Disease and Delayed Manifestation Injuries: A Solution or a Pandora's Box*, *53 Fordham L. Rev. 527 (1984)*. *See also Friedmann v. McGowan, 42 A. 723 (Del. 1898)*; *Buck v. Brady, 73 A. 277 (Md. 1909)*; *Gamer v. Winchester, 110 S.W.2d 1190 (Tex. Civ. App. 1937)*.

[462] *15 Cal. App. 4th 490, 274 Cal. Rptr. 895 (1990)*.

disruption of lives. The *Potter* plaintiffs discovered that their drinking water supply was contaminated with chemicals, including benzene and vinyl chloride, from an adjacent landfill to which the defendant had sent large quantities of liquid wastes. Although the plaintiffs alleged that they suffered from a wide array of physical symptoms, the trial court concluded that it was not possible to demonstrate with sufficient certainty a causal connection between their symptoms and the well-water contamination. Nevertheless, the court found that the plaintiffs would always reasonably fear that the physical impairments they experienced were the result of the contaminated water and were the precursor of a life-threatening disease. However, in *Bubush v. Philadelphia Electric Co.*,[463] the court held that mere exposure is not equivalent to physical injury, reasoning that proof of damages would be highly speculative and would result in "windfalls for those who never take ill and insufficient for those that do."[464]

Plaintiffs also may claim damages for the expense of medical monitoring because of their increased risk of future disease. For example, in *Ayers v. Jackson Township*,[465] the jury awarded the plaintiffs a substantial recovery for medical monitoring for early detection of cancer. Although the intermediate appellate court vacated the jury's verdict on the ground that evidence of an increased risk was not presented, the New Jersey Supreme Court reinstated the jury's verdict and ordered the township to pay $8 million to cover medical monitoring costs.[466]

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[463] *717 F. Supp. 297 (M.D. Pa. 1989)*.

[464] *717 F. Supp. at 300* (quoting *Schweitzer v. Consolidated Rail Corp., 758 F.2d 936, 942 (3d Cir. 1985)*). *See also Burk v. Sage Products, Inc., 747 F. Supp. 285 (E.D. Pa. 1990)* (fear without physical injury is not actionable); *Friedman v. F.E. Myers Co., 706 F. Supp. 376 (E.D. Pa. 1989)* (claims for emotional distress are not legally cognizable until plaintiff manifests physical injury caused by exposure).

[465] *202 N.J. Super. 106, 493 A.2d 1314 (App. Div. 1985)*, *rev'd in part*, *106 N.J. 557, 525 A.2d 287 (1987)*.

[466] *Id.*

§ 17A.11 Conclusion

Reliance on common law remedies as a means of reducing exposure to indoor air pollution is unsatisfactory for everyone. To succeed in obtaining compensation for indoor air pollution, plaintiffs must overcome substantial common law barriers to recovery: they must sue within the allowable statutes of limitations, they must prove causation, and they must know the proper defendants to sue. The jury process often leads to erratic and unpredictable results.

From the defense perspective, the defects of common law litigation are just as substantial. First, strict products liability law creates the prospect of immense damages judgments for conduct that would be considered blameless by any other standard. Second, the exclusivity of workers' compensation remedies encourages suits against third parties that perhaps should not be brought. Third, the random element in common law suits sends mixed signals to industrial and commercial actors who may become the targets for such suits.[467]

Builders, architects, realtors, product manufacturers, and others do not know the standard to which their conduct should conform, because the standard differs from case to case and becomes more stringent as knowledge expands. At present, the business community is forced to defend against certain meritless claims and, indeed, often must settle such claims rather than incur the costs and risks of litigation. In short, common law liability is unreliable as a vehicle for realizing improvements in the indoor environment; the system is inefficient, unpredictable, ineffective, and often unfair.

Litigation over liability for exposure to indoor air pollutants will best be stemmed by addressing the concerns that otherwise would give rise to lawsuits.[468] Based on current knowledge of the nature and scope of indoor air pollution, reducing exposure to many indoor air pollutants can be primarily a matter of good design and proper work practices. Moreover, employers often are happy to protect their employees, if only they know what protective measures are required. Under common law liability, however, the employer's obligations are in flux.

The key to the resolution of indoor air pollution liability, therefore, is guidance: guidance to individuals about the risks posed by indoor air pollution; guidance to employers, building owners, and the broader group of actors who play a role in building design and specification; guidance to state and local governments, which may wish to make decisions concerning building codes or product specifications; and guidance to the federal government in its efforts

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[467] Governo, *The Transformation of Indoor Air Quality Claims from Predictable Risk to Expanding Uncertainty*, 8 Mealey's Emerging Toxic Torts 7 (Oct. 6, 1999) ("Indoor air quality litigation is undergoing a revolution that exposes countless new business people and their insurers to unexpected liability.").

[468] One commentator has posited a four-step "progression" that leads to litigation in IAQ situations. First, there is often a "disconnect" between IAQ complainants and the building managers and engineers who process their complaints—this may result from differences in job description, sex, and attitudes toward smoking, as well as differences in perception as to whether "health" or "comfort" is at issue. Second, if the problem is not quickly resolved, the complainant will likely become angry about both the building and its staff. The third step is that each side hardens in its positions. Fourth, and finally, is the involvement of an outside mediator. *See* Pinto, *How IAQ Problems Grow Into Lawsuits*, 8 Occupational Hazards 41 (Aug. 1, 2001). *See also* Davis, *Avoiding Litigation Arising from IAQ Complaints*, 70 Heating/Piping/Air Conditioning 89 (Oct. 1998) (outlining approaches for building owners and managers).

to regulate indoor air quality. This guidance must rely on expanded knowledge about the nature, concentrations, and sources of indoor pollutants, and on methods for controlling them.

§ 17A.12 Indoor Air Quality Checklists

[1] IAQ Management Checklist

[2] Building Air Quality Action Plan Verification Checklist

NIOSH and EPA developed an eight-step plan to help building owners and managers implement good air quality management practices. The eight steps in the Building Air Quality Action Plan are

- designate an IAQ manager;
- develop an IAQ profile of the building;
- address existing and potential IAQ problems;
- educate building personnel about IAQ management;
- develop and implement a plan for facility operations and maintenance;
- manage processes with potential significant pollutant sources;
- communicate appropriately with tenants/occupants about their role in maintaining good IAQ; and
- establish procedures for responding to IAQ complaints.

The entire document is available from NIOSH's web site at http://www.cdc.gov/niosh/98-123a.html.

End of Document

§ 17A.13 Indoor Air Quality Complaint Form

Indoor Air Quality Complaint Form

End of Document

§ 17A.14 IAQ Incident Log

IAQ Incident Log

Environmental Law Practice Guide

End of Document

§ 17A.15 Occupant Interview

Occupant Interview

§ 17A.16 Occupant Diary

Occupant Diary

End of Document

§ 17A.17 Investigation of an Indoor Air Quality Problem

Investigation of an Indoor Air Quality Problem

(Extended Form)

Symptoms Questionaire

Complete this questionnaire for each person affected (use additional pages as required).

Name of person: Tom Worth

Specific building location(s) involved: Main Building

Date: 8/11/02 Time: 2 PM

Person administering questionnaire: June Goldman, Asst. Principal

Do you have a history of allergies? If yes, describe the type of problem, when it occurs, and any medication you take: Yes—seasonal—Zyrtec

Check any symptoms you have experienced since the beginning of the school year. Estimate and check the number of days you have had this symptom.

	0–24 Hrs			24 Hrs–1 Wk	1–4 Wks	4 Wks
□	Headache	□	□	□	□	
□	Dry Mouth	□	□	□	□	
□	Dizziness or Faintness	□	□	□	□	
□	Difficulty Concentrating	□	□	□	□	
☒	Eye Irritation	□	□	☒	□	
□	Hoarseness	□	□	□	□	
□	Fever	□	□	□	□	
□	Burning of the Nose	□	□	□	□	
☒	Throat Irritation	□	□	☒	□	
□	Nasal Congestion	□	□	□	□	
□	Coughing	□	□	□	□	
☒	Skin Irritation	□	☒	□	□	
□	Too Hot	□	□	□	□	
□	Too Cold	□	□	□	□	
□	Other (describe):					
		□		□	□	□

Have your symptoms occurred □ Continually ☒ Intermittently

Did you have any of these symptoms during the last summer or school year? If yes, name them: No

If you checked any symptoms, please describe them in more detail: Itchiness in eyes & throat for last 2 weeks; now skin is itching.

Have you sought medical attention for these symptoms? Please describe: Not yet, but planning to see allergist.

During which months are you likely to experience symptoms? (Check all that apply): N/A

□ J □ F □ M □ A □ M □ J □ J □ A □ S □ O □ N □ D

During which days of the week are you likely to experience symptoms? (Check all that apply): Could be any day.

☒ M ☒ T ☒ W ☒ Th ☒ F ☒ S ☒ S

During which part of the day are you likely to experience symptoms? (Check all that apply):

□ a.m. □ p.m. □ All the time ☒ Anytime

What are the weather conditions when you experience symptoms? (Check all that apply):

□ Rainy, stormy	□ Calm, mild	□ Windy
□ Dry	☒ Hot, humid	□ Cold

How long have you worked/attended school in this building? 2 years

After you began work or started school in this building, how long was it before a symptom started?

(Check one): □ right away □ days □ weeks □ months ☒ years

□ symptoms began before I was in this building

If you leave the building, do your symptoms improve? Yes (X) No ()

If yes, how rapidly:

□ minutes ☒ hours □ overnight □ days

Do you smoke? □ Yes ☒ No

Are you bothered by cigarette smoke? ☒ Yes □ No

Have you detected any odors? Describe: None

What do you think is the cause of your symptoms: Do not know

Potential Sources or Indoor Air Quality Problems

The investigator may complete this section to the extent necessary to identify a likely source of contamination.

There are many potential sources of indoor air pollution, many not immediately apparent. This questionnaire will assist in the recollection of events that may have contributed to exposure to specific pollutants. This should be a “brainstorming session” with the investigator collecting all possible information and not trying, yet, to judge its relevance to the present problem.

§ 17A.17 Investigation of an Indoor Air Quality Problem

If appropriate, sketch the affected areas including equipment, activities, lighting, intake and exhaust ducts, room dividers, and windows. Also include the adjacent rooms and spaces (e.g., science classroom). If the space below is insufficient, attach your drawing.

Does this are or a nearby area have: N/A—throughout main building.

□ Motor vehicles	□ Garbage storage	☒ Duplicating machine
□ Arts and crafts	□ Science	□ Ind.arts/voc.shops
□ Animals	□ Cigarette smoking	□ Other

Has there been any:

□ New Construction	□ Painting	□ Cleaners used
□ Pesticides	☒ Installation of carpets	☒ Other: New flooring installed /old flooring removed

Is there any evidence of:

□ Water damage or stains	□ Mold growth	☒ Dirt around air ducts
□ Inadequate lighting/glare	□ Noise	

Equipment, Materials, Supplies

List equipment, materials and supplies that have been introduced or modified, or whose emissions are not being removed.

a) Equipment: N/A—Unaware of new equipment

	Type, brand, model number	Date Installed	Special Comments
1.			
2.			
3.			
4.			

b) List materials used in this classroom or work area:

	Material description or brand	Date of Use	Special Comments (any warning on labels?)
1.	New carpet	7/20/02	Carpet is certified low-emission
2.	New tile flooring	7/20/02	Unknown
3.			

§ 17A.17 Investigation of an Indoor Air Quality Problem

	Material description or brand	Date of Use	Special Comments (any warning on labels?)
4.			

c) List furniture, accessories, and the protective coating used. Include rugs, drapes, curtains, or other decorative materials. N/A

	Type	Material	Date Introduced	Comments
1.				
2.				
3.				
4.				

d) List any chemicals introduced such as paints, surface coatings, floor, rug or fabric cleaners, deodorants, insecticides, and detergents, etc.

	Type of Material Used (include brand)		Last Date Used		How Often Used	Comments
1.	Possibly a sealant w/flooring?	7/20/02	Once	Investigate whether sealant was used, and if so what type?		
2.	Varnish on shelves	11/01	Once	Investigate type of varnish		
3.						
4.						

Does this area or a nearby area have: N/A

□ Motor vehicles	□ Garbage storage	□ Duplicating machine
□ Arts and crafts	□ Science	□ Ind. arts/voc. shops
□ Animals	□ Cigarette smoking	□ Other

Has there been any: N/A

□ New construction	□ Painting	□ Cleaners used
□ Pesticides used	□ Installation of carpets	□ Other

Is there any evidence of: N/A

□ Water damage or stains	□ Mold growth	□ Dirt around air ducts
□ Inadequate lighting/glare	□ Noise	

Equipment, Materials, Supplies

List equipment, materials and supplies that have been introduced or modified, or whose omissions are not being removed.

a) Equipment: N/A

	Type, Brand, Model Number	Date Installed	Special Comments
1.			
2.			
3.			
4.			

b) List materials used in this classroom or work area: N/A

	Material Description or Brand	Date of Use	Special Comments (any warnings on labels?)
1.			
2.			
3.			
4.			

c) List furniture accessories, and the protective coating used. Include rugs, drapes, curtains, or other decorative materials. N/A

	Type	Material	Date Introduced	Comments
1.				
2.				
3.				
4.				

d) List any chemicals introduced such as paints, surface coatings, floor, rug or fabric cleaners, deodorants, insecticides, and detergents, etc. N/A

	Type of Material Used (include brand)	Last Date Used	How Often Used	Comments
1.				
2				
3.				
4.				

Activities

a) List activities performed in this classroom or work area: Main building has many students, teachers, and staff moving through each day. No science labs or other chemical-related activities here.

	Activity	Usual Schedule	Emissions From Activity heat odors, fumes
1.	Cleaning	Daily	Cleaning odors/fumes
2.			
3.			
4.			

Episodic or Unusual Events

Building problems sometimes begin after events such as pipes breaking, roof leaks, etc. Describe any such events.

	Event	When Occurred	Comments
1.	Flooring removal & re-installation	7/20/02	Confirm precise dates of use; investigate whether ventilation used
2.	New carpeting	7/20/02	Confirm precise dates of use; investigate whether ventilation used
3.	Shelving sealed in library	Approx. 11/01	Confirm precise dates of use; investigate whether ventilation used

Evaluating of Heating, Ventilation, and Air Conditioning (HVAC) Systems

As needed, the investigator or a person knowledgeable about proper operation and maintenance of heating, ventilation, and air conditioning systems should complete this section of the protocol. Often the HVAC system is the cause of an indoor air problem, delivering air that is the improper temperature or level of humidity or delivering too few air changes for human comfort. Also, improper maintenance can lead to mold growth, which may be the source of symptoms. It is important to have a way to identify these problems. In many cases, adjustments in the HVAC

system will eliminate indoor air symptoms. When a point source is causing the problem, several solutions exist: the source can be eliminated, local ventilation can be installed, or alterations to the HVAC system may be necessary.

The following pages will allow you to systematically review the HVAC system and identify common types of problems.

In any investigation of a problem with the indoor environment, it is important to understand how the HVAC system in the building works and to document any recent changes that may have occurred in the HVAC system's design or operation.

It will be helpful to the investigation if, in addition to answering the general questions below, the investigator can obtain prints or diagrams of the HVAC system for the affected area. Also useful are descriptions of the building intake and exhaust systems and any other pertinent information.

1. Is the building served by one HVAC system or is the building divided into sections served by different units? Describe (include type of distribution system; e.g., VAV, dual duct, fan coil, etc.): Boiler and Central A/C

2. What type of heating is used for the building?

a) On-site boiler: ☒ Yes □ No If yes, what type of fuel: □ Gas ☒ Oil Other: _____ _____

Approximate age of boiler: 25 years

b) Central steam: □ Yes ☒ No

c) Electric: □ Yes ☒ No

d) Other: _____

3. Is accessory heating used in the affected area: ☒ Yes □ No

If yes, please describe: Electric

4. What type of cooling?:

□ None □ Central ☒ Zone □ Individual Unit

5. Ventilation:

Can windows be opened? ☒ Yes □ No

Is there a central ventilation system? ☒ Yes □ No

Where is the fresh air intake with respect to any building exhausts? (e.g., boiler flue, kitchen exhaust, cooling lower vent pipes): At package unit; not near exhausts

6. Humidification/Dehumidification:

Is humidification equipment used? ☒ Yes □ No

If yes, ☒ central □ local? Describe (include type; e.g. steamjet, air washer, water spray, etc.): Air

Is dehumidification equipment used? Yes

If yes, ☒ central □ local? Air

7. Filtration:

Describe type of filtration used (central and local): On package; replaceable filters at unit and at filter grills

§ 17A.17 Investigation of an Indoor Air Quality Problem

8. Are the outdoor air dampers on air handling units fixed in the closed position or not providing outdoor air for another reason?

□ Yes ☒ No

If yes, list each air heating unit and the space(s) served: Automatic fresh air damper in unit

9. Are there other areas in the building that share the same conditioned air as the area where symptoms have occurred?

☒ Yes □ No

If yes, there may be activities within these areas that could emit gases or aerosol forms of liquids and/or solids into the air circulated throughout the building. Based upon what you know about activities in the building, please list those which should be investigated. Carpeting; flooring adhesives and sealant; varnish

10. Are there any sources outside the building, such as garages, industrial plants, restaurants, and dry cleaners, whose emissions can, under certain conditions, be taken in by the building ventilation system? No

List them: _____

_____

_____

11. Are condensate pans in air handling units draining? ☒ Yes □ No

Are condensate pans in air handling units clean? ☒ Yes □ No

(No heat pump; straight air)

12. Were there any changes made in the heating, ventilation, and air conditioning system around the time of the incident? No

If so, describe them: _____

_____

_____

13. Temperature/Relative Humidity (R.H.)

	Room	**Date/Time**	**Temperature**	**R.H.**
a)	Classroom 8	8/11 2 pm	72 degrees	72%
b)	Classroom 8	8/12 2 pm	75 degrees	75%
c)	Cafeteria	8/12 2 pm	75 degrees	86%
d)				

14. Carbon Dioxide (take measurement during peak occupancy):

	Room	**Date/Time**	**CO_2 Room/Outdoor**
a)	Main Duct	8/12 3 pm	Within desireable limits
b	Boiler	8/12 3	Within desireable

Room	Date/Time	CO_2 Room/Outdoor
)	pm limts	
c		
)		
d		
)		

Investigator's Assessment:

Review previous data collected. Summarize the main features of this problem and what you think are the relevant sources or HVAC Information. This should be only a few paragraphs and should demonstrate the logic of your hypothesis as to what is causing the problem.

Based upon when Mr. Worth's symptoms began, we feel confident that the problem relates to the July 2002 flooring replacement in the main building. We are inclined to rule out the new carpeting, which is certified low-emission, as well as the shelf varnishing project this took place in 2001, well before the onset of symptoms.

At this time, our ventilation system is functioning within normal limits. However, we need to examine maintenance records of July 2002 to determine whether a ventilation problem coincided with floor replacement.

Do you have an explanation for these symptoms? ☒ Yes □ No Possibly

If yes, what is the cause? Most likely a reaction to either (1) contaminants released from tear-out of old flooring; or (2) sealant used on new flooring.

What is the recommended solution and time frame? Have air tested and, if necessary, cleaned; to be done within next 7–10 days.

A. Actions to be taken in the area affected (e.g. discontinue use of materials): None

B. Actions to be taken by maintenance personnel (e.g. Increase ventilation, unclog air intake, repair thermometer): Examine ventilation maintenance records from July 2002.

A. Other actions:

- Investigate type of floor sealant used.
- Arrange for air testing and cleaning.

If none, what is the next step (this is a matter of judgment for the investigator)?

_ Monitor for several days to determine if the problem continues.

_ Initiate further evaluation.

Signatures: Investigator: _____ Date: 8/13/02

_____

_____

Principal: _____ Date: 8/13/02

_____

_____

FOLLOW-UP: (complete A or B as appropriate)

Follow-up should take place 1-3 months after the initial response or 1-3 weeks after the action plan is completed. Continuous communication should be maintained with the reporter(s).

A. This problem has been solved: Air testing revealed high concentrations of contaminants in air, likely released by tear-out of flooring in July 2002. Outside consultants have cleaned the air. Mr. Worth's symptoms have ceased.

Signatures: Investigator: _____ Date: 9/10/02

Principal: _____ Date: 9/10/02

B. This problem has not been solved (describe the ongoing problem briefly): N/A

Action planned and time frame (describe): N/A

We have discussed the problem and recommend the above plan of action to evaluate and solve this issue.

Signature: Investigator: _____ Date: _____

Principal: _____ Date: _____

End of Document

§ 17A.18 HVAC Checklist

HVAC Checklist

Environmental Law Practice Guide

End of Document

§ 17A.19 Pollutant and Source Inventory

End of Document

§ 17A.20 Complaint

Name of Court

Date of _____

_____ Plaintiff(s) Name

Plaintiff(s),

v.

_____ Defendant(s) Name

Defendant(s).

COMPLAINT

Plaintiff(s) allege:

COUNT I CAUSE OF ACTION AGAINST ARCHITECT

1. Defendants negligently and carelessly drafted, created and designed the Building in that said building was designed with no openings or windows for the free passage of air. Instead, Defendants exclusively relied upon an independent air circulation system which drew outside air into the Building through a maze of mechanical contrivances, ducts, baffles, filters and other devices presently unknown to plaintiff, but known to Defendants. Defendants failed to take into account and negligently and carelessly failed to provide an adequate return air system. Defendants knew or reasonably should have known that the interior of the Building was to be partitioned in such fashion that certain rooms, cubicles and other locations within the Building would contain stale and trapped air. Because of the negligence and carelessness of Defendants in failing to provide proper adequate intakes of fresh air and return air ducting to enable free and complete circulation of fresh air into said rooms, cubicles and other locations in the Building, Plaintiff was injured and damaged as hereinafter alleged.

COUNT II CAUSE OF ACTION AGAINST BUILDING CONTRACTORS

2. At all times herein mentioned, Defendants held themselves out as general contractors, knowledgeable in the general building industry. Defendants knew or reasonably should have known that if the Building were built to the plans and specifications provided by the architects and their agents, that because said Building depended solely upon a mechanical system of circulating fresh air, that said Building would contain rooms, cubicles and other spaces where air would be trapped and not permitted to freely circulate and would constitute a dangerous condition to the health and safety of persons working in said rooms, cubicles and other spaces where air would be trapped. Defendants knew or reasonably should have known that air not permitted to freely circulate would constitute a dangerous condition to the health and safety of persons working in said rooms, cubicles and other spaces where fresh air was not adequately permitted to circulate. Moreover, Defendants knew or should have known that in the event that toxic materials were permitted to invade the system, that all persons in said Building would be exposed to an environment wherein their health could be damaged or destroyed.

3. Said Defendants negligently and carelessly failed to call to the attention of the architect the defects in the air conditioning and heating system and negligently and carelessly constructed said Building without an adequate air circulating system, and negligently and carelessly permitted a dangerous environment to exist which proximately caused the injuries to Plaintiff as hereinafter alleged.

COUNT III CAUSE OF ACTION AGAINST MECHANICAL ENGINEERS

4. Plaintiff is informed and believes, and upon such ground alleges, that at all times herein mentioned Defendants were project designers and mechanical engineers who owed a duty to engineer the installation of systems which would be adequate, safe and free from defects, and said Defendants knew or reasonably should have known that the heating and air conditioning system relied upon to provide fresh air to the occupants of the Building was inadequate, dangerous and unsafe in that there were no adequate mechanical provisions for exhausting air in certain rooms, cubicles and other spaces, thus permitting toxic materials to create a dangerous, unhealthy and unsafe environment which proximately caused the injuries and damages to Plaintiff as hereinafter alleged.

COUNT IV CAUSE OF ACTION AGAINST BUILDING PRODUCT MANUFACTURERS, SELLERS, DISTRIBUTORS AND INSTALLERS

5. Plaintiff is informed and believes, and upon such ground alleges, that at all times herein mentioned Defendants were the manufacturers, sellers, distributors and installers of a certain [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds], which Defendants knew or reasonably should have known was dangerous and a health hazard if said [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds] was placed in a structure or space wherein a free circulation of fresh air was unavailable to carry away toxic fumes released into the atmosphere by said [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds]. When said [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds] was applied, it became dangerous to those persons working therein who breathed toxic fumes. Defendants knew or reasonably should have known that said [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds] could cause serious physical injuries to persons in close proximity thereto. Defendants knew or reasonably should have known that persons in close proximity thereto should be warned of the dangerous toxins involved with said products; that said Defendants negligently and carelessly failed to warn those persons, including Plaintiff, of the dangers of said [plastic floor tile, floor coverings, glue, carpeting, plastic partitions made of chemicals and compounds] and as a proximate result thereof, Plaintiff was injured and damaged as hereinafter alleged.

COUNT V CAUSE OF ACTION AGAINST MANUFACTURERS OF AIR CONDITIONING COMPONENTS

6. At all times herein mentioned, Defendants were the manufacturers, sellers, distributors and installers of certain air conditioning components used in air conditioning and heating system that contained chemicals which, if permitted to be discharged into the system, would be circulated into all areas of Building, including the area where Plaintiff was located. Plaintiff is informed and believes, and upon such ground alleges, that the chemicals used in said air conditioning and heating system were toxic in nature and harmful to health; that said Defendants owed a duty to confine said chemicals and not permit the same to be circulated into the air conditioning and heating system

of Building. Said Defendants negligently and carelessly permitted said toxic chemicals to be discharged into the air in the area wherein Plaintiff was located so as to proximately cause the injuries and damages to Plaintiff as hereinafter alleged.

COUNT VI CLAIMS AGAINST ALL DEFENDANTS

7. From before and after [*date*], Plaintiff worked in his cubicle space in the Building, working therein many hours, including on many occasions beyond the time the timer had shut down the air circulation system.

8. Plaintiff was unaware of the fact that the dangerous chemicals, gases and toxins which had been discharged into his working environment from the carpet, the glue affixing the carpet, the tile, the glue affixing the tile, the partitions, the chemicals, toners and other products, the identity of some of which are still unknown to Plaintiff, were subjecting him to a dangerous, toxic, deadly, unsafe environment which was hazardous to his health. Plaintiff continued to be subjected to said dangerous, unsafe and unhealthy environment to approximately [date], at which time due to the accumulation of toxic chemicals in Plaintiff's body, Plaintiff suddenly, unexpectedly and without warning, and through no fault of Plaintiff, became comatose and suffered physical and mental injuries, and damages, and Plaintiff is informed and believes, and upon such ground alleges, that he will continue to suffer permanent physical and mental disorders in the future.

9. As a direct and proximate result of the conduct of Defendants, Plaintiff has been compelled to secure the services of physicians, nurses, hospitals and has otherwise been obliged to expend sums for medical and incidental care and treatment. Plaintiff is informed and believes, and upon such ground alleges, that he will be required to expend further sums in the future for medical and incidental care and treatment.

10. As a further direct and proximate result of the conduct of Defendants, Plaintiff has been unable to attend to his usual occupation and has thereby sustained lost earnings and loss of earning capacity. Plaintiff is informed and believes, and upon such ground alleges, that he will be required to sustain additional lost earnings in the future.

11. At all times herein mentioned, the products were manufactured by Defendants and placed in commerce as heretofore alleged, to wit: the glue used to affix the tile, carpet and other floor coverings, the plastic partitions, the chemicals used as toners in the duplicating machines, and other chemicals, which are presently unknown to Plaintiff, all of which discharged toxic chemicals and fumes into the air, were dangerous, ultrahazardous and, under the circumstances, were required to be handled with extreme caution and care; and Defendants owed a duty to oversee the use of said chemicals and other products in the Building. Due to the very nature of the toxic chemicals and other products involved herein and the ultrahazardous condition created by their use, Defendants, and each of them, are strictly liable in tort for the injuries and damages suffered by Plaintiff as herein alleged.

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