COMMENTS

Environmental Law in an Office Building: The Sick Building Syndrome

Imagine you are a court clerk or a district attorney at your first day of work in a newly-constructed courthouse.[1] Shortly after you start working, you begin to have headaches, eye irritation, dizzy spells, and a sore throat. Many of your fellow employees exhibit the same symptoms. Some of them report other symptoms: fatigue, burning skin, nasal congestion, and skin rashes. Since your symptoms seem like a cold or flu, you assume some new "bug" is going around the office. However, your symptoms only improve when you leave the building at night, on weekends, and during vacations. After twenty of your fellow employees go to the hospital complaining of respiratory ailments, you decide to see a physician. The physician orders some tests, but finds no conclusive evidence of any illness.

Shortly thereafter, your employer evacuates the building for a few days to study the building's air quality. Although several "corrective measures" are taken, the health complaints continue. Since you have read about similar episodes, you wonder if a state or federal government agency can help you. Aside from providing information, however, no government assistance is forthcoming. After recognizing that more than half of the employees have reported building-related health problems, your employer decides to close the building. Now that you are working in a different building, your symptoms have disappeared. Meanwhile, your

[1] This scenario is based on the recent problems with the DuPage County Judicial and Office Center in suburban Chicago. *See, e.g.*, Mark Hansen, *Toxic Torthouse?: Ailing Employees Sue Builders of New Courthouse in Suburban Chicago*, A.B.A. J., Dec. 1992, at 26; Robert Becker & Ted Gregory, *Sick Buildings are Difficult to Diagnose, Often Costly to Cure*, CHI. TRIB., Sept. 6, 1992, at C1; Joseph Sjostrom, *Study Confirms Courthouse Illnesses*, CHI. TRIB., Jan. 12, 1993, at D1. In the actual case, the building reopened after the county spent more than $3 million to modify the ventilation system, as well as $325,000 to pay law firms and $193,000 to pay employees' physicians. Despite these expenditures, some employees claim that the air is still unhealthy. Robert Becker & Joseph Sjostrom, *Courthouse Air Still Bad, Some Workers Say*, CHI. TRIB., May 11, 1993, at DU1.

employer spends $3.5 million to fix the building's defective air circulation system (the presumed cause of the illnesses), and hopes to reopen the building in a few months. You now face the decision of whether to join a lawsuit against the building design and construction firms.

The acute health effects and discomfort you suffered in this scenario are collectively called the sick building syndrome (SBS). SBS is usually defined as a condition where more than twenty percent of a building's occupants suffer from headaches, mucous membrane irritation, fatigue, dizziness, and nausea.[2] As in the above scenario, the cause of the symptoms often remains a mystery.[3] For a surprisingly large number of American office workers, however, this scenario is not imaginary.

SBS is a relatively recent phenomenon. The first reports of the syndrome emerged in the early 1970s. Two simultaneous trends are commonly blamed for the rise of SBS. First, since World War II there has been an explosion in the variety and quantity of synthetic materials used in office buildings.[4] Second, the energy crisis of 1973-74 triggered a dramatic change in building construction and operating practices. The rise in energy costs during this period prompted building owners and operators to "tighten" office buildings by sealing windows shut and using more insulation to reduce energy expenditures.[5] These two trends offer clues about the possible cause or causes of the syndrome. However, the scientific debate about the causes of SBS reveals no simple answers.[6]

Although this paper focuses on the sick building syndrome, the syndrome is part of a much larger problem, indoor air pollution. Americans spend ninety percent of their time indoors, and indoor concentrations of air pollutants are often higher than outdoor concentrations.[7] Recognizing the implications of these two

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[2] Jan A. J. Stolwijk, *Sick Building Syndrome*, 95 ENVTL. HEALTH PERSP. 99 (1991).

[3] *Id.*

[4] David T. Mage & Richard B. Gammage, *Evaluation of Changes in Indoor Air Quality Occurring Over the Past Several Decades*, *in* INDOOR AIR AND HUMAN HEALTH 5, 8-9 (Richard B. Gammage et al. eds., 1985).

[5] *Id.* at 10. As a result, the sick building syndrome is also called the "tight building syndrome."

[6] *See infra* part I.B.

[7] *See* OFFICE OF RESEARCH AND DEV., U.S. ENVTL. PROTECTION AGENCY, REPORT TO CONGRESS ON INDOOR AIR QUALITY: VOLUME I: FEDERAL PROGRAMS ADDRESSING INDOOR AIR QUALITY 2 (1989) [hereinafter FEDERAL PROGRAMS].

facts, the Environmental Protection Agency (EPA) recently announced that both radon and non-radon indoor air pollution rank very high in terms of health risk but low in terms of EPA effort.[8] In short, indoor air pollution is a serious environmental problem that has not yet received the attention it deserves.

However, SBS is not simply a subset of indoor air pollution. SBS has both psychosocial and occupational health dimensions. Thus, SBS simultaneously overlaps and extends beyond the issues raised by indoor air pollution alone. As a result, any proposed solution to SBS must address these differences.

Many of the most important indoor pollutants, including radon, asbestos, tobacco smoke, and formaldehyde, have been discussed elsewhere.[9] Although these articles discuss a wide range of indoor air pollutants, SBS is given a cursory examination. The inadequate analysis of SBS stems partly from the authors' design and partly from a failure to appreciate the broader issues raised by SBS.

This Comment is an effort to draw more attention to the vexing scientific and legal problems posed by the sick building syndrome. After defining SBS, part I of this Comment explores the causes, prevalence, economic costs, and technical solutions to the syndrome. Part II analyzes the current legal response to SBS, ranging from federal law to local building codes to tort litigation. Part III outlines possible market-based and regulatory responses to SBS. Part IV analyzes two recent federal proposals to address indoor air quality problems including SBS. This Comment argues that Congress should pass a modified version of the Indoor Air Quality Act of 1993, which would greatly increase federal attention to, and funding for, objective research on SBS.

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[8] OFFICE OF POLICY ANALYSIS, U.S. ENVTL. PROTECTION AGENCY, UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS xix-xx (1987) [hereinafter UNFINISHED BUSINESS].

[9] *See generally*, Andrea Giampetro-Meyer, *Rethinking Workplace Safety: An Integration and Evaluation of Sick Building Syndrome and Fetal Protection Cases*, 8 UCLA J. ENVTL. L. & POL'Y 1 (1988); Andrew J. Harrison, Jr., *An Analysis of the Health Effects, Economic Consequences and Legal Implications of Human Exposure to Indoor Air Pollutants*, 37 S.D. L. REV. 289 (1992); Steve Kelly, *Indoor Air Pollution: An Impetus for Environmental Regulation Indoors?*, 6 B.Y.U. J. PUB. L. 295 (1992); Laurence S. Kirsch, *Behind Closed Doors: Indoor Air Pollution and Government Policy*, 6 HARV. ENVTL. L. REV. 339 (1982); Steven A. Loewy et al., *Indoor Pollution in Commercial Buildings: Legal Requirements and Emerging Trends*, 11 TEMP. ENVTL. L. & TECH. J. 239 (1992); Note, *Legislation for Clean Air: An Indoor Front*, 82 YALE L.J. 1040 (1973).

I

A PRIMER ON THE SICK BUILDING SYNDROME

This part explores the scientific evidence about SBS. The complexity and uncertainty of the research results that follow are an integral part of this paper. The policy discussion in part III, for example, is greatly influenced by the lack of scientific certainty revealed in part I.

A. Sick Building Syndrome Defined

There is no universally-accepted definition of the sick building syndrome. Generally, SBS refers to a wide variety of acute symptoms frequently reported by workers in modern office buildings. Physicians divide these symptoms into five groups: (1) irritation of eye, nose, and throat; (2) neurasthenic symptoms (headaches, dizziness, fatigue, confusion, and nausea); (3) skin irritation; (4) hypersensitivity reactions (nonasthmatics with asthma-like symptoms); and (5) unpleasant odor and taste sensations.[10] Since these symptoms are common, SBS is defined as an excessive incidence of these symptoms among the occupants of a new or remodeled office building.[11] As a rule of thumb, a building where more than twenty percent of the occupants report SBS symptoms is "sick."[12] Moreover, SBS is work-related. The symptoms continue as long as the worker remains in the office and improve when the worker is away from the building.[13]

The sick building syndrome is one of three building-associated illnesses that may affect office workers. Although this paper is limited to SBS, it is important to distinguish between the three illness types. The other two illnesses are termed "building-related illness" and "multiple chemical sensitivity," a pseudo-illness.

Building-related illness (BRI) refers to the onset of a clinically distinct illness with a known cause that can be traced to a particu-

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[10] Lisa A. Morrow, *Sick Building Syndrome and Related Workplace Disorders*, 106 OTOLARYNGOLOGY—HEAD AND NECK SURGERY 649 (1992).

[11] W. Bradford Lyles et al., *Sick Building Syndrome*, 84 S. MED. J. 65 (1991).

[12] *See* FRANK B. CROSS, LEGAL RESPONSES TO INDOOR AIR POLLUTION 67 (1990).

[13] Lyles et al., *supra* note 11, at 65.

lar building.[14] BRI includes a variety of hypersensitivity diseases caused by individual sensitization to airborne allergens.[15] Several infections, including measles and tuberculosis, can also be spread throughout commercial buildings.[16] Most attention, however, has focused on two illnesses that are caused by the legionella bacterium. The first, Legionnaire's disease, is a bacterial pneumonia. The disease was first recognized (and named) after twenty-nine Legionnaires died following a 1976 convention in a Philadelphia hotel.[17] The legionella bacterium also causes Pontiac fever, a disease similar to Legionnaire's disease, but without any known fatalities.[18] These outbreaks are often traced to areas of moisture in the ventilation system where the bacteria can breed and circulate throughout the building.

In addition to SBS and BRI, many plaintiff's lawyers and some scientists believe that a third type of building sickness, multiple chemical sensitivity (MCS), may induce adverse reactions among some office workers. MCS is a poorly understood and controversial phenomenon by which a small subset of the population may be extremely sensitized to common chemicals.[19] These individuals suffer acute reactions upon exposure to very low concentrations of chemicals commonly found in indoor air, but the same exposure would cause no reaction in most individuals.[20] The medical profession disputes the existence of MCS, believing it is the construct of pseudo-scientific "clinical ecologists."[21] SBS, on the other hand, rests on firmer scientific and medical ground.

While BRI and MCS have generated media attention, the media and scientific community have shown greater interest in SBS. This trend probably stems from both the greater prevalence of SBS and the mystery surrounding its etiology. The sick building

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[14] OFFICE OF AIR AND RADIATION, U.S. ENVTL. PROTECTION AGENCY, REPORT TO CONGRESS ON INDOOR AIR QUALITY: VOLUME II: ASSESSMENT AND CONTROL OF INDOOR AIR POLLUTION 3-9 (1989) [hereinafter ASSESSMENT AND CONTROL].

[15] Hypersensitivity diseases include hypersensitivity pneumonitis, humidifier fever, building-related asthma, and allergic rhinitis. *See* Kathleen Kreiss, *The Epidemiology of Building-Related Complaints and Illness*, 4 OCCUPATIONAL MED., 575, 583-84 (1989).

[16] Michael J. Hodgson, *Clinical Diagnosis and Management of Building-Related Illness and the Sick-Building Syndrome*, 4 OCCUPATIONAL MED. 593, 599 (1989).

[17] Kreiss, *supra* note 15, at 585.

[18] *Id.*

[19] ASSESSMENT AND CONTROL, *supra* note 14, at 3-11.

[20] *Id.*

[21] Yank D. Coble et al., *Clinical Ecology*, 268 J. AM. MED. ASS'N. 3465, 3466 (1992).

syndrome has not, however, captured the attention of the medical profession.

Although the syndrome has been recognized for over a decade, only a handful of articles discussing SBS have been published in medical journals. This may result from doubt within the medical profession about the seriousness of SBS. After all, in an era when people are dying from AIDS, cancer, and heart disease on a daily basis, the annoying (but not life threatening) symptoms of SBS may seem trivial. Moreover, it is notable that SBS is "hardly part of mainstream medicine."[22] Another group of physicians argues that "an understanding of SBS is increasingly pertinent to the practicing general physician because it has reached almost epidemic proportions in our country and it has widespread clinical implications."[23] As part I of this Comment will demonstrate, there are elements of truth in both statements.

As a practical matter, more basic medical research is needed on SBS. We know very little about the human health effects of SBS. For example, no research has been performed to determine whether SBS symptoms become more or less severe over time. Nor do we know if the symptoms follow any predictable path after their onset. One might also wonder if there are any long-term adverse health effects from SBS. In addition, the absence of solid medical evidence makes it difficult for researchers in other fields to accurately study SBS.[24]

SBS is called a "diagnosis of exclusion" because a physician diagnoses SBS only after eliminating all other possible causes of the symptoms.[25] In other words, physicians cannot perform any laboratory tests that will confirm or refute a diagnosis of SBS. Indeed, the very definition of SBS presumes that no specific underlying illness can explain the symptoms.

Nevertheless, some medical researchers are attempting to discover specific diagnostic criteria. One opthamologist suggests individuals suffering from SBS may have eye troubles affecting the cornea and conjunctiva, a malady he terms "office eye syndrome."[26] Other physicians are developing more general ap-

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22 *Sick Building Syndrome*, 338 LANCET 1493 (1991) (editorial).

23 Lyles et al., *supra* note 11, at 66.

24 Coble et al., *supra* note 21, at 3466.

25 Kreiss, *supra* note 15, at 577.

26 M. Norn, *Pollution Keratoconjunctivitis: A Review*, 70 ACTA OPTHALMOLOGICA 269 (1992).

proaches to the clinical diagnosis of SBS.[27] Without an objective test for SBS, researchers must rely on self-reporting of SBS symptoms.

It would be misleading to think of SBS as a single phenomenon. Simply put, the term "sick building syndrome" is a catch-all phrase that is used to describe all unexplained outbreaks of the office building-related symptoms described above. SBS is not a distinct illness; it is a set of symptoms. We may eventually discover that what we now call SBS is actually a set of predictable human responses to various environmental stress factors found in the modern office building. As part I.B. underscores, SBS is almost certainly caused by many factors.

B. Possible Causes of the Sick Building Syndrome

Most of the literature on the sick building syndrome consists of research projects attempting to discover the cause or causes of SBS. Despite this effort, no single causal factor has emerged. Instead, scientists have discovered a wide range of factors that are closely correlated with SBS symptoms. At the risk of oversimplifying a complex subject, it is helpful to divide the results into three basic categories. First, many studies reveal that chemical and biological contaminants found in office building air may cause the syndrome. Second, some widely quoted reports note that physical and environmental building characteristics, including inadequate ventilation and poor lighting, may cause the symptoms. Third, several articles show that personal characteristics, including psychological factors, may be responsible for SBS.

1. Indoor Air Pollution

Most research focuses on the possibility that one or more chemical or biological compounds commonly found in office building air cause SBS. In particular, scientists have analyzed Volatile Organic Compounds (VOCs), tobacco smoke, and biological agents.

VOCs have probably received the most attention from researchers.[28] VOCs are ubiquitous in the modern office environment. They are emitted from building materials, cleaning

[27] *See generally* Hodgson, *supra* note 16, at 593.

[28] VOCs are organic compounds with atmospheric pressure boiling points of 250° C or less. RESEARCH DIV., STATE OF CAL. AIR RESOURCES BOARD, ASSESSMENT OF INDOOR CONCENTRATIONS, INDOOR SOURCES AND SOURCE EMISSIONS OF SE-

compounds, paints, stains, pressed wood products, adhesives, caulks, office furniture, and carpeting.[29] More than 900 different organic compounds can be found in office air.[30]

Several laboratory experiments have demonstrated a relationship between VOC exposure and symptoms characteristic of SBS. One pair of researchers exposed a group of fourteen healthy volunteers to a mixture of twenty-two VOCs at a total concentration of 25 mg/m3 for a four hour period.[31] This type of research is called a "chamber study" because a sealed chamber is used to measure and control the VOC concentration. Although the concentration of VOCs were well below the threshold limit values (TLVs)[32] for occupational exposure, the VOC mixture induced an inflammatory response in the subjects' noses for up to eighteen hours after the exposure.[33] According to the authors, this study provides a "physiological basis for some of the subjective upper airways complaints associated with the sick building syndrome."[34] Similar laboratory experiments have shown like results.[35]

A different group of researchers, using the same methodology, found that exposure to VOCs at levels approximating the office

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LECTED VOLATILE ORGANIC COMPOUNDS 10 (1991) [hereinafter SOURCE EMISSIONS].

[29] Hillel S. Koren & Robert B. Devlin, *Human Upper Respiratory Tract Responses to Inhaled Pollutants with Emphasis on Nasal Lavage*, 641 ANNALS N.Y. ACAD. SCI. 215 (1992). *See also* Notice of Proposed Rules on Indoor Air Quality, 59 Fed. Reg. 15,968, 15,984 (1994) (to be codified at 29 C.F.R. §§ 1910, 1915, 1926, 1928) (proposed April 5, 1994) (Tables III-1 & III-2) (listing emissions from building materials and office equipment) [hereinafter OSHA Proposed Rules].

[30] M.C. BAECHLER ET. AL., SICK BUILDING SYNDROME: SOURCES, HEALTH EFFECTS, MITIGATION 10 (1991).

[31] Koren & Devlin, *supra* note 29, at 217-18.

[32] TLVs are chemical concentrations to which the American Conference of Governmental Industrial Hygienists (ACGIH) believes that "nearly all" workers may be repeatedly exposed without adverse effects. Many TLVs have been adopted by OSHA as enforceable standards. S.A. Roach & S.M Rappaport, *But They are Not Thresholds: A Critical Analysis of the Documentation of Threshold Limit Values*, 17 AM. J. INDUS. MED. 727, 728 (1990) (arguing that existing TLVs offer relatively little protection for workers and exposure should be reduced to 10-25% of TLV values).

[33] Koren & Devlin, *supra* note 29, at 221.

[34] *Id.*

[35] Soren K. Kjaergaard et al., *Human Reactions to a Mixture of Indoor Air Volatile Organic Compounds*, 25A ATMOSPHERIC ENV'T 1417 (1991) (comparing the reactions of twenty-one healthy subjects to those of a group of fourteen subjects suffering from SBS after exposure to a mixture of twenty-two VOCs in a climate chamber).

environment led to greater mental confusion and fatigue.[36] They also found that exposure to VOCs increased the incidence of both headaches and drowsiness.[37]

A recent field study confirms the results obtained from these chamber studies.[38] However, a well-publicized investigation of the James Madison Building of the Library of Congress by the National Institute for Occupational Safety and Health (NIOSH) failed to find a statistically significant relationship between VOC concentrations and SBS symptoms.[39] As the NIOSH scientists noted, however, the total VOC concentrations in their study building were much lower than the concentrations discovered in other field studies.[40] After weighing all the evidence from both chamber studies and field studies, EPA cautiously concludes that VOC exposure may be an "important source" of SBS symptoms.[41]

One VOC, formaldehyde, has often been studied individually. Formaldehyde is known to be an irritant, but there is inconclusive evidence about its effects when found in the relatively low exposure levels typical of office buildings.[42] At high enough concentrations, formaldehyde, like other VOCs, can induce SBS symptoms. As a possible causal agent of SBS, however, there is little reason to single out formaldehyde from the rest of the VOCs found in office building air.

Cigarette smoke, commonly called environmental tobacco smoke (ETS) in the literature, has also been implicated as a possible cause of SBS.[43] The thousands of chemicals present in ETS

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[36] David A. Otto et al., *Exposure of Humans to a Volatile Organic Mixture: I. Behavioral Assessment*, 47 ARCHIVES OF ENVTL. HEALTH 23 (1992) (exposing male volunteers to a complex mixture of VOCs with a total concentration of 25 mg/m3).

[37] H. Kenneth Hudnell et al., *Exposure of Humans to a Volatile Organic Mixture: II. Sensory*, 47 ARCHIVES OF ENVTL. HEALTH 31, 37 (1992).

[38] Michael J. Hodgson et al., *Symptoms and Microenvironmental Measures in Nonproblem Buildings*, 33 J. OCCUPATIONAL MED. 527, 531 (1991) (finding statistically significant relationship between VOC exposure and SBS symptoms in cross-sectional study of 147 office workers in three buildings).

[39] NAT'L INST. FOR OCCUPATIONAL SAFETY AND HEALTH, U.S. DEP'T OF HEALTH & HUMAN SERVICES., INDOOR AIR QUALITY AND WORK ENVIRONMENT STUDY, VOLUME III 28 (1991) [hereinafter NIOSH STUDY].

[40] *Id.* at 29.

[41] ASSESSMENT AND CONTROL, supra note 14, at 3-7.

[42] Jonathon M. Samet et al., *Health Effects and Sources of Indoor Air Pollution Part II*, 137 AM. REV. RESPIRATORY DISEASE 221, 228 (1988).

[43] M. J. Finnegan et al., *The Sick Building Syndrome: Prevalence Studies*, 289 BRIT. MED. J. 1573, 1574 (1984).

can cause mucous membrane irritation and respiratory difficulties, common SBS symptoms.[44] Most ETS research, however, has focused on the links to cancer.

Aside from SBS symptoms, there are significant health risks posed by VOCs and ETS. Evidence is inconclusive about whether formaldehyde is a carcinogen;[45] but among the class of VOCs there are both known and suspected carcinogens.[46] These risks are an independent reason to research the health effects of exposure to low levels of a mixture of VOCs and ETS. Moreover, the cancer risk may create a compelling case for regulating indoor air quality aside from SBS concerns.

In addition to gaseous forms of indoor air pollution, recent research points to the role of airborne fibers as a possible cause of some SBS symptoms. One recent study found a correlation between SBS symptoms and microscopic fibers of materials (silicon oxides and calcium oxides) commonly used to make acoustical ceiling tiles and insulation.[47]

Biological factors may also be an important source of SBS symptoms. Airborne pathogens can cause respiratory tract infections which may induce some SBS symptoms. These pathogens may be concentrated and dispersed throughout modern office buildings by the ventilation systems.[48] Most researchers agree that exposure to certain microorganisms causes some SBS outbreaks.[49] These microorganisms can be found in office trash cans, for example.[50]

In contrast with the large volume of research on VOCs, there has been little research on the relationship between SBS symptoms and either ETS or biological contaminants.

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[44] Ira B. Tager, *Health Effects of Involuntary Smoking in the Workplace*, 89 N.Y. ST. J. MED. 27, 27-29 (1989).

[45] *Id.*

[46] Non-radon indoor air pollution is estimated to cause 3,500-6,000 cancers every year. Although ETS is an important factor, the risks from volatile organics are also high. *See* UNFINISHED BUSINESS, *supra* note 8, at 28.

[47] Boyce Resenberger, *Environment: Fiber Problems in Sick Buildings*, WASH. POST, Nov. 22, 1993, at A2.

[48] John F. Brundage et al., *Building-Associated Risk of Febrile Acute Respiratory Diseases in Army Trainees*, 259 J. AM. MED. ASS'N 2108, 2110 (1988) (finding that rates of febrile acute respiratory disease were significantly higher among Army trainees in modern "tight" barracks as compared with older, naturally-ventilated barracks).

[49] Hodgson et al., *supra* note 38, at 527.

[50] T.J. Howard, *Clearing the Air, Work Making You Ill? Don't Blame it all on Your "Sick Building,"* CHI. TRIB., July 25, 1993, at 1.

2. *Physical and Environmental Building Characteristics*

Several physical and environmental building features are closely correlated with the sick building syndrome. These features include office furnishings, physical environmental parameters, and ventilation systems.

As mentioned above, virtually every office product and piece of furniture emits VOCs. However, certain types of building furnishings can exacerbate this problem. For example, wall-to-wall carpeting has been implicated as a possible factor in SBS symptoms.[51] There are several reasons why carpeting may increase the rate of SBS symptoms. The chemicals used to clean carpets may release VOCs and other irritants.[52] Additionally, accumulated dirt and dust in carpets might induce SBS symptoms.[53] Although there is conflicting evidence, static electricity exposure from carpets may lead to fatigue, a frequently reported SBS symptom.[54] SBS symptoms are also more common in buildings with exposed shelves and cupboards, as well as fabric which can absorb and desorb indoor air pollutants.[55]

In addition to office products, a long list of environmental factors can induce SBS symptoms. For example, inappropriate levels of artificial lighting can cause headaches and eye irritation, two common SBS symptoms.[56] Noise and vibration can lead to nausea and dizziness, two more SBS symptoms.[57] Temperatures that occupants perceive as either too warm or too cold also cause an increase in reported SBS symptoms.[58] Similarly, relative humidity that is above seventy percent or below twenty percent may lead to SBS symptoms.[59]

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[51] *See* Dan Norbäck & Margareta Torgén, *A Longitudinal Study Relating Carpeting With Sick Building Syndrome*, 15 ENV'T INT'L 129, 134 (1989).

[52] *Id.*

[53] *Id.*

[54] *Id.*

[55] P. Sherwood Burge, *Bacteria, Fungi, and Other Micro-Organisms*, *in* INDOOR AIR POLLUTION: PROBLEMS AND PRIORITIES 45 (G.B. Leslie & F.W. Lunau eds., 1992).

[56] Bradford O. Brooks et al., *Indoor Air Pollution: An Edifice Complex*, 29 CLINICAL TOXICOLOGY 315, 320 (1991).

[57] *Id.*

[58] J.J.K. Jaakkola & O.P. Heinonen, *Sick Building Syndrome, Sensation of Dryness and Thermal Comfort in Relation to Room Temperature in an Office Building: Need for Individual Control of Temperature*, 15 ENV'T INT'L 163, 167 (1989).

[59] Brooks et al., *supra* note 56, at 319-20.

Ventilation problems are commonly seen as a culprit behind SBS. One prominent researcher claims that eighty percent of SBS cases are primarily caused by inadequate ventilation.[60] Investigations by NIOSH support this theory but show a statistic closer to fifty percent.[61] However, some researchers believe that increasing ventilation rates may only worsen SBS problems.[62] They argue that increasing ventilation may actually increase the concentration of VOCs by increasing the rate at which products emit VOCs.[63] Still other studies show no relationship between ventilation efficiency and SBS complaints.[64] Indeed, there is a paradox: although people in naturally ventilated buildings have fewer SBS complaints than people in air conditioned buildings, naturally ventilated buildings have much lower ventilation rates.[65]

One recent study supports doubts about the role of inadequate ventilation as a cause of SBS symptoms. Researchers studied the effect of increasing the supply of outdoor air from twenty to fifty cubic feet per minute per person in four buildings.[66] The study failed to find a statistically significant relationship between ventilation rates and SBS symptoms.[67] However, as the researchers note, twenty cubic feet per minute per person of outdoor air

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[60] *NRC to Issue Standards for Ventilation in Office Buildings to Improve Indoor Air*, 17 Env't Rep. (BNA) 2136 (Apr. 17, 1987) (statement of Jan Stolwijk, Professor of public health at Yale Medical School).

[61] NATIONAL INST. FOR OCCUPATIONAL SAFETY AND HEALTH, U.S. DEP'T OF HEALTH & HUMAN SERVICES, THE NIOSH APPROACH TO CONDUCTING INDOOR AIR QUALITY INVESTIGATIONS IN OFFICE BUILDINGS (1989). Between 1971 and 1988, NIOSH investigated 529 office buildings in response to requests by building occupants. NIOSH estimates that 53% of problems were caused by inadequate ventilation. *Id.* at Table 4. The remaining causes were: inside contamination (15%), unknown (13%), outside contamination (10%), microbiological contamination (5%), and building materials contamination (4%). *Id.* However, the NIOSH effort is really a public health investigation service, aimed at mitigating the problem. As has been noted, it is important to distinguish these public health investigations from true SBS research studies, the objective of which is to test a hypothesis. *See* NATIONAL RESEARCH COUNCIL, HUMAN EXPOSURE ASSESSMENT FOR AIRBORNE POLLUTANTS: ADVANCES AND OPPORTUNITIES 242 (1991).

[62] *See The Indoor Air Quality Act of 1991: Hearings on H.R. 1066 Before the Subcomm. on Env't of the House Comm. on Science, Space, and Tech.*, 102d Cong., 1st Sess. 161-172 (1991) [hereinafter *Hearings*] (statement of Dr. Alan Hedge).

[63] CROSS, *supra* note 12, at 55.

[64] Hodgson et al., *supra* note 38, at 532.

[65] *See, e.g., Hearings*, *supra* note 62.

[66] Richard Menzies et al., *The Effect of Varying Levels of Outdoor-Air Supply on the Symptoms of Sick Building Syndrome*, 328 NEW ENG. J. OF MED. 821 (1993).

[67] *Id.* at 824.

"may have been insufficient to produce symptoms."[68] Thus, this study is not determinative on the relationship between ventilation rates and SBS.

Regardless of the issue of ventilation adequacy, SBS problems may arise from dirty or poorly maintained ventilation systems. The ventilation system itself may be dirty from years of neglect, spreading dust and dirt throughout the building. This intuitively obvious possible cause of SBS has yet to be addressed by researchers.

SBS problems may also stem from faulty building design. For example, the ventilation system's air intakes may be located next to parking areas, thereby providing an entrance for vehicle exhaust fumes. One group of researchers found that a sealed building envelope and a mechanical heating, ventilation, and air-conditioning (HVAC) system are both highly correlated with SBS symptoms.[69] Two American researchers reanalyzed the data from six earlier studies, and concluded that sealed buildings with air-conditioning are associated with a higher prevalence of SBS symptoms than unsealed buildings without air-conditioning.[70] The authors recognize, however, that other factors may be confounding their data.[71] In other words, other factors may be so closely associated with air-conditioned buildings that the statistical analysis does not distinguish between the tight seal and the air conditioning. As the next section notes, the presence of confounding factors afflicts most SBS research.

3. *Psychological and Personal Characteristics*

Ever since SBS was first reported, some scientists have argued that SBS is "merely psychological." Many of the first investigations of SBS led to diagnoses of mass psychogenic illness.[72]

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[68] *Id.* at 825.

[69] Elia M. Sterling, *Sick Buildings: Physical and Psychological Effects on Human Health and Preventative Measures*, *in* INDOOR AIR QUALITY DESIGN GUIDEBOOK 63 (Milton Meckler ed., 1991).

[70] Mark J. Mendell & Allan H. Smith, *Consistent Pattern of Elevated Symptoms in Air-Conditioned Office Buildings: A Reanalysis of Epidemiologic Studies*, 80 AM. J. PUB. HEALTH 1193, 1195 (1990).

[71] The authors suggest that air-conditioned buildings are more likely to contain florescent lighting, inner offices lacking natural light, synthetic materials emitting organic compounds, and materials capable of accumulating and re-releasing contaminants. Each of these confounding factors has also been shown to be closely correlated with SBS symptoms. *Id.*

[72] Kreiss, *supra* note 15, at 577.

Given the common symptoms of SBS, its widespread nature, and uncertain etiology, a psychological explanation for SBS seemed plausible. However, SBS does not meet the conditions of a purely psychogenic illness: sudden onset, symptoms of hyperventilation, and transmission by communication between workers.[73] In short, SBS cannot be dismissed simply as mass hysteria.

However, there are important psychological and personal elements to SBS. One recent American study included twenty-seven office buildings and 4,479 workers. The researchers measured a variety of environmental factors, including temperature, relative humidity, and formaldehyde concentration. Surprisingly, they found that job stress had the strongest effects on reports of SBS.[74] However, they noted that it is unclear whether job stress caused the SBS symptoms or whether stress altered the body's response to other factors.[75] The head researcher on this project, Professor Alan Hedge of Cornell, said elsewhere that the human side of the SBS problem is "grossly under-researched."[76]

Gender is also an important factor in the prevalence of SBS symptoms. Several studies have discovered that women report SBS symptoms more often than men.[77] No theory to explain this disparity has yet won consensus. Three possible explanations have been advanced: (1) for physiological reasons, women have more SBS symptoms than men; (2) for cultural reasons, women report more symptoms than men; and (3) women have more risk factors.[78] The NIOSH study suggested that a prevalence of risk factors is the most likely explanation. By controlling for factors like job stress and VOC exposure, gender disappears as a significant factor in SBS causation.[79] Another group of researchers theorized that women may be exposed to greater concentrations of VOCs due to job related exposure or from wearing cosmetics.

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[73] *See* Morrow, *supra* note 10, at 652.

[74] *Job Stress Found Strongest Indicator of Sick Building Reports by Workers*, 30 Gov't Emp. Rel. Rep. (BNA) 1571, 1576 (Nov. 30, 1992) (discussing results of research by Alan Hedge, researcher at Cornell).

[75] *Id.*

[76] *Hearings*, *supra* note 62, at 191.

[77] *See, e.g.*, Kare Lenvik, *Sick Building Syndrome Symptoms—Different Prevalences Between Males and Females*, 18 ENV'T INT'L 11, 15 (1992) (study reveals statistically significant differences between the sexes, regardless of job category).

[78] NIOSH STUDY, *supra* note 39, at 30.

[79] *Id.* at 31.

Their research showed that gender is not a factor in SBS complaints when the study properly controls for VOC exposure.[80]

Workers further down the office hierarchy exhibit more SBS symptoms (independent of gender) than workers higher up the hierarchy.[81] Possible explanations include that these workers work in poorer quality areas of the building, are more crowded, and are less able to control their environment.[82] These workers may also face greater VOC exposure. Further research will show that gender and worker hierarchy are not *causing* SBS. Rather, these two factors are masking other causal agents.

One Swedish study tested the hypothesis that SBS symptoms may be caused by personal factors that are not revealed by studying the office environment. The researchers analyzed the results of a questionnaire distributed to 633 subjects.[83] Statistical analysis of the results revealed a relationship between SBS symptoms and urban residency, static electricity, exposure to fresh paint, and the presence of preschool children at home.[84] This study confirms that SBS research must analyze more than the physical office environment. Other aspects of our personal lives may contain an important key to solving the SBS mystery.

The research outlined in this section demonstrates that there is no single cause of SBS. Clearly, a large number of factors are related to SBS. Professor Hedge once analogized SBS symptoms to heart disease.[85] Just as there are a large number of risk factors that increase the risk of heart disease, many factors play a role in the incidence of SBS symptoms. Reducing the risk of heart disease involves reducing fat and salt intake while increasing exercise, but genetic factors are also important. Reducing SBS symptoms may involve reducing both VOC concentrations and worker stress, but the physical structure of the "sealed" office building remains an important variable. This is probably the best model for thinking about the complexities of SBS causation.

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[80] Hodgson et al., *supra* note 38, at 532.

[81] Burge, *supra* note 55, at 42-43.

[82] *Id.* at 43.

[83] Dan Norbäck & Christer Edling, *Environmental, Occupational, and Personal Factors Related to the Prevalence of Sick Building Syndrome in the General Population*, 48 BRIT. J. INDUS. MED. 451, 452 (1991).

[84] *Id.* at 457.

[85] *Hearings*, *supra* note 62, at 194.

C. Prevalence of the Sick Building Syndrome

Although the sick building syndrome is commonly assumed to be a widespread problem, we actually have very little reliable data confirming its prevalence. This uncertainty is the product of the unanswered scientific questions discussed above. Since the medical definition of SBS is imprecise and it is diagnosed by exclusion, we cannot easily assess the magnitude of the problem. Despite this uncertainty, the World Health Organization estimates that up to thirty percent of new and remodeled buildings in the developed world may be subject to SBS complaints.[86]

In the United States, surveys have been the primary method for estimating the prevalence of SBS. The Honeywell Corporation surveyed six hundred office workers by telephone and found that twenty-four percent of the respondents were dissatisfied with their office air quality, and twenty percent believed that their work performance was hampered by the air quality.[87]

Recently, various unions have used surveys in an attempt to show that SBS is in fact a widespread problem. For example, the American Federation of Government Employees mailed 48,000 employees questionnaires asking about indoor air quality.[88] Of the nearly 5,500 who responded, about half said they have suffered SBS symptoms.[89] Although this figure leads the casual reader to think that SBS is a widespread problem, this type of survey is more of a political document than a scientific survey. The survey suffers from selection bias: it is likely that employees who suffer from SBS are more likely to respond to the survey than those that have no complaints.

Some of the best research on prevalence rates of SBS comes from foreign research. In the *Danish Town Hall Study* a multidisciplinary team of Danish researchers studied fourteen town halls in Denmark and surveyed 4,369 employees.[90] The questionnaire revealed that twenty-eight percent of the respondents had work-related mucosal irritation and thirty-six percent had headaches or abnormal fatigue, both of which are common SBS

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86 WORLD HEALTH ORG., INDOOR AIR QUALITY RESEARCH 16 (1986).

87 James E. Woods, *Cost Avoidance and Productivity in Owning and Operating Buildings*, 4 OCCUPATIONAL MED., at 753, 754 (1989).

88 Ken Miller, *Union Says Federal Workers Fearing "Sick Buildings,"* GANNETT NEWS SERVICE, Dec. 9, 1992, at 1, *available in* LEXIS, News Library, Curnws File.

89 *Id.*

90 Peder Skov et al., *The "Sick" Building Syndrome in the Office Environment: The Danish Town Hall Study*, 13 ENV'T INT'L 339, 340 (1987).

symptoms.[91] A similar study looked at forty-seven buildings and 4,373 office workers in Great Britain.[92] This research uncovered prevalence rates of almost sixty percent for lethargy and approximately fifty percent for dry throat, stuffy nose, and headache.[93]

No American studies have been performed on such a large scale. Whether American prevalence rates are similar is an unanswered question. One widely cited American estimate proposes that between 800,000 and 1,200,000 commercial buildings in the United States may have SBS problems affecting between thirty and seventy million occupants.[94]

Although most articles claim that as many as one-third of American office workers may be affected by SBS, we simply do not have adequate evidence to substantiate that estimate. Further research is necessary before we will have an understanding of the prevalence of SBS. In addition, it would be helpful to know if SBS is concentrated in particular geographic areas. This type of information could offer further clues about the causation of SBS symptoms.

D. Economic Costs of the Sick Building Syndrome

Given the uncertainty about the definition, severity, and prevalence of SBS, any estimate of the economic costs of the syndrome is highly unreliable. Nevertheless, even an unreliable figure is helpful. With an estimate, it is possible to determine how much money should be allocated to research and remedy SBS.

The best economic analysis thus far has been generated by EPA.[95] While emphasizing the uncertainty imposed by data limitations, EPA suggests that SBS imposes significant costs. The EPA considered three major categories of economic costs of indoor air pollution: materials and equipment damages, direct medical costs, and lost productivity.[96] Only the latter two costs are relevant for measuring the cost of SBS.

As for direct medical costs, EPA estimates that the medical costs of doctor visits by white-collar workers due to indoor air

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[91] *Id.* at 348.

[92] A. Hedge et al., *Work-Related Illness in Offices: A Proposed Model of the "Sick Building Syndrome,"* 15 ENV'T INT'L 143 (1989).

[93] *Id.* at 148.

[94] Woods, *supra* note 87, at 762-63.

[95] ASSESSMENT AND CONTROL, *supra* note 14, at 5-1 to 5-17.

[96] *Id.* at 5-1.

pollution to be approximately half a billion dollars per year.[97] This figure represents the upper limit of an estimate of the cost of direct medical expenses imposed by SBS because the EPA figure is for all kinds of indoor air pollution.

The EPA estimates for the annual productivity losses due to indoor air pollution are even more significant. Applying some figures gathered from surveys, EPA estimates the economic cost of lost productivity to be approximately $60 billion annually.[98] Although that figure is only an estimate, it suggests that the productivity losses imposed by SBS may reach billions of dollars per year.

Although these figures will undoubtedly be revised as we learn more about the prevalence and severity of the sick building syndrome, these preliminary estimates suggest that SBS imposes significant costs on society. The magnitude of these figures also point out that employers may have strong economic incentives to eliminate SBS.[99] Moreover, increases in research expenditures can be justified on economic grounds.

E. Physical Solutions to the Sick Building Syndrome

Despite the uncertainty about the causes of SBS, affected office workers and their unions demand solutions. Attempts to remedy SBS usually begin with a careful investigation of the building by the building owners, private firms, or, in a few cases, a government agency. Mitigating the symptoms associated with SBS is likely to involve a large number of building-specific "solutions." These solutions to SBS can be as varied as the hypothesized causes discussed above. Nevertheless, several physical solutions have emerged that may reduce or eliminate SBS symptoms in a large percentage of cases.

One proposed solution focuses on reducing VOC concentrations by raising the air temperature in a fully furnished but unoccupied building, while maintaining ventilation. This procedure, commonly called "building bake-out," is designed to induce the release of volatile organics from all of the products that contain them in the office building, thereby reducing later VOC emissions. California researchers found that a "bake-out" of an office building at temperatures between 32° and 39°C for twenty-four

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[97] *Id.* at 5-12.
[98] *Id.* at 5-15.
[99] *See infra* part III.

hours reduced total VOC concentration by twenty-nine percent.[100] On the other hand, a laboratory experiment studying VOC emissions from particle board and modular office partitions found that increasing temperature did not significantly reduce VOC emissions.[101] Further research will be necessary to explain this apparent discrepancy.

One new theory relies on common houseplants to reduce chemical compounds in office air. According to a former NASA researcher, houseplants effectively reduce the concentrations of chemicals in indoor air.[102] Even if this proves to be true, however, plants are probably a net negative for indoor air quality. Potentially hazardous microorganisms live in the soil, and watering plants can lead to mold and mildew.[103]

A growing number of builders around the country hope to prevent SBS symptoms by specifically designing and constructing buildings to prevent SBS problems.[104] Builders and developers can choose construction materials that emit fewer chemicals and include effective ventilation systems. As discussed in part III, both economic forces and the threat of litigation encourage this preventative behavior.

One of the most common and intuitive solutions to SBS has been to increase ventilation in the building. However, as discussed previously, the effectiveness of this solution is questionable and, perhaps, even counterproductive. Moreover, increasing the amount of outside air used will require using more energy to heat or chill the outside air to match the indoor temperature, a solution which imposes environmental and health costs of its own. We will need to balance the increased environmental threats imposed by consuming more energy with the environmental threat from SBS. This calculation will help us to assess the wisdom of increasing ventilation rates to "solve" SBS.

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[100] *See* John R. Girman et al., *The Bake-Out of an Office Building: A Case Study*, 15 ENV'T INT'L 449 (1989).

[101] Charlene W. Bayer, *The Effect of 'Building Bake-Out' Conditions on Volatile Organic Compound Emissions*, *in* INDOOR AIR POLLUTION: RADON, BIOAEROSOLS, & VOC's 101, 109 (Jack G. Kay et al. eds., 1991).

[102] *An Advocate of Plants to Clean Air Indoors Welcomes a New Test*, N.Y. TIMES, July 30, 1991, at C4.

[103] Howard, *supra* note 50, at 1.

[104] Diana Shaman, *Sick Buildings: Seeking Remedies for Indoor-Air-Pollution Problems*, N.Y. TIMES, April 12, 1992, §10 at 13.

II

CURRENT LEGAL RESPONSES TO THE SICK BUILDING SYNDROME

As part I demonstrates, uncertainty surrounds every aspect of SBS. As a result, there are no easy legal solutions to the problem. This part will begin with a look at the federal response to SBS and then discuss state and local efforts. Finally, this part will look at tort litigation, the most frequent intersection between SBS and the legal system.

A. Federal Law

The Radon Gas and Indoor Air Quality Research Act of 1986[105] represents Congress' first step toward addressing the SBS problem. Section 403 of the Act directs EPA to establish a research program to study radon and indoor air quality. More specifically, EPA is required to study the sources and levels of indoor air pollution, the resulting health effects, and control technologies and mitigation strategies. The EPA is also required to disseminate this information to the public. The Act specifically does not authorize any regulatory programs.[106] Aside from radon gas, the Act does not name any specific contaminants or problems that EPA must research. However, EPA is required to study "high-risk building types,"[107] a reference to SBS.

In early 1986, the Office of Air and Radiation of the EPA created a three person indoor air quality staff to study indoor air pollution.[108] The staff and budget has grown considerably since. Currently, the group has division status within EPA and consists of fifteen persons.[109] The Division currently spends about six million dollars annually on indoor air quality programs, most of it on research.[110]

Despite its relatively low-level effort to research SBS, the EPA recently announced a new SBS study. Over the next three to five

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[105] Radon Gas and Indoor Air Quality Research Act of 1986, Pub. L. No. 99-499, §§ 401-405, 100 Stat. 1613 (codified as amended at 42 U.S.C. §§ 9671-9675 (1988)). The Act is also known as Title IV of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

[106] *Id.* § 404.

[107] *Id.* § 403(b)(1)(B).

[108] FEDERAL PROGRAMS, *supra* note 7, at 3.

[109] Dan Fagin, *Sick Buildings, Sick People*, NEWSDAY, Nov. 15, 1992, at 4.

[110] *Id.*

years, EPA will study about two hundred buildings.[111] The researchers will analyze air samples, interview building occupants, and study building design and operation, using the results to develop a computer data base.[112] It is unclear how strongly this study signals increased attention to SBS issues by EPA.

Section 403(c) of the Act requires EPA to coordinate federal indoor air quality activities and specifically mandates that EPA set up an advisory committee. The Committee on Indoor Air Quality (CIAQ)[113] fills that role.[114] The CIAQ coordinates federal indoor air quality research; facilitates exchange among government agencies (at the federal, state, and local level), private entities, and the general public; and develops federal responses to indoor air quality issues, including SBS.[115] The Indoor Air Division of EPA represents EPA at the quarterly meetings of the CIAQ.

In 1987, EPA published the implementation plan required by section 403(d).[116] EPA stated it was pursuing a non-regulatory approach to indoor air quality, relying on public education and technical assistance to state and local governments. The EPA also noted that it could regulate indoor air quality problems under existing statutes. EPA continues to follow this approach in remedying SBS.[117]

Section 403(e) required the EPA Administrator to submit a report to Congress by October 1988. Although the EPA report was completed by early 1989, the Office of Management and Budget prevented its release "out of fear that it would lead to costly regulatory requirements."[118] Interested members of Congress then

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111 Tim Hilchey, *Government to Study Quality of Indoor Air*, N.Y. TIMES, March 15, 1994, at C4.

112 *Id.*

113 The members of the CIAQ are: Environmental Protection Agency, Consumer Product Safety Commission, Department of Energy, Department of Health and Human Services, Bonneville Power Administration, General Services Administration, National Aeronautics and Space Administration, Tennessee Valley Authority, Department of Commerce (National Institute of Standards and Technology), Department of Defense, Department of Housing and Urban Development, Department of the Interior, Department of Labor (OSHA), Department of State, and the Department of Transportation.

114 FEDERAL PROGRAMS, *supra* note 7, at 13-14.

115 *Id.* at 14.

116 OFFICE OF AIR AND RADIATION, U.S. ENVTL. PROTECTION AGENCY, INDOOR AIR QUALITY IMPLEMENTATION PLAN (1987).

117 *See supra* notes 108-112 and accompanying text.

118 CROSS, *supra* note 12, at 120.

leaked the report and ensured its official release later in 1989.[119] This three volume report contains EPA's most comprehensive policy statement on SBS. The report emphasizes the uncertainty surrounding SBS and its multiple causes. The relevant section concluded that SBS problems are increasingly being recognized as potentially serious, albeit nontraditional, health and comfort consequences of modern indoor environments. However, the report also found that these consequences are poorly understood and that there is a lack of scientific consensus concerning the important environmental or physiological determinants of SBS problems. As a result, SBS problems create a dilemma for those charged with the clinical treatment of afflicted individuals as well as for those responsible for managing building environments.[120] This report continues to be the best summary of EPA's policy toward SBS.

As part of the Act's mandate to disseminate its research results, EPA has generated several significant documents. The EPA and NIOSH recently published a practical guide on indoor air quality for building owners and managers.[121] The book provides an overview of indoor air quality issues, including SBS. Moreover, the guide explains how to prevent and resolve many indoor air quality problems. The EPA also developed a thirty-two page booklet for the general public which discusses a wide range of indoor air quality issues, from residential problems to SBS.[122]

B. State and Local Law

The most common state indoor air quality laws regulate environmental tobacco smoke. Although these regulations may decrease the incidence of SBS, they are not specifically drafted to address SBS. Several states have adopted laws that focus directly on SBS. The examples that follow are not intended to be exhaustive, rather, they illustrate the diversity of current state approaches to SBS.

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119 *Id.*

120 *See* ASSESSMENT AND CONTROL, *supra* note 14, at 3-12.

121 ENVIRONMENTAL PROTECTION AGENCY & NAT'L INST. FOR OCCUPATIONAL SAFETY AND HEALTH, BUILDING AIR QUALITY: A GUIDE FOR BUILDING OWNERS AND FACILITY MANAGERS (1991).

122 ENVIRONMENTAL PROTECTION AGENCY & CONSUMER PROD. SAFETY COMM'N, THE INSIDE STORY: A GUIDE TO INDOOR AIR QUALITY (1988).

Some states provide special protection for workers in state-owned or-managed office buildings. New Jersey, for example, has established regulations to protect public employees in buildings with SBS problems.[123] Along with specific standards for temperature, humidity, ventilation, and ETS levels,[124] the regulations permit public employees to submit health complaints to their employer who must then outline the proposed response action in writing.[125] If the problem is not remedied, then the employee can petition a state agency to correct the problem. To date, however, very few complaints have been filed.[126]

Washington state uses a different approach. Washington's Department of General Administration has set design requirements for some state buildings. The standards mandate that ventilation systems operate at full capacity during a ninety-day "flush out" period prior to occupancy and for an additional ninety days after employees move in.[127] Washington also sets emission limits for furniture and carpets ordered for new buildings.[128] These requirements obviously focus on the role of VOCs in SBS complaints.

California has also recognized the importance of indoor air quality issues, including problems arising from SBS. State statutes require the State Department of Health Services to research the "causes, extent, prevention, and control of indoor pollution."[129] In addition, the Department must establish nonbinding guidelines for the reduction of VOCs in new and remodeled office buildings.[130] The Department must also consider the possi-

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123 N.J. ADMIN. CODE tit. 5, § 23-11 (1992).

124 *Id.*

125 *Health & Safety: Some Public Employee Complaints Result From New Jersey's Indoor Air Regulation*, 30 Gov't Empl. Rel. Rep. (BNA) 522 (Apr. 13, 1992).

126 *Id.*

127 WASHINGTON STATE DEP'T OF GEN. ADMIN., INDOOR AIR QUALITY SPECIFICATIONS FOR WASHINGTON STATE NATURAL RESOURCES BUILDING AND LABOR AND INDUSTRIES BUILDING.

128 (a) Formaldehyde emissions may not exceed 0.05 ppm; (b) total VOC emissions may not exceed 0.5 micrograms per cubic meter of air; (c) 4-phenylcyclohexene emissions may not exceed 1 ppb; (d) pollutants not specifically mentioned may not produce emission levels greater than 1/10 of the threshold limit values recognized for industrial workplaces; (e) total particulates may not exceed 50 micrograms per cubic meter of air; and (f) manufacturers must identify any toxins, mutagens, or carcinogens that are off-gassed from their products. *Id.*

129 CAL. HEALTH & SAFETY CODE § 426.8 (West 1990).

130 *Id.* § 426.10 (West Supp. 1994).

bility of mandatory regulations to reduce VOC exposure.[131] Additionally, the State Air Resources Board must assess the levels of indoor exposure to toxic air pollutants.[132] Pursuant to its statutory authority, California's Air Resources Board has made significant advances in our understanding of VOCs in the context of office buildings.[133]

Additionally, just as builders have sought to alleviate SBS through increased ventilation, state and local building codes[134] commonly address SBS by adopting minimum ventilation standards. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), a worldwide technical society, has played an important role in this field. ASHRAE's first ventilation standard, 62-73, was published in 1973.[135] As a result of rising energy prices at the time, most designers apparently used only the minimum ventilation to conserve energy.[136] The ASHRAE standard was not designed to prevent SBS; the standard was based on odor perception and carbon dioxide concentration.[137] The ventilation standard was revised in 1981, and the most recent incarnation is ASHRAE Standard 62-1989, titled *Ventilation for Acceptable Indoor Air Quality*. ASHRAE Standard 62-1989 sets an office ventilation rate of twenty cubic feet per minute (cfm) per occupant and sixty cfm per occupant for smoking lounges.[138]

A number of state and local governments require ventilation rates equal to the 62-1989 standard.[139] Building codes will continue to adopt this ASHRAE standard in the future. Although ASHRAE claims that SBS is rarely encountered in buildings that

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131 *Id.* § 426.10(a)(5).

132 CAL. HEALTH & SAFETY CODE § 39660.5 (West Supp. 1994).

133 *See, e.g.*, SOURCE EMISSIONS, *supra* note 28; RESEARCH DIV., CAL. AIR RESOURCES BD., DEVELOPMENT OF A UNIVERSALLY ACCEPTED TEST METHOD FOR VOLATILE ORGANIC COMPOUNDS (1991).

134 State and local building codes are usually based on one of three model building codes published in the United States: *The BOCA Basic Building Code*, the *Uniform Building Code*, or the *Southern Building Code*. COMMITTEE ON INDOOR POLLUTANTS, NAT'L RESEARCH COUNCIL, INDOOR POLLUTANTS 451 (1981).

135 *Id.*

136 *Id.*

137 CALIFORNIA AIR RESOURCES BD., REDUCING EXPOSURES TO INDOOR AIR POLLUTANTS IN CALIFORNIA: EXISTING AUTHORITIES AND RECOMMENDED ACTIONS, VOLUME II: APPENDICES, X-3 (1989) [hereinafter REDUCING EXPOSURES].

138 Philip R. Morey & Douglas E. Shattuck, *Role of Ventilation in the Causation of Building-Associated Illness*, 4 OCCUPATIONAL MED. 625, 626 (1989).

139 *See Hearings*, *supra* note 62, at 143.

meet the 62-1989 standard, many independent researchers disagree.[140] As discussed above, this emphasis on ventilation standards may be misplaced. Research suggests that increased ventilation may have no effect on the prevalence of SBS symptoms.[141] In addition, local governments continue to adopt a wide variety of ordinances to reduce the likelihood of SBS.[142]

C. Tort Litigation and Workers Compensation

As the scenario at the introduction of this comment suggested, office workers suffering from SBS may file lawsuits to recover damages for medical bills and suffering. Moreover, most agree the number of SBS lawsuits will increase in the coming years. Although reported opinions discussing SBS are almost nonexistent, journals oriented toward practitioners have begun to carry an increasing number of articles about SBS litigation.[143]

As a general matter, plaintiffs in SBS cases can bring claims based on theories such as breach of contract and express warranties, breach of implied warranties, negligence, strict liability, fraud, and misrepresentation.[144] Potential defendants include manufacturers, wholesalers, contractors, builders, brokers, architects, engineers, and building owners.[145]

In one typical case, nine female office workers filed suit in the District of Columbia against their building's landlord and the management company that maintained the building's heating

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[140] *Id.*

[141] *See supra* part I.B.2.

[142] The City of Los Angeles, for example, requires air conditioners to be equipped with air filtration devices because of the poor outdoor air quality. *See*, REDUCING EXPOSURES, *supra* note 137, at W-3.

[143] *See, e.g.*, James B. Cohoon, *Indoor Air Pollution Litigation: A Primer for Defense Counsel*, FOR THE DEFENSE, Aug. 1989, at 12; Randall J. Dean, *In Defense of Tight Building Syndrome*, FOR THE DEFENSE, Aug. 1991, at 2; Donald C. Dilworth, *Indoor Air Pollution Cases Focus on Ventilation Systems*, TRIAL, Dec. 1992, at 11; Lee R. Epstein, *Indoor Air Pollution and the 'Duty to Warn,'* PROBATE & PROPERTY, Nov./Dec. 1991, at 23; Thomas F. Gardner, *Is the Design Architect or Engineer Liable for Sick Building Syndrome Damages?*, 11 CONSTRUCTION LAW.; Robert W. Katz & Jonathan N. Portner, *Sick Building Syndrome: An Emerging Phenomenon*, TRIAL, Sept. 1993, at 38; Robert W. Katz et al., *How to Prove a Sick Building Case*, TRIAL, Sept. 1991, at 58.

[144] Mark Diamond, *Liability in the Air: The Threat of Indoor Pollution*, A.B.A. J., Nov. 1, 1987, at 78, 84. For a more comprehensive analysis of potential claims, see Barbara J. Eden, *Toxic Indoor Air: Commercial Real Estate Transactions May be Hazardous to Your (Fiscal) Health*, 24 TULSA L.J. 449, 456-463 (1989).

[145] Eden, *supra* note 144, at 456.

and ventilation system.[146] The workers suffered from common SBS symptoms. The plaintiffs claimed that these symptoms resulted from an unspecified bacteria or mold in the office building's air.[147] The case eventually settled for an undisclosed amount.[148]

However, at least one case did result in a jury verdict.[149] In that case, an Ohio couple claimed that fumes emitted from their new carpet caused them to become ill.[150] The jury found for the defendant carpet manufacturer, largely because the defendant was able to convince the jury that if the carpet was causing the symptoms, the illness would have appeared immediately after installation rather than many years later.[151]

The principal theory in most SBS cases is negligence,[152] but given the scientific uncertainties surrounding SBS, the elements of a negligence claim may be difficult to meet. Causation is often the most difficult element to prove. As a result, plaintiffs are increasingly relying on a strict liability theory premised on section 402A of the Restatement (Second) of Torts.

The primary obstacle to strict liability in the SBS context is finding a "product" that is defective. Although some courts treat "mass-produced" residential homes as products,[153] courts have refused to extend this treatment to commercial buildings.[154] These cases are probably correct, given the obvious differences between the archetypal "product," a mass-produced automobile, and a commercial office building. As one commentator noted, office buildings are not mass-produced, and are the result of an "ongoing contractual relationship between the purchaser and

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146 Charles-Edward Anderson, *Sick Building Syndrome: Suits Increase for Indoor Pollution Despite Absence of Favorable Verdict*, A.B.A. J. Dec. 1990, at 17 (discussing Perkins v. Matomic Operating Co., No. CA 89-00357 (D.C. Super. Ct.)).

147 *Id.*

148 *Id.* Consistent with this example, most SBS cases settle.

149 Beebe v. Burlington Industries, No. A 8103-037 [C.P.] (Ohio, Hamilton County, 1989).

150 *See* Anderson, *supra* note 146.

151 Dean, *supra* note 143, at 5-6.

152 Katz & Portner, *supra* note 143, at 42.

153 Blagg v. Fred Hunt Co., 612 S.W.2d 321 (Ark. 1981) (imposing strict liability for physical injury from formaldehyde fumes); Kriegler v. Eichler Homes, 74 Cal. Rptr. 749 (Cal. Ct. App. 1969) (imposing strict liability for housing defects causing economic injury).

154 *See* Trent v. Brasch Mfg. Co., 477 N.E.2d 1312, 1315-1317 (Ill. Ct. App. 1985); Chubb Group of Insurance Cos. v. C.F. Murphy & Assoc., Inc., 656 S.W.2d 766, 778-780 (Mo. App. 1983).

builder."[155] However, this reasoning does not foreclose plaintiffs from asserting that particular products within the office are defective.

For instance, one case which settled one month into trial[156] has important implications for plaintiffs attempting to rely on a strict liability theory. Plaintiffs were office workers who developed SBS symptoms shortly after moving into a high rise in El Segundo, California.[157] In this case, the judge ruled that the heating, ventilation, and air conditioning system was a separate "product" for strict liability purposes. Thus, had the case proceeded and the jury found the HVAC system defective, then the designer and contractor of the building would have been subject to strict liability.[158]

Other courts have left open the issue of whether the HVAC system can be treated as a "defective product."[159] Perhaps as a result of the possibility of establishing strict liability, more SBS plaintiffs are blaming ventilation systems.[160]

At least one SBS-like case has resulted in a jury verdict for the plaintiff. In *Bloomquist v. Wapello County*,[161] the plaintiffs argued that repeated exposure to a pesticide sprayed in their office building, combined with a defective HVAC system, led to various injuries. The plaintiffs focused on the HVAC system's inadequacies and the building supervisor's failure to repair the system.[162] After a ten week trial, the jury returned substantial verdicts for the plaintiffs.[163] The trial judge overturned the award because, *inter alia*, the plaintiffs failed to establish proximate cause for the injuries.[164] The Iowa Supreme Court reinstated the verdict, holding that there was sufficient evidence to support the verdict and

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155 Edie Lindsay, Comment, *Strict Liability and the Building Industry*, 33 EMORY L.J. 175, 209 (1984).

156 Call v. Prudential, No. SWC 909 13 Calif. Super. Ct. (settled Oct. 15, 1990).

157 Janet Rae-Dupree, *"Sick Building" Suit is Settled Abruptly*, L.A. TIMES, Oct. 18, 1990, at B4.

158 C. Jaye Berger, *Legal Aspects of Sick Building Syndrome*, N.Y. L.J., Sept. 10, 1991, at 1.

159 Trent v. Brasch Mfg. Co., 477 N.E.2d 1312, 1317 (Ill. App. Dist. 1985).

160 Dilworth, *supra* note 143.

161 500 N.W.2d 1 (Iowa 1993).

162 Katz & Portner, *supra* note 143, at 43.

163 *Bloomquist*, 500 N.W.2d at 2.

164 *Id.* at 3.

that epidemiological evidence was not the sole source of causation evidence.[165]

Currently, two highly publicized cases are progressing toward trial. The first is the Chicago courthouse case which formed the basis for the scenario at the beginning of this Comment.[166] Ironically, the second case involves EPA's Waterside Mall headquarters in Washington, D.C.[167] If either case results in a plaintiff's verdict, we can undoubtedly expect to see a larger number of SBS cases being brought in the future. One attorney claims that in the United States "the syndrome will be one of the most litigated issues of the 1990s."[168]

In addition to pursuing damage remedies, tenants can use the doctrine of constructive eviction to withhold rent and move to a new (and healthier) office building.[169] Constructive eviction allows a tenant to withhold rent payments and vacate the premises when the landlord's wrongful acts or omissions "substantially and materially deprive tenant of beneficial use and enjoyment of the premises."[170] The success of this theory in factual situations similar to SBS, indicates that tenants suffering from SBS might employ this theory with favorable results.[171]

Workers may also seek damages from their employers. In all but a few states, however, workers' compensation laws bar injured workers from suing their employers.[172] The relatively modest payments available under state workers' compensation laws do, however, provide an additional source of recovery for

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165 *Id.* at 3-6.

166 *Illinois County Sues Architect, Builder; Charges New Judicial Facility Contaminated*, 22 O.S.H. Rep. (BNA) 1330 (Dec. 23, 1992) (describing current status of lawsuit over DuPage County Courthouse).

167 *See* Dan Fagin, *Fuming Over Indoor Air: Even the EPA Faces "Sick Building" Lawsuit*, NEWSDAY, Nov. 17, 1992, at 6 (noting that $35 million dollar suit against landlord by 19 EPA employees will go to trial in 1993).

168 Hester Abrams, *"Sick" Office Buildings Are Also Presenting Some Problems In Europe*, CHI. TRIB., Aug. 11, 1991, at 1E (attributing prediction to James Newsom of Shook, Hardy, and Bacon).

169 For an analysis of this doctrine in the radon context, see Jeanne Prussman, *The Radon Riddle: Landlord Liability for a Natural Hazard*, 18 B.C. ENVTL. AFF. L. REV. 715, 725-28 (1991).

170 *Id.*

171 *See, e.g.*, Barash v. Pennsylvania Terminal Real Estate Corp., 256 N.E.2d 707 (N.Y. 1970) (landlord's failure to provide adequate ventilation on evenings and weekends in a sealed office building could be construed as constructive eviction).

172 For a brief discussion of workers compensation laws, as well as some emerging exceptions to the general bar against suits against employers see Diamond, *supra* note 144, at 84-5.

injured office workers. There is no way of knowing how common SBS-related workers' compensation claims are. Several examples have been widely reported. For example, a Florida woman received workers' compensation for SBS symptoms including fatigue, burning eyes, coughing, and voice loss.[173] Other SBS victims, however, have been less successful. In New York, for instance, workers have not been able to recover for SBS symptoms under workers' compensation.[174]

III

FREE MARKET OR GOVERNMENT INTERVENTION: ALTERNATIVE SOLUTIONS TO REMEDY THE SICK BUILDING SYNDROME

A. Market-Based Solutions

Although environmental law has traditionally relied on "command and control" regulations to solve environmental problems, an increasing number of commentators now argue for a greater emphasis on market solutions. As the EPA's Science Advisory Board recently noted, the "forces of the marketplace can be a powerful tool for changing individual and institutional behavior."[175] Market forces are currently remedying SBS, and will continue to do so in the future.

Economic theory suggests market forces will be more effective against SBS than against other environmental problems. Unlike most outdoor pollution, the sick building syndrome does not involve a "commons" problem.[176] From an economic perspective, people "consume" outdoor air by polluting it since they do not have to pay for the use of the resource. Moreover, no rational individual or firm would attempt to clean outdoor air because the costs to that individual or firm would exceed the benefits accruing to him or her. The air inside a building, on the other hand, is

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173 Goldman v. Broward County Bd. of County Comm'rs, Claim No. 287-48-1830; See brief description of case in Giampetro-Meyer, *supra* note 9, at 14-15.

174 Judith M. Gallent, *Indoor Air Pollution*, 2 ENVTL. L. N.Y. 81, 92 (explaining that statutory definition of "occupational disease" is a formidable obstacle to compensation).

175 SCIENCE ADVISORY BD., U.S. ENVTL. PROTECTION AGENCY, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 21 (1990).

176 John D. Spengler & Ken Sexton, *Indoor Air Pollution: A Public Health Perspective*, SCIENCE, July 1983, at 17.

a private good. As we will see, the building owner faces the costs and benefits of the air inside his or her building.

Despite this crucial distinction between SBS and outdoor air quality problems, legal commentators have argued that three market imperfections prevent the market from "solving" SBS. First, individuals may not have enough information about SBS to make informed decisions.[177] Second, many people would not be able to afford to remedy SBS problems.[178] Third, people other than the building owner may enter the building and be affected by SBS, thus externalizing the costs of SBS.[179] Although these arguments have some force as applied to residential buildings, they are not convincing in the context of office buildings.

The first suggested market failure, inadequate information, applies with less force to SBS. Both building owners and office workers have adequate information about SBS. For example, the Building Owners and Managers Association has used EPA's indoor air quality guidebook for a series of seminars on improving indoor air quality.[180] Partly out of fear of tort liability, architects are also conducting nationwide seminars on how to reduce SBS.[181] In addition, architects are finding that designing healthier workplaces can be cost effective.[182] Thus, office building owners and managers currently can gain access to practical information about how to diagnose and mitigate many SBS problems. Moreover, office workers may know enough about SBS to seek help. After all, they are the individuals who suffer the symptoms, read about SBS in newspapers and magazines, and petition their unions to remedy the problem. Nonetheless, some regulation is probably warranted. Office workers may not have the power to effect change, and labor market imperfections and unemployment suggest that workers cannot simply change jobs.

As for the second market imperfection, commercial building owners *can* afford to remedy SBS problems. According to EPA, some SBS problems can be cheaply alleviated by properly storing

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177 Kelly, *supra* note 9, at 317; Kirsch, *supra* note 9, at 383.

178 Kelly, *supra* note 9, at 317; Kirsch, *supra* note 9, at 385.

179 Kelly, *supra* note 9, at 317; Kirsch, *supra* note 9, at 385.

180 David W. Dunlap, *Seeking Remedies for "Sick Buildings,"* N.Y. TIMES, July 26, 1992, § 10, at 1.

181 Richard Kahlenberg, *Earth Watch: Design Ecology; Movement for Environmentally Friendly Architecture To Get A Boost From Nationwide TV Seminar*, L.A. TIMES, Jan. 14, 1993, at J13.

182 Michael D. Lemonick, *Architecture Goes Green*, TIME, April 5, 1993, at 38.

cleaning products and maintaining ventilation systems.[183] Even far more expensive undertakings may be economically feasible given the dominance of labor costs in the average firm's budget. As EPA concluded, "even a modest increase in productivity could justify substantial capital expenditures to improve indoor air quality."[184] One study showed reduced productivity from SBS of five or ten minutes per day would cost an employer between $636 and $2,444 per affected employee per year, depending on his or her salary.[185] Employers have a strong interest in increasing worker productivity, because at least part of the gains will accrue to them. Building owners also have a financial incentive to reduce SBS problems. As many have noted, "[t]he assurance of building health may allow the [building] owner to rent the building for a higher price . . . ."[186]

The third market imperfection is more problematic. In many, if not most commercial buildings, building owners would face the costs of remedying SBS problems, but the employees of office tenants would receive the benefits. The threat of litigation by the tenant employees and the reduced market value of buildings known to induce SBS, however, serve to at least partially internalize the costs of inadequate attention to SBS problems.

Putting aside the theoretical arguments, there is evidence that market incentives are already reducing the incidence of SBS. In particular, VOC control strategies are gradually becoming available. EPA has a testing facility to measure VOC emission rates from different office products and plans to help manufacturers develop and market products that emit smaller amounts of VOCs.[187] In addition, private firms are developing filters and adsorbents that can dramatically reduce VOC concentrations.[188] Despite the power of market incentives to gradually reduce the incidence of SBS, some type of regulatory option is warranted.

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183 ASSESSMENT AND CONTROL, *supra* note 14, at 5-15.

184 ASSESSMENT AND CONTROL, *supra* note 14, at 5-17.

185 C.J. Weschler et al., *Concentrations of Volatile Organic Compounds at a Building with Health and Comfort Complaints*, 51 AM. INDUS. HYGIENE ASS'N J. 261, 268 (Table V) (1990).

186 J.F. Miller & G.E. Keller, *Overview of the ACS Symposium on Indoor Air Pollution*, *in* INDOOR AIR POLLUTION: RADON, BIOAEROSOLS, & VOCs 1, 7 (1991).

187 FEDERAL PROGRAMS, *supra* note 7, at 19.

188 Miller & Keller, *supra* note 186, at 7.

B. Regulatory Options Under Existing Law

Despite the absence of scientific information about SBS, there is an increasing demand for federal regulation to remedy the SBS problem. However, even if we accept the proposition that SBS poses health risks to about one-third of American office workers and that SBS costs our economy billions of dollars per year in lost productivity, it does not follow that regulation is the most effective remedy.[189] Even when scientific information on SBS is more definitive, regulating SBS will not be simple. According to the most recent statistics, there are approximately 4.5 million commercial buildings in the United States.[190] Unlike outdoor air quality standards which can cover a large swath of territory, indoor air quality can vary from room-to-room and building-to-building. However, EPA's efforts at regulating asbestos in schools is one precedent for direct federal involvement in regulating indoor air quality in publicly accessible buildings.[191] More importantly, however, the significant non-chemical explanation for SBS cannot effectively be reached through regulation. For example, the government cannot banish worker stress by regulatory decree.

Despite these difficulties, several existing statutes can be used to reduce the incidence of SBS. EPA has announced it will use the Toxic Substances Control Act (TSCA)[192] and the Federal Insecticide Fungicide and Rodenticide Act (FIFRA)[193] to control indoor air pollutants as scientific knowledge becomes available.[194] However, these statutes have limited value because they only address chemical contaminants. Therefore, any regulatory solution authorized by TSCA or FIFRA will be incomplete.

While FIFRA may be a possible source of statutory authority for alleviating indoor air pollution, it is of dubious value as a tool to control SBS. Although the VOC content in pesticides may

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189 Other indoor air quality issues like radon, ETS, lead, and asbestos may warrant legislation.

190 ENERGY INFO. ADMIN., U.S. DEP'T. OF ENERGY, COMMERCIAL BUILDINGS CHARACTERISTICS (1991).

191 Asbestos-Containing Materials in Schools, 52 Fed. Reg. 41,826 (1987) (codified at 40 C.F.R. § 763 (1993)) (requiring (1) all private and public schools to be inspected by certified persons following an EPA-approved protocol and (2) schools to develop a control program for asbestos).

192 15 U.S.C. §§ 2601-2671 (1988 & Supp. III 1991).

193 7 U.S.C. §§ 136-136y (1988 & Supp. III 1993).

194 *Hearings*, *supra* note 62, at 12-13, 36 (prepared statement of Michael H. Shapiro, Deputy Assistant Administrator for Air and Radiation, U.S. EPA).

induce SBS symptoms, no research indicates that pesticide use in offices is a major source of SBS complaints. EPA has used its authority under FIFRA to cancel the registration of several pesticides used in indoor environments.[195] In short, FIFRA may be used to eliminate office health risks only in limited cases. Given the absence of a known connection between pesticides and SBS, however, pesticide controls cannot be expected to reduce the prevalence of SBS.

TSCA is a more promising source of regulatory authority. TSCA provides EPA with authority to regulate "chemical substances"[196] which "present an unreasonable risk of injury to health or the environment."[197] This statutory mandate is comprehensive enough to permit EPA to regulate VOCs. Under TSCA, EPA has a wide range of regulatory options. The agency can (1) limit or prohibit the manufacture, processing, or distribution of chemical substances,[198] (2) prohibit or limit the manufacture, processing, or distribution of chemical substances for particular uses,[199] (3) require any article containing a chemical substance to have a warning label or be accompanied by instructions,[200] (4) prohibit or regulate any "manner or method of commercial use" of a chemical substance,[201] or (5) require manufacturers to give notice of possible health risks to purchasers or the general public.[202] TSCA does not give EPA the discretion to choose whichever strategy it wants. The EPA must use the "least burdensome" requirement, and regulate only to "the extent necessary to protect adequately" against the unreasonable health risk posed by the chemical substance.[203] Despite this limitation, EPA could justifiably require labels, instructions, or notice of health risks for products that emit high concentrations of

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195 FEDERAL PROGRAMS, *supra* note 7, at 45-47 (describing EPA cancellation of insecticides used indoors, including lindane fumigation devices).

196 TSCA defines "chemical substance" as "any organic or inorganic substance of a particular molecular identity, including — (i) any combination of such substances occuring in whole or in part as a result of a chemical reaction or occuring in nature and (ii) any element or uncombined radical." 15 U.S.C. § 2602 (2)(A). However, the term does not include pesticides, tobacco, nuclear materials, food, food additives, drugs, and cosmetics. *Id.* § 2602 (2)(B).

197 *Id.* § 2605(a).

198 *Id.* § 2605(a)(1)

199 *Id.* § 2605(a)(2).

200 *Id.* § 2605(a)(3).

201 *Id.* § 2605(a)(5).

202 *Id.* § 2605(a)(7).

203 *Id.* § 2605(a).

VOCs. If that approach proves inadequate, EPA could use more burdensome regulations.

However, EPA's record under TSCA is not promising for the regulation of indoor air contaminants. For example, EPA failed to regulate formaldehyde exposure despite evidence of its adverse health effects from very high exposures in particular settings.[204] As one authority put it, "[t]he main difficulty in regulating any substance under TSCA is simply prodding EPA to regulate."[205]

Although the Clean Air Act (CAA)[206] would seem like the logical statutory authority to address SBS, the CAA gives EPA the authority to regulate "ambient air," a term which EPA has defined to exclude indoor air.[207] This interpretation has never been challenged, and is consistent with the CAA's statutory language and legislative history.[208]

The Consumer Product Safety Act (CPSA)[209] is similarly unhelpful. The CPSA does not provide much assistance for the SBS problem because the act is limited to "consumer products."[210] Although this definition is restrictive, some consumer products used in offices may be regulated under the Act.[211] Regardless, the CPSA is of limited value for protecting office workers from SBS.

As this overview suggests, current regulatory options are largely limited to FIFRA and TSCA, which only address pesti-

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204 THAD GODISH, INDOOR AIR POLLUTION CONTROL 326-27 (1989). The Consumer Product Safety Commission, however, banned urea-formaldehyde foam insulation in 1982.

205 Kirsch, *supra* note 9, at 372.

206 42 U.S.C. §§ 7401-7642 (1988 & Supp. III 1991).

207 The EPA defines "ambient air" as "that portion of the atmosphere, *external to buildings*, to which the general public has access." 40 C.F.R. §50.1(e) (1992) (emphasis added).

208 *See* CROSS, *supra* note 12, at 79.

209 15 U.S.C. §§ 2051-2084 (1988).

210 The term "consumer product" is 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 in or around a permanent or temporary household or residence, a school, in recreation, or otherwise." 15 U.S.C. § 2052(a)(1) (1988).

211 *See* Consumer Product Safety Comm'n. v. Anaconda Co., 593 F.2d 1314 (D.C. Cir. 1979) (product customarily sold to consumers remains a "consumer product" within meaning of CPSA even if large portion of distribution is for industrial use).

cides and chemical substances, respectively. The potential for broader federal regulation is considered in the next section.

IV

FUTURE REGULATORY DEVELOPMENTS

Federal proposals that may significantly impact SBS regulation are advancing along two fronts. The first is a proposed OSHA rule on workplace indoor air quality. The second development is the prospect of comprehensive federal indoor air quality legislation. Although neither regulatory proposal is limited to SBS, both are partially motivated by concerns over SBS.

A. OSHA's Proposed Rule

The Occupational Safety and Health Act (OSH Act)[212] gives the Occupational Safety and Health Administration (OSHA) the authority to regulate workplaces to protect worker health. To date, however, OSHA has largely focused on regulating industrial workplaces. In testimony to a Congressional subcommittee, an OSHA representative testified that OSHA has "sufficient statutory authority to protect workers from indoor air hazards."[213] In response to questioning, however, the OSHA representative alluded to statutory difficulties with regulating in the non-industrial setting.[214] In the context of harmful physical agents, OSHA empowers the Secretary of Labor to promulgate standards such that "no employee will suffer material impairment of health or functional capacity."[215] SBS symptoms arguably fit within this standard, because the symptoms interfere with the victims' ability to work.[216] Nevertheless until recently, OSHA has shown no interest in regulating offices to protect workers from SBS.

On September 20, 1991, however, OSHA published a request for information on indoor air pollution in the Federal Register.[217] The publication requested answers to ninety-two different questions, most of which had multiple parts. The questions explore

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212 29 U.S.C. §§ 651-678 (1988).

213 *Hearings*, *supra* note 62, at 57 (prepared statement of Cynthia Douglass, Deputy Assistant Secretary of Labor for Occupational Safety and Health).

214 *Hearings*, *supra* note 62, at 71.

215 29 U.S.C. § 655(b)(5)(1988).

216 OSHA Proposed Rules, *supra* note 29, at 16,001-02.

217 56 Fed. Reg. 47892 (Sept. 20, 1991).

virtually every issue relating to indoor air quality and SBS. In January of 1992, OSHA extended the comment period until March 20, 1992.[218] Interested parties submitted 1,214 comments, including more than 17,000 pages.[219] About seventy percent of the comments expressed support for some type of OSHA regulation.[220]

On April 5, 1994, OSHA finally issued its notice of proposed rulemaking for indoor air quality.[221] The proposed rule would create controls on ETS in all worksites and more general indoor air quality controls that would apply to all "nonindustrial work environments."[222]

The proposed rule has six substantive provisions: indoor air quality compliance program,[223] compliance program implementation,[224] specific contaminant controls,[225] air quality maintenance during renovation and remodeling,[226] employee information and training,[227] and recordkeeping.[228]

In more specific terms, employers must establish a written indoor air quality compliance program. The employer must keep records about the building design and operation and the HVAC system,[229] and a written record of employee complaints of building-induced symptoms.[230]

Paragraph (d) of the proposed rule imposes a laundry list of specific mandates, including maintenance of the HVAC system, limits on relative humidity, and provision of ventilation as required by building or ventilation code.

The OSHA proposed rule seems reasonable. It does not impose very onerous requirements. In fact, parts of the proposal are just good business sense. By making one individual responsi-

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218 57 Fed. Reg. 3096 (Jan. 27, 1992).

219 *OSHA to Decide on Indoor Air Rule, Answer Petitions by Year's End, Official Says*, 16 CHEM. REG. REP. (BNA) 1257 (Oct. 16, 1992).

220 *Id.*

221 59 Fed. Reg. 15,967 (1994) (to be codified at 29 C.F.R. pts. 1910, 1915, 1926, 1928) (proposed Apr. 5, 1994).

222 *Id.* at 15,968.

223 *Id.* at 16,036, ¶(c).

224 *Id.* at 16,036, ¶(d).

225 *Id.* at 16,037, ¶(e).

226 *Id.* at 16,037, ¶(f).

227 *Id.* at 16,037, ¶(g).

228 *Id.* at 16,037, ¶(h).

229 *Id.* at 16,036, ¶(c)(3).

230 *Id.* at 16,036, ¶(c)(5).

ble for recording and resolving indoor air quality disputes and fears, employers should be able to recognize and alleviate problems before they become highly publicized and litigated. On the other hand, the proposed rules are so vague as to leave employers guessing about their obligations.

The proposed rules will undoubtedly undergo significant revision before they are finally promulgated. Without more research into indoor air quality, however, the proposed rules will of necessity remain vague. Perhaps most troubling are the seemingly inevitable lawsuits that arise when OSHA promulgates any new rule. For these reasons, OSHA needs guidance and support in the form of federal legislation.

B. The Indoor Air Quality Act of 1993

March 1993, Senator George Mitchell (D-Maine) introduced the Indoor Air Quality Act of 1993 in the Senate[231] and Representative Joseph Kennedy II (D-Mass.) introduced a similar bill, with the same name, in the House of Representatives.[232] Although neither bill has been enacted into law, and both predate the OSHA proposal discussed above, they provide current insight into Congressional attitudes about SBS. Thus, they are worth analyzing in detail.

The bills would dramatically increase federal efforts to research, mitigate, and prevent indoor air quality problems, including SBS. Each bill would establish an Office of Indoor Air Quality within EPA's Office of Air and Radiation, require EPA to develop and publish a national indoor air quality response plan, and authorize approximately fifty million dollars per year indoor air quality programs and research.

The findings in both bills state that "as many as 20% of office workers may be exposed to environmental conditions manifested as sick building syndrome."[233] Clearly, congressional concern about SBS is part of the impetus behind the two bills. Although both pieces of legislation are intended to be comprehensive federal indoor air quality legislation, several programs in the bills are directed toward SBS.

For example, both bills require EPA to study the types of buildings and design features that increase the likelihood of ex-

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231 S. 656, 103d Cong., 1st Sess. (1993).
232 H.R. 1930, 103d Cong., 1st Sess. (1993).
233 S. 656, §2(10); H.R. 1930, § 2(10).

posure to indoor contaminants.[234] The House Bill requires EPA and NIOSH to conduct a baseline study on commercial buildings that comply with generally accepted design, maintenance, and ventilation systems.[235] The Senate version specifically requires EPA to identify remedies for SBS including proper design and construction practices, and a standardized protocol for investigating sick buildings.[236] Both bills, therefore, require further research into SBS.

Although both bills were touted as denying EPA any new regulatory authority, both bills create a system for publishing health advisories.[237] This provision requires EPA to publish advisory materials about contaminants determined to have adverse impacts on human health. The bills require EPA to issue at least six advisories within eighteen months of enactment, and an additional six advisories within three years of enactment. The Senate version specifies a list of particular contaminants that must be addressed. Health guidelines would affect manufacturing decisions because corporations would face moral and market pressure to produce safe products.[238]

The bills also create a special program for buildings owned and leased by the federal government. Although these sections do not specifically mention SBS, they must have been at least partially motivated by SBS concerns given the high profile SBS problems plaguing several federal buildings in Washington (including EPA's headquarters and the Library of Congress).[239] Both bills require the federal government to undertake a variety of programs to evaluate and remediate its stock of buildings, as well as to appoint an indoor air quality "monitor" in each federal building that employees can approach with SBS complaints.[240]

Both bills also emphasize the role of ventilation systems. The Senate Bill requires EPA to analyze the adequacy of current ventilation standards, assess the cost of compliance, and report its findings to Congress.[241] The House Bill, on the other hand, essentially adopts the current ASHRAE ventilation standard 62-

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234 S. 656 § 5(b)(5); H.R. 1930, § 5(b).
235 H.R. 1930 § 5(i).
236 S. 656 § 8(c)(9).
237 H.R. 1930 § 7; S. 656 § 7.
238 GODISH, *supra* note 204, at 315.
239 *E.g.*, Fagin, *supra* note 167; *see also* NIOSH STUDY, *supra* note 39.
240 H.R. 1930, § 9; S. 656 § 9.
241 S. 656 § 6(c).

1989. It requires all new public or commercial buildings to maintain an HVAC system designed to provide a minimum of twenty cubic feet per minute (cfm) of outdoor air per occupant and a minimum of sixty cfm in rooms where smoking is permitted.[242] Existing buildings must comply with applicable building codes.[243] These ventilation requirements in the House Bill were strongly criticized in Congressional testimony.[244] Existing federal law already contains some ventilation standards. Under the Energy Conservation and Production Act,[245] the Department of Energy (DOE) was required to establish mandatory ventilation standards for new federal buildings; the standards are merely advisory for private entities. DOE adopted ASHRAE Standard 62-1981,[246] which requires ventilation at the rate of five cfm. Thus, the House Bill would dramatically increase the ventilation requirements in federal buildings.

In addition to mandating specific ventilation standards, the House Bill requires contaminant emissions product labeling. The Bill would give EPA and the CPSC two years after enactment to (1) issue regulations establishing scientific methods for measuring and describing indoor air contaminant emissions and (2) identify products that pose significant adverse human health threats.[247] Within three years of enactment, EPA and CPSC would issue regulations requiring products with significant adverse health threats to bear labels or be accompanied by written material informing purchasers of indoor air contaminant emission rates.[248] Thus, the House Bill would force EPA to issue regulations similar to those that EPA currently has authority to issue under TSCA.

There is a bias throughout both bills toward researching and controlling chemical contaminants. As discussed above,[249] there is no consensus that chemical contaminants are the primary cause of SBS. Given the possible carcinogenicity of many VOCs found

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242 H.R. 1930 § 15(a)(1). EPA would establish regulations and OSHA would enforce the regulations according to penalties included in the Act.

243 H.R. 1930 §15(b)(1).

244 For a summary of the testimony see *Proposed Indoor Air Ventilation Standard Draws Fire From Witnesses at House Hearing*, 133 Daily Lab. Rep. (BNA) A-10 (July 11, 1991).

245 42 U.S.C. §§ 6801-6892 (1988).

246 10 C.F.R. § 435.107, standard 7.3.1.4 (1993).

247 H.R. 1930 § 16(a).

248 *Id.* § 16(b).

249 *See supra* part I.B.

in office air, however, it may be prudent to reduce VOC concentrations in offices before turning to the other possible causes of SBS.

The Senate approved Senator Mitchell's Bill on October 29, 1993.[250] Congressman Kennedy's Bill has yet to be voted out of committee in the House.[251] Since his bill has languished in the House Education and Labor, Energy and Commerce, and Science, Space, and Technology committees, Kennedy has decided to try a new tactic.[252]

In August, 1993, Kennedy introduced the "Indoor Air Act of 1993" as a proposed amendment to the Public Health Service Act.[253] Kennedy purposely drafted the bill so that the House Energy and Commerce Committee would have sole jurisdiction.[254] This bill is significantly different from either Senator Mitchell's bill or Kennedy's earlier bills. The bill omits any responsibility for OSHA, placing the onus on the EPA Administrator. The bill requires EPA to promulgate a list of common indoor air hazards and guidelines for identifying, eliminating, and preventing those hazards, and states that compliance with the guidelines "shall be voluntary unless the Administrator determines otherwise."[255] The bill also establishes a program to accredit indoor air contractors.[256] It also requires EPA to establish a national public awareness campaign[257] and grants permission to do research on indoor air quality.[258]

CONCLUSION

As has been emphasized throughout this Comment, we know surprisingly little about the sick building syndrome. Our lack of knowledge seriously hampers our ability to respond to the significant health threat that SBS may represent. As discussed above, without better data on the prevalence, health effects, and economic costs of SBS, it is difficult to know whether SBS is a seri-

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[250] *Senate Approves Mitchell Research Bill; Future Depends on Stalled House Legislation*, O.S.H. Daily (BNA) at 16 (Nov. 9, 1993).

[251] *Id.*

[252] *Certification, Lack of OSHA Role Prompts Concern Over Kennedy Bill*, 23 O.S.H. Rep. (BNA) 853 (Dec. 15, 1993).

[253] H.R. 2919, 103d Cong., 1st Sess. (1993).

[254] *Certification*, *supra* note 252.

[255] H.R. 2919, § 2702.

[256] *Id.* § 2703.

[257] *Id.* § 2704.

[258] *Id.* § 2708.

ous problem. As Robert B. Axelrad, director of EPA's Indoor Air Division succinctly stated:

> The problem is there are a lot of scientific unknowns at this point and we really have to have a better understanding of a lot of these issues before we can go off and say that we know how to fix them. Sick-building syndrome merely means that we don't know what it is.[259]

Increased research on SBS and indoor air quality issues should become a top priority. As one editorial in the *New England Journal of Medicine* noted, "we do not know the cause of the sick building syndrome, and the science to support prevention, correction, and the setting of standards is woefully undeveloped and unsupported in the United States."[260] Although it is possible to spend too much money researching a problem, the resources currently devoted to SBS research undoubtedly fall short of that mark. Increased research will have many ripple effects. For example, as we learn more about the causes of SBS, it will become easier for plaintiffs in SBS cases to establish the element of causation. The better our scientific information becomes, the more effective both market-based and regulatory solutions will become.

Congress should build upon and strengthen the foundation for OSHA rulemaking by passing legislation to address SBS. This legislation should primarily focus on research. Aside from environmental tobacco smoke, we do not currently know enough about the causes of SBS to enact a comprehensive regulatory program. Given the possible social and psychological causes of SBS, and the fact that SBS occurs in the employment context, OSHA should be given primary authority over any regulatory program.

Congress should pass a substantially modified version of Senator Mitchell's Indoor Air Quality Act of 1993 this year. This legislation should provide OSHA and EPA with significant resources to research SBS (and other indoor air quality problems) without prematurely committing either agency to a new regulatory scheme. Without this legislation, neither EPA nor OSHA will be able to act in a comprehensive manner because neither agency has the discretionary funds to begin a new

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259 Shaman, *supra* note 104, at 13.

260 Kathleen Kreiss, *The Sick Building Syndrome in Office Buildings—A Breath of Fresh Air*, 328 NEW ENG. J. MED. 877, 878 (1993).

research program. Moreover, this legislation would be a strong signal from Congress that it is willing to address some of the increasingly complex environmental problems that will face us in the coming decades. However, the bill needs to be amended to remove some of the focus on chemical and ventilational sources of SBS. There simply is not enough scientific evidence to support these assumptions. In fact, the best scientific evidence suggests that SBS has many different causes.

However, federal legislation alone will not, and probably cannot, eliminate SBS. Although federal research and regulation (under existing federal statutes) of SBS causation should be encouraged, costly federal mandates would be unwise at this time. Market forces, state and local government regulation, and tort litigation will undoubtedly reduce the prevalence of SBS. Private building owners will continue to alleviate SBS problems increasing the value of their buildings while avoiding the costs of litigation. State and local governments will experiment with various SBS regulatory schemes, thereby providing researchers with data about the efficacy of various types of regulation. Tort litigation will compensate injured victims and deter building owners from creating avoidable SBS problems. As our knowledge about SBS increases, we will eventually be able to decide how best to remedy SBS problems. However, an amended version of the Indoor Air Quality Act of 1993 remains an important first step.

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