Asbestos in Schools: A Remonstrance Against Panic

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Following the discovery of asbestos-containing materials in some public schools, parents have responded with understandable concern for the health of children and a demand for prompt action to remove the materials. Ironically, and tragically, the rush to remove asbestos from schools may significantly increase the hazard presented by the substance. A more carefully thought out policy is required to protect public health, for current school conditions may present little or no risk to students, while removal operations may create a new risk. This article examines the existing situation and proposes a redirection of attention and effort toward a more focused program to evaluate the risks posed by asbestos in schools and, where a significant risk exists, to ensure that response actions are both safe and effective.

I. The Health Risk from Asbestos in Schools

There is no question but that asbestos can be a very hazardous substance. At high exposure levels, asbestos has been clearly linked to various fatal diseases, including lung cancer, mesothelioma, and asbestosis.[1] One survey of the evidence suggested that workplace inhalation alone might cause more than 60,000 cancer deaths annually. [2] While this figure may be excessive, even the

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1. See 48 Fed.Reg. 51,086, 51,099-51,122 (1983) for a summary of the evidence on the health harms of asbestos. The diseases to which asbestos exposure has been linked are listed in Lang, *Danger in the Classroom: Asbestos in the Public Schools,* 10 Colum. J. Envtl. L. 111, 112 (1985). *See also Hearing on Federal Efforts to Control Asbestos Hazards Before the Subcomm. on Commerce, Transportation, and Tourism of the House Comm. on Energy and Commerce,* 98th Cong., 2d Sess. 1 (1984)(statement of Rep. Florio) [hereinafter cited as *Federal Efforts Hearing*] ("Asbestos is an undisputed human carcinogen and is perhaps the most deadly and most feared toxic substance currently contaminating our environment.")

2. M. Green & N. Waitzman, Business War on the Law 110 (1979). *But see* Doll & Peto, *The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today,* 66 J. Nat'l. Cancer Inst. 1191, 1245 (1981) (suggesting that four to eight thousand deaths is a more accurate estimate).

studies performed by the Occupational Safety and Health Administration (OSHA) for the Reagan Administration have estimated that present occupational exposures to asbestos are responsible for over 6000 deaths per year. [3] In light of this evidence, it is not surprising that Americans are acutely concerned at the prospect of their children breathing asbestos fibers.

As with any hazardous substance, however, the degree of harm from asbestos will depend on the degree to which people are exposed. The legacy of asbestos-caused death discussed above is the consequence of very high levels of exposure. In the past, workers were confronted with airborne asbestos levels exceeding ten and even one hundred asbestos fibers per cubic centimeter (f/cc).[4] OSHA's current standard for maximum average occupational asbestos exposure, which still presents a considerable hazard to workers, is 2 fibers per cubic centimeter (f/cc).[5] While the latter number may seem small, it corresponds to an average inhalation of 16 million fibers per day for a worker exposed at the standard level.[6] Obviously, the historic death toll results from a high level of asbestos exposure.

A. *Exposure Levels in Schools*

Measured against past occupational concentrations, exposure levels in schools are exceedingly low. Indeed, many schools containing asbestos materials experience no detectable increase in asbestos levels in the classroom air. Where indoor asbestos concentrations have been measured, most are "tens of thousands of times less than historical worker asbestos exposures."[7] Asbestos

3. See 48 Fed. Reg. at 51,096 (1983).

4. *See, e.g.*, S. LEVINSON, REPORT ON DUST COUNTS DURING SHIPBOARD ASBESTOS WORK (June 18, 1965). *See also Federal Efforts Hearing*, *supra* note 1, at 192.

5. *See* 37 Fed. Reg. 11,318 (1972). OSHA attempted to reduce this legal limit by issuing an emergency temporary standard of 0.5 f/cc. 48 Fed. Reg. 51,086 (1983)(to be codified at 29 C.F.R. § 1910.4). The Fifth Circuit, however, overturned this emergency standard for lack of proof that the current danger to workers was "grave" and that the emergency standard was "necessary" under the terms of the Occupational Safety and Health Act. Asbestos Information Association/North America v. OSHA, 727 F.2d 413, 427 (5th Cir. 1984).

6. 48 Fed. Reg. at 51,091 (1983).

7. *Federal Efforts Hearing*, *supra* note 1, at 191 (letter from Safe Buildings Alliance, a coalition of companies who have in the past produced asbestos products). *See also Hearings on Potential Health Hazards Associated With the Use of Asbestos Containing Material in Public and Private Facilities Before the Subcomm. on Public Buildings and Grounds of the House Comm. on Public Works and Transportation*, 98th Cong., 2d Sess. 53 (1984) [hereinafter cited as *Potential Health Hazards Hearing*] (testimony of Jo Ann Semones of EPA) ("Compared with historic

is often enclosed behind walls or ceilings and thus can never reach the lungs of schoolchildren, as documented by a growing number of studies summarized below.

Before reviewing the studies available measuring asbestos concentrations in schools, it is valuable to understand how asbestos materials are found in buildings. Such products fall into one of the following three categories: (1) those used or applied in a liquid state; (2) hard products in which fibers are embedded in some other solid material; and (3) materials that are soft and easily crushed, often referred to as "friable."[8]

Asbestos materials applied in a liquid state pose a very low risk of release to the air and thus to children's lungs. Inhalation is "unlikely, because the fibers are combined with and held down by a liquid."[9] In this type of product the asbestos fibers are "impregnated" with a liquid such as asphalt and it is "very unlikely that they can become airborne again."[10] The second category of asbestos-containing materials, hard products, also present little risk of exposure.[11]

Much of the controversy over asbestos in schools relates to the last category of "friable" materials. While this is the kind of application that may present a risk to building occupants, many materials that are referred to as "friable" may actually present little threat of fiber release. The Environmental Protection Agency ("EPA") found that 85-92% of asbestos "end-product uses have effectively immobilized the asbestos fibers by mixing them into a strong binding material, e.g., cement."[12] Another study of supposed "friable" materials found them to be "cementitious" as ap-

levels of asbestos in workplaces, airborne asbestos in these schools is lower by a factor of between 1,000 and 10,000.")

8. *See* ONTARIO ROYAL COMMISSION ON ASBESTOS, REPORT OF THE ROYAL COMMISSION ON MATTERS OF HEALTH AND SAFETY ARISING FROM THE USE OF ASBESTOS IN ONTARIO, VOLUME TWO, at 549-557 (1984) [hereinafter cited as ROYAL COMMISSION REPORT].

9. *Id.* at 549.

10. *Id.*

11. *Id.* These materials include "floor tiles, asbestos-cement products, hard ceiling tiles" and others. *Id.* While these products cause little contamination under ordinary circumstances, they may release significant numbers of fibers during demolition or removal operations. *Id.*

12. OFFICE OF TOXIC SUBSTANCES, U.S. ENVTL. PROTECTION AGENCY, SPRAYED ASBESTOS-CONTAINING MATERIALS IN BUILDINGS: A GUIDANCE DOCUMENT, Part 1, I-1-2 (March 1978)[hereinafter cited as "1978 EPA GUIDANCE DOCUMENT"]. *See also Potential Health Hazards Hearings, supra* note 7, at 313 (Statement by National Institute of Building Sciences) ("most [about 90%] of this annual asbestos use was in products and applications that effectively immobilize asbestos fibers by mixing them with strong binding materials.").

plied and "intact and presenting no current hazard of asbestos contamination."[13] In many cases, these asbestos materials were applied with binders such as gypsum and water and "the resulting product is relatively hard and dense."[14] Unless these materials are quite old or have suffered unusual deterioration, the quantity of asbestos fibers they release is "nearly zero."[15] The Asbestos Policy Committee of the State of New Jersey therefore concluded that "mere presence of asbestos does not in and of itself pose a health risk to anyone," because "materials in good repair are not likely to emit airborne fibers. . . ."[16]

In sum, most asbestos applications in schools and other buildings present very little danger of injury-causing contamination of the indoor environment. Even the most hazardous "friable" asbestos will seldom pose such a risk. Consequently, most school situations involving asbestos-containing materials will not result in fiber release and therefore will not threaten the health of children or other building occupants. This understanding is confirmed by many studies that have actually measured the asbestos concentrations in schoolroom air. These studies, discussed below, find very low fiber levels and therefore very low exposure levels for school children.

B. *Scientific Studies of Ambient Concentration Levels*

Perhaps the most comprehensive and reliable study on the harms of asbestos in general was performed by an expert Commission established by the government of Ontario in Canada.[17] This Commission issued a report, over 900 pages in length, based on the testimony of 53 expert witnesses who provided thousands of pages of testimony, and on independent research studies.[18] The Commissioners themselves were distinguished Canadian scientists.[19]

13. W.J. NICHOLSON, CONTROL OF SPRAYED ASBESTOS SURFACES IN SCHOOL BUILDINGS: A FEASIBILITY STUDY 38 (1980).

14. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 550.

15. 1978 EPA GUIDANCE DOCUMENT, *supra* note 12, at I-2-5.

16. ASBESTOS POLICY COMMITTEE'S INTERIM REPORT TO THE GOVERNOR 1-2 (September 1984) [hereinafter cited as NEW JERSEY COMMITTEE REPORT]. *See also* Lang, *supra* note 1, at 112 ("[h]ard asbestos-containing materials, such as vinyl floors, do not generally create exposure problems.")

17. *See generally* ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8.

18. ROYAL COMMISSION REPORT, VOLUME ONE, at 5.

19. ROYAL COMMISSION REPORT, VOLUME THREE, *supra* note 8, at 875.

The Royal Commission Report addressed all major health issues associated with asbestos, including the risk in office buildings and schools.[20] Among the Commission's investigations was an extensive survey of indoor exposure levels. It began by considering the modes of possible contamination and noting that building materials may release asbestos into the air either by slow erosion or by disturbances resulting from physical contact with materials containing asbestos.[21] According to the Commission, the former produces only "minimal levels of fiber concentration," while the latter results in exposure "for very short periods of time."[22] The most prevalent source of breathable asbestos in schools comes from reentrainment, the repeated dispersion of asbestos fibers that have already been released and have fallen to the floor of schools, only to be floated back into the air when disturbed by cleaning or other similar operations.[23]

These qualitative findings of the Ontario Royal Commission are confirmed by extensive empirical quantitative assessments, which show school exposure levels to be quite low. The Commission conducted its own exposure studies, as well as surveying earlier reports. One of the Commission-initiated studies was performed by Dr. Eric Chatfield, who collected numerous air samples in schools, commercial buildings, airports, and other structures containing asbestos materials.[24] Dr. Chatfield's final report concluded that "building atmospheres have not in general shown concentrations significantly higher than those observed outside."[25] The representative measurements reported by this study were 0.0006 f/cc and below.[26] Thus, inhabitants of the

20. In addition to addressing the hazards of asbestos in buildings, *id.* at 547-592, the Commission extensively surveyed the health effects evidence, occupational exposures and risks, general environmental exposures, and appropriate government responses.

21. *Id.* at 561. *See also* 1978 EPA GUIDANCE DOCUMENT, *supra* note 12, at I-2-5 - I-2-7; *Potential Health Hazards Hearing*, *supra* note 7, at 227-233, 313-14 (summarizing the wide variety of asbestos-containing products found in buildings and the great differences in their use and fiber release potential).

22. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 561-62.

23. *Id.*

24. E. CHATFIELD, MEASUREMENT OF ASBESTOS FIBER CONCENTRATIONS IN AMBIENT ATMOSPHERES, Royal Commission on Asbestos Study Series, no.10, Ontario Royal Commission on Asbestos (May 1983).

25. *Id.* at 84.

26. *Id.* at 86. Dr. Chatfield's measurements, like those of several others measuring very low indoor exposure levels, were taken in a different form, expressed in nanograms per cubic meter. His study found median levels of 2 ng/m^3. For the sake of simplicity, all such measurements have been converted in the text into fibers per cubic centimeter, using a

buildings studied by Dr. Chatfield were exposed to levels 5000 times lower than those allowed for workers by OSHA. Moreover, the fibers that were present may have come from the outdoor air, rather than the asbestos materials in the buildings studied.[27]

The same Royal Commission completed another study supervised by Dr. Donald J. Pinchin.[28] Pinchin's results were close to those reported by Chatfield, with a median level of 0.0003 or below, in all buildings sampled. [29] Dr. Pinchin's report concluded that "it is clear that the levels of airborne fibers in buildings sprayed with asbestos-containing material are very similar to the fiber levels detected in buildings without asbestos, under normal conditions."[30] In short, asbestos materials in buildings frequently pose no threat of exposure to residents, and can be expected in most circumstances to create only an infinitesimal concentration of asbestos fibers in the indoor air.

In addition to its own studies, the Commission evaluated the published literature on asbestos in schools and other buildings. This review demonstrated that "the exposure of building occupants to asbestos fibers during normal building use" was "insignificant."[31] The Royal Commission observed that "[s]tudies of asbestos concentrations in building air have shown that many buildings containing asbestos insulation do not exhibit fiber levels exceeding those in the outdoor air or in buildings not insulated with asbestos."[32] The conservative estimate of average exposures in buildings with asbestos products was "less than 0.001 f/cc."[33] This data led to the conclusion that "the exposure of general building occupants to asbestos fiber concentrations in the air [is] negligible under most conditions."[34] Even the worst con-

generally accepted finding that 33,000 ng/m^3 is roughly equivalent to 1 f/cc. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 574.

27. Asbestos from a variety of sources is found throughout the ambient air outside buildings. EPA has measured mean urban asbestos levels higher than those found indoors in Chatfield's study. 1978 EPA GUIDANCE DOCUMENT, *supra* note 12, at I-2-1 - I-2-3. *See also Federal Efforts Hearing*, *supra* note 1, at 189. No study has been found quantifying the contribution of outdoor levels to indoor exposures, but it seems obvious that some of the fibers found in buildings can be attributed to outside sources.

28. D. PINCHIN, ASBESTOS IN BUILDINGS, Royal Commission on Asbestos Study Series, no.8, Ontario Royal Commission on Asbestos (June 1982).

29. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 566.

30. PINCHIN, *supra* note 28, at 1.13.

31. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 548.

32. *Id.* at 577.

33. *Id.*

34. *Id.* at 578-79.

ditions resulted in relatively low airborne asbestos concentrations. The Royal Commission thus found that "the worst building exposures are considerably less than 0.01 f/cc," or two hundred times less than the current OSHA standard.[35] In all the studies performed or reviewed by the Commission, "a few sample readings as high as 0.01 f/cc represent the highest likely exposure."[36]

An independent investigation of the available studies on asbestos exposures in schools reinforces the Royal Commission's findings.[37]

One of the best known studies of abestos contamination in buildings was conducted by the state of New Jersey. The study examined New Jersey school buildings and measured indoor asbestos fiber levels, distinguishing between those where sprayed asbestos had been "wet-applied" and "dry-applied". In the former circumstance, virtually all measured concentrations were less than 0.0006 f/cc, which proved to be somewhat lower than outdoor levels in the area.[38] Slightly higher levels were found where dry application was used, but even here the vast majority of measurements (over 80%) were below 0.0015 f/cc.[39] Where materials were visibly damaged, a few higher readings were found, with the highest reading at about 0.025 f/cc.[40]

The most recent comprehensive study measuring asbestos levels in schools was undertaken for EPA in Houston.[41] This study showed somewhat higher indoor concentrations, but upon examination the results largely confirm the findings discussed above. The mean average level found was 0.005 f/cc, but this was skewed upward by a few very high measurements in a few schools.[42] Futhermore, even this relatively low figure appears to be an overstatement of average exposures, because the study was not a truly random sampling of schools with asbestos-containing

35. *Id.* at 577.

36. *Id.*

37. W.J. NICHOLSON, A.N. ROHL AND I. WEISMAN, ASBESTOS CONTAMINATION OF THE AIR IN PUBLIC BUILDINGS, EPA-450/3-76-004 (October 1975)(available from U.S. Environmental Protection Agency).

38. *Id.* at 25-26.

39. *Id.*

40. *Id.*

41. J. CONSTANT, AIRBORNE ASBESTOS LEVELS IN SCHOOLS (June 1983) [hereinafter cited as CONSTANT].

42. *Id.* at 60.

materials. The research focused instead on schools with a known high asbestos content, thus limiting the degree to which these results might be deemed representative.[43] Peer review of the study also identified other data problems that may have caused the study to overstate exposures in even these high risk schools.[44] Consequently, the concentrations revealed in this study, though still hundreds of times less than occupational levels, are probably greater than those found in typical American schools.

Even EPA has now questioned the authoritativeness of the Houston study, and relies instead on a study by Dr. Chesson and others at EPA's Office of Toxic Substances.[45] Chesson monitored 24 sites at four schools and reported average asbestos concentrations of 0.0002 f/cc.[46] As a result of this study, EPA has revised its exposure estimates downward[47] and now acknowledges that in-school exposures are "10,000 to 100,000 times lower than levels in industry workplaces where asbestos-related diseases have been well documented."[48]

Other smaller scale studies have also demonstrated low levels of airborne asbestos. The National Institute of Occupational Safety and Health took measurements at an Ohio high school and concluded that "students, teachers, and staff of Wilmington High School are not currently exposed to detectable levels of airborne fibers."[49] Research conducted in Massachusetts public schools found the vast majority of measurements to be so low as to be

43. In describing his methods Constant noted that his "first stage sample of 25 schools were allocated among the nine strata approximately in proportion to the size but with greater emphasis on known asbestos content and high asbestos content." *Id.* at 11.

44. Dr. Robertson Sawyer reviewed the draft Constant study for EPA and raised a number of questions about the validity of its results. These included sampling problems, laboratory analytical bias and certain erratic data points. As a consequence, Sawyer warned that Constant's results "may be without real meaning." R. Sawyer, REVIEW OF AIRBORNE ASBESTOS LEVELS IN SCHOOLS, 11 (Midwest Research Institute, 1983).

45. *Compare* OFFICE OF TOXIC SUBSTANCES, U.S. ENVTL. PROTECTION AGENCY, GUIDANCE FOR CONTROLLING FRIABLE ASBESTOS-CONTAINING MATERIALS IN BUILDINGS 1-5 (March 1983) (using Constant's results to estimate school exposures between 75 and 750 ng/m^3)*with*OFFICE OF TOXIC SUBSTANCES, U.S. ENVTL. PROTECTION AGENCY, GUIDANCE FOR CONTROLLING ASBESTOS-CONTAINING MATERIALS IN BUILDINGS 1-4 (June 1985) (using Chesson's results to estimate school exposures between 1 and 80 ng/m^3) [hereinafter cited as "1985 EPA GUIDANCE DOCUMENT"].

46. J. CHESSON, DRAFT FINAL REPORT: EVALUATION OF ASBESTOS ABATEMENT TECHNIQUES 56 (November 1984).

47. *See* note 45 *supra*.

48. 1985 EPA GUIDANCE DOCUMENT, *supra* note 45, at 1-2.

49. NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH, HEALTH HAZARD EVALUATION REPORT 1 (1982).

non-detectable by monitoring.[50] Similar results were found in a study of San Francisco's Federal Building, where no measurable asbestos was found in 99% of the samples taken.[51]

Moreover, the presence of asbestos in indoor air samples is not conclusive proof that the fibers emanated from building materials. Asbestos from a variety of sources is commonly found in outdoor ambient air, and "[n]umerous scientific studies indicate that typical exposure levels of asbestos in schools and other buildings are close to the normal level found in outside air."[52] Thus, while in-school levels tend to be slightly higher than those found outdoors, some unmeasurable but possibly high percentage of indoor asbestos exposure must be attributed to external sources.[53]

Relevant data from foreign sources is also available on the issue of asbestos contamination of buildings. A French study took measurements in twenty-one buildings in Paris containing sprayed asbestos.[54] The median exposure level in these buildings was 0.00015 f/cc, which was comparable to outdoor measurements in this area.[55] EPA has evaluated the French data and has determined that "the areas and materials are similar to those found in U.S. schools."[56] These results may therefore be added to the wealth of information indicating that indoor asbestos concentrations are quite low.

A review of all the studies shows that asbestos levels in buildings, including schools, are barely detectable, and over one thousand times lower than the occupational levels found to be

50. Irving, Alexander and Bavley, *Asbestos Exposures in Massachusetts Public Schools*, 41 AM. INDUS. HYG. A. J. 270 (1980).

51. L. HEINS, INVESTIGATION OF AIRBORNE ASBESTOS LEVELS: FEDERAL BUILDING AND COURT HOUSE 14-18 (April 1983). This building has been the source of considerable employee controversy, but the available data demonstrate that occupants have very low, usually undetectable, exposures. *See Potential Health Hazards Hearing*, *supra* note 7, at 124 (testimony of John B. Miles, Director of OSHA Office of Field Operations).

52. *Federal Efforts Hearing*, *supra* note 1, at 105 (statement of Safe Buildings Alliance).

53. *See* note 27 *supra*.

54. *See* P. SEBASTIEN, M.A. BILLION-GALLAND, G. DUFOUR AND J. BIGON, MEASUREMENT OF ASBESTOS AIR POLLUTION INSIDE BUILDINGS SPRAYED WITH ASBESTOS (translation of study prepared for the French Ministry of Health and the French Ministry for the Quality of Life-Environment), EPA-560/13-80-026 (1980) (available from U.S. Environmental Protection Agency).

55. *Id.* at 16. *See also* ROYAL COMMISSION REPORT, *supra* note 8, at 575.

56. OFFICE OF TOXIC SUBSTANCES, U.S. ENVTL. PROTECTION AGENCY, SUPPORT DOCUMENT FOR FINAL RULE ON FRIABLE ASBESTOS-CONTAINING MATERIALS IN SCHOOL BUILDINGS 65, 68 (January 1980)[hereinafter cited as EPA SUPPORT DOCUMENT]. *See also* 47 Fed. Reg. at 23,363 (1982).

harmful.[57] This average, however, should not obscure the fact that a few high measurements have been found, which have sometimes come dangerously close to the demonstrably hazardous workplace concentrations.[58] Nevertheless, the low levels found in the vast majority of schools should be reassuring to parents and others concerned with their children's safety. No policy conclusions can be drawn, however, without consideration of the health studies and the levels of risk resulting from these low exposures.

C. *Risk Levels in Schools*

The fact that indoor asbestos levels are quite low does not mean that they are perfectly safe. To the best of our current scientific knowledge, there is no threshold level below which there is zero risk from asbestos.[59] While there is no direct evidence of harm at the low levels found in schools, scientists assume that the risk is proportional to the exposure and thereby extrapolate a quantitative risk assessment based on the mortality data from the higher occupational exposure levels.[60] Before reviewing the results of such assessments, it should be recognized that the models used to estimate risk are designed conservatively, to provide an upper bound on possible risk and hence "may overestimate" the true risk.[61] Dr. Robert Sawyer of Yale, in his statement to EPA on asbestos in schools, emphasized that one must "understand that the predicted risk is an upper level conservative estimate that approximates a hypothetical maximum risk, not hard evidence of actual risk."[62]

Even employing this method, i.e. overstating risk levels, reveals the relative innocuousness of asbestos in schools. EPA conducted such an assessment, which was subsequently criticized for its "selective use of data" and other flaws that tended to increase its risk

57. *See generally* notes 17-56 *supra*.

58. *See, e.g.*, 1978 EPA GUIDANCE DOCUMENT, *supra* note 12, at I-2-9, listing several buildings, including one elementary school, where asbestos fiber counts were measured in excess of 1 f/cc during custodial activities that disturbed asbestos-containing products.

59. This is a general assumption employed by EPA for all cancer-causing substances. *See* Industrial Union Department, AFL-CIO v. American Petroleum Institute, 448 U.S. 607, 635-36 (1980) (plurality opinion).

60. *See* 48 Fed. Reg. at 51,122-25 (1983) for a summary of the most commonly used risk assessment models for predicting the harms of low level asbestos exposures. *See also* ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 579-581.

61. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 579.

62. *Federal Efforts Hearing*, *supra* note 1, at 220.

estimate.[63] Notwithstanding these limitations, the EPA study showed an increased risk of cancer of only 10 in one million.[64] An independent study by Julian Peto of Oxford assessed the risk to school occupants at 6 in one million.[65] The United Kingdom Advisory Committee on Asbestos came to a comparable conclusion.[66]

These risk levels are abstract, but a comparison to other familiar risks provides some perspective. The risk that a student faces from being struck by lightning is 35 in one million, or several times that posed by asbestos in schools.[67] The corresponding risk from tornadoes is 49 per million and from hurricanes and tropical cyclones is 28 per million.[68] This comparison might be fairly objected to on the grounds that the latter occurrences are major and unpreventable acts, and therefore not analogous to asbestos in schools.[69] Nevertheless, recognizing that the asbestos risk is far below that from such relatively rare occurrences as those described illustrates just how minimal a danger the students face.

To cite a more commonplace example, the Ontario Royal Commission observed that the drive to school every day is far more dangerous than the possibility of school-related asbestos exposure.[70] This risk is also real and immediate, while the hypothesized risk from asbestos is speculative and, if it occurs, far in the future.[71] Obviously, more pressing public health risks to students

63. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 580.

64. *Id.* at 581.

65. *Id.*

66. Using relatively high exposure level assumptions, the United Kingdom Advisory Committee assessed a risk between 5 and 170 deaths per million and concluded this represented "no appreciable mortality." *Id.*

67. This relative ratio is computed from statistics provided in Crouch and Wilson, *Estimates of Risk*, 2 J. OF BUS. ADMIN. U. OF BRITISH COLUMBIA 300, 314 (1979-1980). When expressed as an annual risk, a hazard must be multiplied by seventy to approximate a lifetime risk, used for asbestos exposures.

68. *Id.*

69. EPA, for example, has rejected the use of such analogies when determining significant risk levels for hazardous air pollutants. *See* 49 Fed. Reg. 23,478, 23,489 (1984).

70. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 585.

71. As shown above, quantitative risk assessments for asbestos in schools may significantly overstate the true risk. Comparing this assessed risk with other risk estimates for carcinogens is also instructive. According to EPA's own estimates, the risk from average school asbestos exposures is "equivalent to the risk a person would experience smoking five cigarettes, or living in a brick building for seven months." SAFE BUILDINGS ALLIANCE, WHAT YOU SHOULD KNOW ABOUT ASBESTOS IN BUILDINGS, 19 (1984)[hereinafter cited as ASBESTOS IN BUILDINGS].

from transportation, fires, etc. should take a higher place on the safety agenda than asbestos.

Another context for the risk from asbestos in schools was provided by Dr. Kenny S. Crump, who testified on behalf of an industry group, the Alliance for Safe Buildings, at the EPA hearing on asbestos in schools.[72] Dr. Crump estimated the risk from indoor asbestos concentrations in terms of decreased life expectancy, taking into account both when and how death might occur.[73] Because of cancer's long latency period, even those exposed as children will not show harms from asbestos until relatively late in life.[74] Dr. Crump concluded, based on an extremely conservative risk assessment model, that the average lifespan reduction for a student exposed in the classroom ranged between eleven minutes and three hours.[75] Using a risk assessment model that may be more realistic for asbestos exposure yielded a lifespan reduction from school exposures of only a few seconds.[76] By contrast, smoking reduces one's life expectancy by more than four years.[77] There is very little reason to panic at the prospect that a few children attending schools with asbestos materials may lose a tiny fraction of their lifespan, especially when one considers the far greater hazards from other activities.

Arguably, however, any danger to children, no matter how small, should be prevented if possible, and the above data may not convince parents that the schools are safe enough.[78] These parents can be reassured in the knowledge that the risk estimates addressed above, small as they are, may considerably overstate the true risk in schools.

72. Testimony by Dr. Kenny S. Crump, EPA OTS Docket No. OPTS-211012 (July 6, 1984).

73. *Id.* at 20.

74. *See* 48 Fed. Reg. at 51,099 (1983) on the latency period.

75. Crump, *supra* note 72, at 21.

76. *Id.* Specifically, using a multi-stage cancer development model with two dose-related stages, the estimated life shortening is 0.02 seconds. *Id.*

77. *Id.* at 28.

78. *See* McCormick,*Asbestos*, 171 AM. SCH. BOARD J. 33, 34 (1984)(quoting Edwin C. Holstein of Mt. Sinai School of Medicine: "they would like to see schools help prevent those deaths—no matter how few—by removing the risk.").

D. *Preliminary Conclusions*

It is worth repeating at this point that there is no demonstrable evidence of any harm from asbestos in buildings.[79] One type of disease that might be traced to school exposures is mesothelioma, because it is caused almost exclusively by asbestos.[80] Yet Dr. E. Donald Acheson of the University of Southhampton, the Chairman of the medical subcommittee for the United Kingdom Advisory Committee on Asbestos, observed that there "is no evidence up to the present time of cases of mesothelioma having occurred as a result of exposure in schools."[81] Dr. Henry Anderson, formerly of the Mt. Sinai Medical Center, likewise stressed that he was "not aware that there are any mesotheliomas that have been attributed to. . . school asbestos exposure."[82] Dr. Hans Weill of Tulane University described the risk as "very, very low, if not non-existent."[83] Dr. Thomas Kurt, an Associate Professor of Internal Medicine at the University of Texas Health Science Center stated that the "issue of exposure to school children is greatly out of proportion to the actual danger" and there is no serious or substantial risk to schoolchildren."[84] Evidence such as this led the Ontario Royal Commission to conclude: "We deem the risk which asbestos poses to building occupants to be insignificant and therefore find that asbestos in building air will almost never pose a health hazard to building occupants."[85] The New Jersey Asbestos Policy Committee concluded that it "is *very* unlikely that non-occupational exposures. . . produce mesothelioma."[86] Indeed, "numerous governmental and scientific groups, including the National Academy of Sciences, Commission of European Communities, and the International Agency for Research on Cancer, have

79. *See,e.g.*, ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 579: "there are no reliable epidemiological studies of the health effects of exposures to very low asbestos fiber levels. . . ." *See also* NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 4: "There are no documented cases of lung cancer associated with low-level asbestos exposure over a lifetime."

80. *See* ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 100 ("mesothelioma remains a disease that is quite significantly linked to asbestos exposure.").

81. *Transcript of Royal Commission Hearings*, Volume XIX at 28-29 (July 20, 1981).

82. *Id.*, Volume XVI at 76.

83. SAFE BUILDINGS ALLIANCE, ASBESTOS IN BUILDINGS, *supra* note 71, at 22 .

84. *See* Schulte & Stutz, *Experts Say Asbestos Harm Unlikely in Schools*, Dallas Morning News,Oct 31, 1982, at 29A, col. 1.

85. ROYAL COMMISSION REPORT,VOLUME ONE, *supra* note 8, at 14.

86. NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 10 (emphasis in original).

concluded that low level exposures do not pose significant public health risks."[87]

Another reason for downgrading even the minimal level of hazard presented by indoor asbestos involves the type of fiber used. Whereas much of the evidence of harm from asbestos involves crocidolite or amosite asbestos, in-school exposures typically involve chrysotile asbestos.[88] This difference is important because the classroom chrysotile asbestos fibers found in classrooms tend to be softer and more stable, while other types are more rigid, needle-like and have a greater tendency to become airborne.[89] Consequently, the asbestos fibers found in schools and other buildings are less hazardous than those found in the workplace, from which we have produced risk estimates that are applied to schoolrooms.

Some experimental data supports the distinction between chrysotile and other forms of asbestos. One large study compared workers exposed only to chrysotile with those exposed to crocidolite as well and found much higher lung cancer rates among the crocidolite group.[90] A recent House Committee report emphasized that "there is no conclusive evidence of measurable adverse health effects produced by the inhalation of 'white' [chrysotile] asbestos at low nonoccupational levels. . . ."[91] Even more significant is the Royal Commission's finding that chrysotile used in sprayed asbestos-containing insulation has a lower contamination potential than other types of asbestos.[92] There is as yet no consensus regarding the magnitude of the health risk dif-

87. SAFE BUILDINGS ALLIANCE, ASBESTOS IN BUILDINGS, *supra* note 71, at 10. OSHA reported several studies finding no excess risk from low cumulative exposures to asbestos, and that agency's definition of "low" (100 f/cc/year) is vastly in excess of any conceivable in-school exposure. 48 Fed. Reg. at 51,104-05 (1984).

88. *See, e.g.*, CONSTANT, *supra* note 41 (almost all school exposures are to chrysotile asbestos rather than other fiber types.).

89. *See* ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 83-84.

90. Weill, *Influence of Dose and Fiber Type on Respiratory Malignancy in Asbestos Cement Manufacturing*, 120 AM. REV. RESP. DIS. 345, 346, (1979). *See also* Henderson & Enterline, *Asbestos Exposure: Factors Associated with Excess Cancer and Respiratory Disease Mortality*, 330 ANNALS OF N.Y. ACAD. SCI. 117, 118-119 (1979). Concededly, there is also some medical evidence to the contrary.

91. H.R. REP. No. 803, 98th Cong., 2d Sess. 19 (1984).

92. The Commission found that even if chrysotile asbestos had the same inherent disease potential per fiber inhaled, the higher release probability of crocidolite or amosite asbestos makes them more hazardous. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 551.

ferential of these asbestos types,[93] but the evidence that chrysotile is safer is conclusive enough to support the assertion that the toxicity of school-related asbestos exposure has generally been overestimated. The Ontario Royal Commission thus concluded that in-school inhalation of asbestos "almost never poses a health hazard, save perhaps if particularly elevated exposure is occasioned by the disturbance of asbestos, especially in removal projects."[94]

One final concern must be addressed before concluding that asbestos in schools does not present a significant risk. Some have worried that children of school age may be more susceptible to asbestos-induced disease and that the risk assessments may therefore understate the actual harm.[95] On balance, however, the available evidence demonstrates no significantly higher risk for children. After reviewing the testimony of expert witnesses, the Ontario Royal Commission concluded:

> we could find no substantive support for the proposition that the lungs of young children are in and of themselves more susceptible than those of adults to asbestos-related diseases. Indeed, there is evidence from animal experiments that might well suggest a contrary conclusion.[96]

In support of this finding, the Commission noted that school exposure has existed for over thirty years and if the theory of heightened susceptibility were true, "we would have expected a number of non-occupational cases of mesothelioma to develop."[97] The "absence of such cases is strongly indicative of the fact that school exposures are so low that they are not a health problem."[98]

We probably lack the necessary data to determine indisputably whether children may be somewhat more at risk from asbestos than adults. Given the prevailing concentrations in schools, though, even a higher susceptibility for children would not translate into a significant risk from school asbestos exposures. The

93. *See* A REPORT BY THE TASK FORCE ON ASBESTOS IN SCHOOLS AND PUBLIC BUILDINGS OF THE NATIONAL INSTITUTE OF BUILDING SCIENCES 5 (July 2, 1984).

94. ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 13.

95. These concerns are well-summarized in Lang, *supra* note 1, at 113-14.

96. ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 305. Dr. William Nicholson of the Mt. Sinai School of Medicine testified that "[w]e don't have data on whether there is greater human susceptibility at young ages." Transcript, Vol. XIV, at 121.

97. ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 309.

98. *Id.*

Ontario Royal Commission observed that even "allowing for the hypothesis that the very young might be more susceptible to asbestos disease, the health risk to children remains insignificant because the level of exposure in asbestos-containing schools has in general been so low."[99]

According to the best evidence available, the risk of asbestos in most schools is *de minimis*, if it exists at all. This is not to suggest that parents and the government should have no concern whatsoever for the problem. Asbestos remains a potentially hazardous substance and in some schools with disturbed asbestos materials, student exposures and risks may be much higher and unacceptable. Any remedial action should be limited to these few schools with higher indoor concentrations. Where the need for abatement action is not urgent, the cost to public health of crying wolf over small asbestos exposures is actually increased by the procedures employed to remove asbestos from schools. As the following section demonstrates, removal operations currently are the greatest source of danger from asbestos in schools.

II. LEGISLATIVE ACTION AND ASBESTOS REMOVAL OPERATIONS: ABATING OR ABETTING "DANGER IN THE CLASSROOM"?

As growing public attention has turned to the presence of asbestos in schools, local governments, with some federal direction, have rushed to remove the asbestos materials.[100] The issue is undeniably "volatile" and affected by the "emotionalism, rhetoric and public pressure of parents and teachers,"[101] which has resulted in the "current level of hysteria."[102] Federal reporting requirements have further raised the issue for community attention, and the natural response has been to act quickly to attempt to cure the situation.[103] In some cases, these "fears [are] emanating

99. *Id.* at 15.

100. *See Federal Efforts Hearing*, *supra* note 1, at 211-15 (statement of Dr. Sawyer).

101. *Id.* at 113 (Report of the New Jersey Department of the Public Advocate on Asbestos in Schools and Other Buildings in New Jersey).

102. NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 10. This situation is created in part by headlines such as *The Clock is Ticking in Your Schools and Inaction Could Prove to be Devastating*, 171 AM. SCH. BD. J. 33 (April 1984).

103. *See, e.g.*, *Federal Efforts Hearing*, *supra* note 1, at 214-16 (statement of Dr. Sawyer). *See also* NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 3: "Health officials and other government agencies must recognize that the manner in which the asbestos issue has been presented to the public has generated apprehension and panic concerning the actual health risk to teachers and students or to other individuals in buildings containing friable asbestos materials."

from 'unsubstantiated overgeneralizations'. . . ."[104] "Frequently noted statements such as 'No safe level of exposure to asbestos has been established' and 'One asbestos fiber can cause mesothelioma' have been largely responsible for generating the confusion, misapprehension and panic in the public. . . ."[105] As a consequence, Lang and others have called for the immediate removal of asbestos from schools.[106] Unfortunately, precipitous removal actions undertaken to protect children's health may actually be increasing the risk in schools.

Dr. Robert Sawyer of Yale described the shortcomings of decisions made in this current emotional situation:

> The net result of notification of a potential carcinogen in the proximity of schoolchildren without the balancing effects of understanding of the low exposure levels and comprehensive guidance on control alternatives, has been the stampeding of local school administrators into inappropriate actions that, in some cases, have resulted in a chaotic situation that can actually increase the hazard presented by asbestos-bearing products.[107]

Responses to asbestos are "probably more dependent upon the opinions of vocal individuals" in the local community than on scientific evaluations.[108] When a crisis atmosphere such as this is created, total removal is typically demanded.

Ironically, removal of asbestos products from schools may be the most dangerous approach. Removal, especially when done improperly by untrained workers, will disrupt the asbestos and release large quantities of fibers to the ambient air, creating a great risk to workers.[109] As such fibers become recirculated, or

104. *See* Kincade,*Issues in School Asbestos Hazard Abatement Litigation,* 16 ST. MARY'S L.J. 951, 963 at n. 52.

105. NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 4a.

106. *See id.* at 2: "Perhaps more than any other environmental agent, the identification of the presence of asbestos in schools and other public buildings creates an atmosphere of anxiety among parents, school administrators and the general public. Once asbestos has been identified, parents, school employees, and building occupants, concerned for the health of their children and themselves, frequently exert political and social pressure to force the removal of the asbestos."

107. *Federal Efforts Hearing, supra* note 1, at 215.

108. *Id.* at 219.

109. *See Potential Health Hazards Hearing, supra* note 7, at 314 (statement of National Institute of Building Sciences) ("Whether the removal process involves dry or wet disruption of the in-place asbestos, data shows that a substantial quantity becomes resuspended or recirculated throughout the building."). *See also* NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 1 ("poor removal jobs not only pose a significant health risk to the removal workers but can liberate asbestos fibers into the air at higher levels than existed prior to the removal").

reentrained, students are also exposed to elevated levels, often far in excess of those prior to removal.[110] Even well-conducted removals inevitably stir up previously enclosed fibers and increase airborne asbestos concentrations.[111] Dr. Sawyer's own studies, commissioned by EPA, have found that removal operations resulted in ambient asbestos concentrations ranging from 8 to 82 f/cc.[112]

Dr. Sawyer's statement before Congress addressed this problem in detail. He criticized recent asbestos removal efforts, which have often "[c]onverted a situation of highly questionable risk to that of certain and well-documented hazards to the involved abatement workers."[113] In the longer term, removal has "caused contamination of school structures and grounds that have placed children, teachers and other school personnel at totally unnecessary risk of exposure."[114] As a result, Dr. Sawyer lamented, "the EPA program. . .will cause more adverse health effects, including malignancies, than it is preventing."[115]

Other empirical evidence, reviewed by the Ontario Royal Commission, supports Sawyer's conclusions. The Commission found that "the scale and pace of the program significantly increased the risk to some workers directly engaged in control projects."[116] After examining specific school responses, the Commission found a "number of asbestos-control projects in schools were conducted in a manner which, according to the evidence before us, may have generated significant risk. . . ."[117]

EPA has bowed to public pressure and encouraged removals in many circumstances, but even that agency acknowledges that this course will often be counterproductive. EPA has stressed that removal is a "radical" action that very often "generates significant levels of asbestos."[118] A survey of control measures found that

110. *See* notes 114-15, 117-120, 123-132 *infra* and accompanying text.

111. *See* SAFE BUILDINGS ALLIANCE, ASBESTOS IN BUILDINGS, *supra* note 71 at 19 ("removal often results in increased fiber release, even when careful work practices are followed"). *See also* notes 119-20, 137-141 *infra* and accompanying text.

112. *See* EPA SUPPORT DOCUMENT, *supra* note 56, at 101.

113. *Federal Efforts Hearing*, *supra* note 1, at 214.

114. *Id.*

115. *Id.* at 222.

116. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 588.

117. *Id.* at 586.

118. OFFICE OF TOXIC SUBSTANCES, U.S. ENVTL. PROTECTION AGENCY, MEASUREMENT OF ASBESTOS AIR POLLUTION INSIDE BUILDINGS SPRAYED WITH ASBESTOS 24 (August 1980) [hereinafter cited as ASBESTOS AIR POLLUTION INSIDE BUILDINGS].

some removal techniques produce in excess of 100 f/cc, while even preferred methods generated approximately 20 f/cc.[119] The lowest levels found during removal, using the optimal removal procedures under ideal conditions of highly cementitious asbestos, still yielded 0.5 f/cc, a concentration significantly higher than even the upper range of current school exposure levels.[120]

The independent National Institute of Building Sciences further confirms the dangers of unnecessary asbestos removal operations.[121] In testimony to Congress, the Institute emphasized that such actions may be "counterproductive" regardless of the precautions used, and that "a substantial quantity [of asbestos] becomes resuspended and recirculated throughout the building."[122] The highest exposures from removal are faced by workers, but residual asbestos remains in the building and presents risks to students and other occupants as well. In reviewing recent experience, the Institute found "reports of cases where stable asbestos was disturbed during abatement resulting in airborne asbestos where it had not been previously," demonstrating that "poor abatement practices may exacerbate existing conditions rather than solve the problem."[123] The National Institute determined:

> Following removal, weeks and sometimes months must pass before ambient air levels of friable asbestos fiber drop below acceptable levels Even then the potential exists for occupants to disturb the material and cause it to become resuspended.[124]

In short, according to this independent expert organization, asbestos removal will typically aggravate health risks to schoolchildren.

Many other organizations have also discovered the hazards of asbestos removal. The New Jersey Department of the Public Advocate warned that it "is well-documented that the improper removal of asbestos can be far more hazardous than if the asbestos is not removed at all."[125] The Safe Buildings Alliance, an indus-

119. 1978 EPA GUIDANCE DOCUMENT, *supra* note 12, at II-2-3.

120. *Id.*

121. NIBS was "authorized by Congress in 1974 to provide an authoritative source of finding and advice to the public and private sector. . . ." *Potential Health Hazards Hearing*, *supra* note 7, at 313.

122. *Id.* at 314.

123. *Federal Efforts Hearing*, *supra* note 1, at 214.

124. *Potential Health Hazards Hearing*, *supra* note 7, at 314.

125. *Federal Efforts Hearing*, *supra* note 1, at 112. *See also* NEW JERSEY COMMITTEE REPORT, *supra* note 16, at 5 ("we run a serious risk of continuing a program where the cure (i.e.,

try organization, warned of "the danger that hasty and unnecessary removal actions will actually create hazards where none previously existed."[126]

This finding is verified by many studies that have measured post-removal asbestos concentrations. One Canadian study found concentrations up to a hundred times higher after the completion of removal operations, as compared to levels before removal.[127] The French study found asbestos levels increased dramatically after removal operations.[128] The Pinchin study for the Ontario Royal Commission examined nine asbestos removal projects and found that in eight of those cases asbestos concentrations after removal were higher than before.[129] In one instance, asbestos levels had increased by more than six hundredfold.[130] James Schirripa, representing an asbestos safety contractor, testified to EPA that removal generates fiber levels of thirty to forty f/cc and "presents a severe risk" to "children who subsequently occupy the schools."[131]

The dangers of asbestos removal are often a consequence of improper techniques and untrained workers. Such problems are inevitable in a public climate which, absent full understanding, demands precipitous action without proper study. The Ontario Royal Commission observed that "[c]rash programs invariably mean that inexperienced contractors and personnel will enter the field."[132] According to the New Jersey Department of the Public Advocate, this problem is commonplace. The Department stated that the "large number of removal projects" was a "reason for poor performance."[133] At the present time, "there is a lack of qualified asbestos removal workers."[134] Dr. Sawyer noted that "the surge in demand for removals greatly reduces the probability that the local school administration will obtain a com-

asbestos removal) may be worse than the problem caused by the presence of asbestos in our schools and other buildings.").

126. *Federal Efforts Hearing*, *supra* note 1, at 106.

127. E. CHATFIELD, RELEVANCE OF TEM ANALYSIS TO AMBIENT AIR CONTROL LIMITS (Ontario Research Foundation, 1983). Table 11 shows an increase from 0.4 ng/m^3 prior to 30-40 ng/m^3 after removal.

128. ASBESTOS AIR POLLUTION INSIDE BUILDINGS, *supra* note 118, at 64.

129. PINCHIN, *supra* note 28, at 7.12 - 7.13.

130. *Id.*

131. Envtl. Protection Agency, *Hearing on Asbestos in Schools*, at 21 (November 17, 1980).

132. ROYAL COMMISSION REPORT, VOLUME TWO, *supra* note 8, at 588.

133. *Federal Efforts Hearing*, *supra* note 1, at 122.

134. *Id.* at 122.

petent contractor, experienced workers, knowledgeable architectural advice and a safe removal operation," since we may have "exceeded the available supply" of qualified contractors.[135] This rush to remove asbestos may thus present a risk "many magnitudes greater in most cases than if the material had simply been left alone."[136]

The risk from removal is not solely attributable to unqualified workers, however, and cannot be cured merely by implementing stricter standards for removal operations. Dr. Sawyer pointed out that "[w]hile precautions can and must be taken, removal is always potentially hazardous."[137] Dr. Pinchin's Canadian study found that even "very well performed" removal projects elevated asbestos levels slightly.[138] The Georgia Institute of Technology asbestos removal program determined that the quantitative goal of a well-conducted removal program is to have residual post-completion asbestos concentrations of no more than 0.01 f/cc,[139] which is roughly the highest level found in schools containing asbestos that is left undisturbed.[140]

Indeed, Dr. Edward Swoszowski of the Yale Medical Center has emphasized that we lack information necessary for "conducting asbestos related activity in a safe and efficient manner."[141] Specifically, Dr. Swoszowski points to a lack of data regarding "our understanding of the building environment and the movement of asbestos fibers therein, the availability of accurate and meaningful guidelines and technology for abatement activity, the ability to enforce abatement standards" and other issues.[142] In the absence of a better understanding, any "rush into regulatory action," will "only lead to the unnecessary exposure of workers and by-standers to asbestos."[143]

As frustrating as it may seem to parents and others concerned with in-school asbestos exposures, the seemingly simple answer

135. *Id.* at 221-22.

136. *Id.* at 222.

137. *Id.* at 220.

138. PINCHIN, *supra* note 28, at 7.12-7.13.

139. Ewing and Spain, *Getting to the Very Fiber of Industrial Asbestos Removal,* 12 OCCUP. HEALTH & SAFETY, 50, 68 (June 1984).

140. *See, e.g.*, ROYAL COMMISSION REPORT, VOLUME ONE, *supra* note 8, at 14 ("the highest readings would rarely exceed 0.01 f/cc.").

141. Comments of Dr. Edward Swoszowski, EPA Doc. No. OPTS-211012, March 21, 1984, at 3.

142. *Id.*

143. *Id.*

of removing the threatening products is fraught with problems. Well-meaning attempts to respond to the situation have ended up exacerbating the risk. Virtually all the data on asbestos removal operations indicates that they are counterproductive as presently conducted. As public clamor for action increases, so does the danger that we may harm more children.

Yet other commentators have urged school boards to expend their limited financial resources on litigation that might bring about this very result. Besides being a disservice to the intended beneficiaries, suits of the type encouraged by Lang involve enormous social costs.

III. COSTS OF ASBESTOS LITIGATION

Lang regards litigation against asbestos manufacturers as "one method by which school districts may obtain funds for necessary inspection and corrective action."[144] In doing so, he concedes that, "to expect such uncertain and time-consuming legal actions to provide an adequate solution to beleaguered school districts is optimistic at best."[145] However, this simply side-steps what should be a crucial consideration: namely, the truly staggering financial and societal costs of asbestos litigation as evidenced in the asbestos worker injury cases.

The frustration with the excessive time, cost, and often inadequate results of asbestos litigation was articulated by Eugene R. Anderson—a partner at Anderson, Russell, Kill & Olick, P.C. in New York City—in an address delivered in conjunction with the annual meeting of the American Arbitration Association in New York on April 12, 1983.[146] Mr. Anderson suggested that the American Arbitration Association take an active role in promoting a national dispute resolution mechanism to help guarantee proper handling of the claims and to reduce the high cost of litigation.[147] He stated: "The asbestos health crisis has spawned a new growth industry dubbed by one former federal judge as the 'asbestos litigation industry.' The economic rewards to those

144. Lang, *supra* note 1, at 126.

145. *Id.* at 127.

146. Anderson, *Asbestos Product Liability Litigation: What Can Be Done About It*, 38 ARB. L. J. 3 (1983).

147. *Id.*

participating in asbestos litigation are enormous. The injured workers are all but forgotten."[148]

Illustrations of the costs of this 'asbestos litigation industry' abound. In analyzing transaction costs, UNARCO Industries, Inc., in its bankruptcy proceedings, estimated that of every dollar spent in asbestos litigation, only 18.6 cents went to the plaintiff.[149] Similarly, the Commercial Union Insurance Company estimated that it spent 77.3 cents to deliver 22.7 cents to the plaintiffs and their attorneys,[150] while The Travelers Insurance Company spent an estimated 44.8 cents to deliver 55.2 cents.[151] In addition to the inefficiency implied in these figures, Mr. Anderson points out that:

> The portion of those amounts that actually goes to the plaintiff is even lower because the plaintiffs' lawyers receive from 33 to 44 percent of the recovery and their disbursements are deducted from the plaintiffs' share. Considering all of these factors, the final result is that of every dollar that goes into the asbestos litigation industry, only 10 to 25 cents actually reaches the plaintiffs.
>
> The transaction costs eat up 75 to 90 cents of every dollar. Those estimates of costs do not include the costs to the taxpayers of this country, which the Rand Institute for Civil Justice estimates at $1,740 for each federal court case filed and $400 for each state court case filed. That is over $17 million in governmental costs to process the presently pending 16,000 cases. Contrast these high transaction costs wit bureaucratic national security system. In 1981 the Social Security Administration spent onl 1.2 cents to deliver 98.8 cents to the beneficiaries.[152]

Other studies of asbestos litigation have drawn comparable conclusions. A major study completed in 1981 by Dr. Irving Selikoff for the Deparatment of Labor described and analyzed compensation experiences resulting from asbestos-associated occupational diseases. For cases where both legal fees and settlement were known, litigation expenses averaged 37 percent of the settlement amount, but the ratio ranged from 8 to 73 percent.[153] A 1982 study headed by Paul MacAvoy, a Yale University econo-

148. *Id.*
149. *Id.* at 5.
150. *Id.*
151. *Id.*
152. *Id.* at 5-6.
153. I.J. SELIKOFF, DISABILITY COMPENSATION FOR ASBESTOS-ASSOCIATED DISEASE IN THE UNITED STATES,Table 3.8 (June 1981)(Environmental Sciences Laboratory, Mount Sinai School of Medicine of the City University of New York) *cited in* J. KAKALIK, P. EBENER, W.

mist, estimates that in cases that have been resolved, litigation expense was 34 percent of rewards and settlement.[154] The study also estimated that further compensation payments would be between $8 billion and $87 billion, with the "most likely estimate" of present value of awards set at $38 billion.[155] If Mr. MacAvoy's dollar and percentage estimates are correct, then society will have to absorb approximately $12.92 billion in asbestos litigation costs.

Other commentators have estimated that "[a]bout $1 billion in compensation and litigation expenses was spent on asbestos product liability litigation as of the end of 1982, of which about one-third was paid by defendants and two-thirds by insurers. Of total compensation paid by defendants and insurers, 41 percent was used by plaintiffs for litigation expenses."[156] These authors concluded:

> The average total compensation paid per claim by all defendants and their insurers was approximately $60,000 and required total defense litigation expenses of $35,000 (58 percent of total compensation). Thus, the total costs to defendants and their insurers averaged about $95,000 per closed claim. After deduction on plaintiff's litigation expenses of about $25,000 (41 percent of total compensation), the plaintiff received an average of $35,000. These figures may be better understood by considering the total amount that defendants, insurers, and plaintiffs pay for every *one dollar* in net compensation that goes to the plaintiff. For every $2.71 paid by defendants and insurers, defense litigation expenses are an estimated $1.00, plaintiff's litigation expenses are an estimated $0.71, and the plaintiff receives $1.00. The plaintiff receives an estimated 37 percent of the total expended.[157]

Given the demonstrated cost of asbestos worker litigation, alternatives must be sought to more efficiently facilitate the abatement of asbestos hazards in schools. The bill for removing asbestos from all the nation's schools has been estimated to be as high as $1.5 billion.[158] To this expense would be added the huge

FELSTINER AND M. SHANLEY, COSTS OF ASBESTOS LITIGATION at 4, n.3 (Institute for Civil Justice, The Rand Corporation, No. R-3042-ICJ, 1983).

154. *Id.* at 2.

155. *Id.*

156. *Id.* at 6.

157. *Id.* at 6-7.

158. Legal Times, Oct. 1, 1984 at 2, col. 1.

transaction costs and legal fees witnessed in prior asbestos litigation.

One author has divided the asbestos victims into two subclasses: present or near-future victims and far-future victims.[159] "Any liability rule that threatened an asbestos manufacturer with bankruptcy would benefit near-future victims, who would receive compensation, at the expense of far-future victims, who would be unable to recover full compensation for their injuries from the bankrupt defendant."[160]

Suing the asbestos manufacturers increases transaction costs in the removal of asbestos. These additional transaction costs add to the manufacturers' financial burden and increase their risk of bankruptcy. This would hurt the interests of the potential far-future victims, the exposed schoolchildren, whom the asbestos removal is intended to aid.

Alternatives to litigation must be found. The burden of school removal cases should not be added to the already overtaxed courts. Further, the cost in economic dislocation should not be ignored. There have been three major bankruptcies—the Manville Company, UNARCO, and AMATEX—and at least one small one.[161] "The transaction costs and not the amounts received by the claimants pulled these companies under."[162]

Given this array of circumstances, the inescapable conclusion is that:

> The federal and state court system cannot handle this volume of litigation, even if one were to conclude that litigation was the answer. The state court system in Pennsylvania put in a crash program in Philadelphia to dispose of eight asbestos cases per week. If no new cases are filed, the Philadelphia court docket will be clear of asbestos cases shortly after the turn of the next century. Sadly, new cases are being filed at a rate of 50 a week. As they say in Pennsylvania Dutch Country, 'the hurrieder I go, the behinder I get.'[163]

159. Note, *Adjudicating Asbestos Insurance Liability: Alternatives to Contract Analysis*, 97 HARV. L. REV. 753, 753-58 (1984).

160. *Id.* at 753-54.

161. Anderson, *supra* note 146, at 6.

162. *Id.*

163. *Id.*

CONCLUSION

The presence of asbestos in schools does call for policy action, but not the sort of removal response previously prescribed. Proposals for a school asbestos "superfund" or other radical action are likely to make the risk to children greater rather than less.[164] As we have seen, removal of asbestos materials is likely to increase exposures, which are currently quite low and "safe" as that term is ordinarily used.[165] At the present time, government is already over-reacting to the presence of asbestos and engaging in unnecessary and hazardous removal operations. Expansion of this program will only aggravate an already bad situation.[166]

The type of action needed is a five-pronged program to slow down the current pace of removal actions to ensure safety and to focus any future action on the true problem. This program should include the following primary components:

1. Binding standards for all future asbestos removal operations, including licensing of qualified contractors and required practices to minimize fiber release during removal.[167]

2. Careful assessment of the risk presented by asbestos materials in a school prior to initiating removal, which should include actual measurements of fiber concentrations to determine the necessity of acting.[168]

164. Such a "superfund"-type proposal was made by Lang, *supra* note 1, at 128. Precisely the opposite is preferable— it is now time to slow the pace of removals. The authoritative National Institute of Building Sciences wrote to "caution the Congress against hasty actions to fund a program at EPA for immediate and unconditional handling of asbestos in schools." *Potential Health Hazards Hearing*, *supra* note 7, at 315.

165. While there is no guarantee that a carcinogen such as asbestos is absolutely free of risk, current school exposures are very safe relative to other hazards confronted by children. *See* notes 67-75 *supra*.

166. Dr. Sawyer thus noted that "[f]urther increases in demand for removal will only worsen this situation." *Federal Efforts Hearing*, *supra* note 1, at 222.

167. This is similar to the primary proposal of the New Jersey Public Advocate, which reviewed a litany of past abuses in asbestos removal and called for "pre-qualification" and "licensing" prior to future response actions. *Federal Efforts Hearing*, *supra* note 7, at 123-34.

Such a program should include extended training in various procedures that can minimize contamination, such as construction of a containment barrier around the workplace and provision of decontamination facilities for workers. *See* 1985 EPA GUIDANCE DOCUMENT at 5-3.

168. While visual examination is helpful, the need for action can only be demonstrated by measurements of actual contamination levels. Only "[r]esults of air sampling . . . establish the degree of actual hazard present in building areas." GENERAL ACCOUNTING OFFICE, ASBESTOS CONTROL MANAGEMENT DOCUMENT 19 (1984). Such pre-removal exposure assessment is also crucial in order to avoid exacerbating in-school asbestos levels. Given the limitations of even the best-conducted removal operations (*see notes* 111, 119-20, 137-

3. Education of school personnel about the true character of the asbestos threat and their development of an inspection and maintenance program to prevent serious problems from fiber release and to identify any problems that arise.[169]

4. Establishment of a threshold level of ambient asbestos concentration that calls for response action.[170]

5. Guidance in evaluating response alternatives, including enclosure and encapsulation as well as removal, to help determine the optimal action for any given school.[171]These five steps address the main health threat from asbestos in schools today — the problem created by well-meaning attempts to eliminate all asbestos-containing materials. Because the threat from removal usually greatly exceeds the risk from the present condition of these

41 *supra*), it makes little sense to undertake such a response without knowing in advance that exposures exceed those that are probable post-removal.

169. In terms of practical effects, this may be the most important of all the recommendations. In the current, sometimes hysterical, climate of public opinion, "understanding and wisdom are badly needed." *Federal Efforts Hearing*, *supra* note 1, at 215 (statement of Dr. Sawyer). In addition to education about the true nature of the risk from asbestos, information about operation and management of custodial procedures is essential. "Management and custodial control can best protect workers and building occupants from elevated fiber exposures if appropriate procedures are carefully followed." ROYAL COMMISSION REPORT, VOLUME THREE, *supra* note 8, at 609. EPA too has recognized that a "reasonable effort by school officials to manage the materials can prevent damage to or deterioration of them and the consequent release of asbestos. . . . " 47 Fed. Reg. 23,360 (1982). *See also* 1985 EPA GUIDANCE DOCUMENT at 3-1 - 3-5 for a summary of such procedures. Everyone should support such a program, which can reduce exposures both before and after removal actions and should be employed whenever asbestos is present. While this primarily custodial response is less dramatic and glamorous than total removal of asbestos-containing products, it carries no risk of worsening the situation.

170. Once the exposure assessment conducted in step two is carried out, school officials need guidance in determining whether response action, such as removal, is necessary. Various groups have already proposed or established such levels. In Massachusetts, the exposure standard for schools is 0.04 f/cc. *See Potential Health Hazards Hearing*, *supra* note 7, at 18. The Province of Ontario has adopted this 0.04 f/cc action level for the ambient air. ROYAL COMMISSION REPORT, VOLUME THREE, *supra* note 8, at 661. Rhode Island set their standard at 0.01 f/cc. 1956 R.I. Pub. Laws, Reenactment of 1985, 85-366, ch. 24.5, § 23-24.5-5(b). Since the latter figure is roughly the best that removal operations can achieve, it should serve as a floor on conditions calling for removal. A level in the range adopted above would promote school safety by invoking radical response action when exposures are unusually high but preventing such action in circumstances when it is likely to aggravate the situation and elevate indoor contamination.

171. Even when there is significant asbestos exposure in the classroom, removal may not be the preferred alternative. Encapsulation or enclosure of the threatening materials may be an effective response. In some cases, "contamination could be prevented by simple procedures such as covering asbestos, coating the surface of asbestos materials, and effecting quick repair to damaged items." I.J. SELIKOFF & D. LEE, ASBESTOS AND DISEASE 120 (1978).

materials, any new program should center on limiting and improving removal actions rather than encouraging the current counterproductive approach.

The presence of asbestos in schools and society's attempt to deal with it provides an interesting study in the complexities of environmental decision-making, which are most pronounced when dealing with carcinogens for which no exposure level is absolutely safe.[172] It is to be hoped that government and the public will not repeat the mistakes made in dealing with asbestos when confronted with other future potential health hazards. In the meantime, the least that can be done is to educate people about the true nature of the problem posed by asbestos in schools, and thereby prevent the damage that could be caused by public responses founded in panic.

172. When dealing with hazardous substances, the public and Congress ordinarily seek a "margin of safety" from risk. *See, e.g.*, 42 U.S.C. §§ 7409(b)(1), 7412(e)(1) (Clean Water Act)(1982). For carcinogens with no known safe level, the concept of "margin of safety" becomes illusory. This is especially problematic when continued use of carcinogens may be essential to our economic health. *See, e.g.*, Industrial Union Department, AFL-CIO v. American Petroleum Institute, *supra* note 59, at 637 ("[b]ecause of benzene's importance to the economy, no one has ever suggested that it would be feasible to eliminate its use entirely."). In these instances, as the asbestos in schools experience amply demonstrates, decisions based in emotion and fear are not helpful and may even increase the risk to public health. A more thoughtful approach is needed.