BIBLIOGRAPHY OF SECONDHAND SMOKE VENTILATION STUDIES

In Descending Chronological Order

May 20, 2004

Hyland, A.; Travers, M.; Repace J., "7 City Air Monitoring Study (7CAM), March-April 2004," *Roswell Park Cancer Institute*, May 2004

> This study measured the levels of fine particulate air pollution in the bars and restaurants of seven major U.S. cities, three with smokefree laws and four without. The study found that air pollution levels were 82 percent lower on average in venues required by law to be smokefree compared to those where smoking was permitted. In cities without smokefree laws, full-time bar and restaurant employees are exposed on the job to more than four times the average annual limits of fine particulate air pollution recommended by the U.S. Environmental Protection Agency (EPA).

Glantz, S.A.; Schick, S., "Implications of ASHRAE's Guidance On Ventilation for Smoking-Permitted Areas," *ASHRAE Journal,* March 2004.

> This article discussed the impact of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) ventilation standards and guidelines regarding secondhand smoke in public places. The paper outlined how the tobacco and hospitality industries have pushed for standards that permit smoking, and are now asking ASHRAE for a separate standard for hospitality venues, with smoking permitted. The article reviewed literature regarding secondhand smoke pollution, the health hazards of secondhand smoke exposure, and what constitutes acceptable indoor air quality for this issue. The authors concluded, "Since ASHRAE seems unwilling to develop a standard based on de minimus risk, perhaps it would be best to simply include a statement in Standard 62, as the Board Policy Committee did in its report to the ASHRAE Board of Directors on June 25, 2002, that 'There is evidence that acceptable air quality cannot be achieved where smoking is permitted,' delete Section 6.1.3.5, the statement in the standard about the need for additional ventilation or air cleaning when smoking is permitted, drop the forthcoming ETS design guide, and leave it at that."

Environmental Protection Agency, "Indoor air facts no. 6: report to Congress on indoor air quality," *Washington, DC: Environmental Protection Agenccy,* [n.d.].

> A summary of the four parts of the Environmental Protection Agency's "Report to Congress on Indoor Air Quality", a report required by Title IV of the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Repace, J.L.; Lowrey, A.H., "An estimate of nonsmokers' lung cancer risk from passive smoking," *[n.s.],* [n.d.].

> The Repace, Lowrey preliminary research study on estimating the risk of secondary smoke.

Cains, T.; Cannata, S.; Poulos, R.; Ferson, M.J.; Stewart, B.W., "Designated "no smoking" areas provide from partial to no protection from environmental tobacco smoke," *Tobacco Control 13(1): 17-22,* March 2004.

This study measured the effectiveness of using no-smoking sections in hospitality establishments and found that, "By comparison with levels in general use areas, nicotine and particulate matter levels were significantly less in the 'no smoking' areas, but were still readily detectable at higher than ambient levels." The authors concluded "Provision of designated 'no smoking' areas in licensed (gaming) clubs in New South Wales, Australia, provides, at best, partial protection from ETS—typically about a 50% reduction in exposure. The protection afforded is less than users might reasonably have understood and is not comparable with protection afforded by prohibiting smoking on the premises."

Repace, J., "Flying the smoky skies: secondhand smoke exposure of flight attendants," *Tobacco Control 13(Suppl. I): i8-i19,* March 2004.

This paper reviewed and analyzed published air quality measurements, modelling studies, and dosimetry studies in order to determine the role played by secondhand smoke (SHS) in aircraft cabin air pollution and flight attendants SHS exposure compared to the general public. The study concluded, "In-flight air quality measurements in ,250 aircraft, generalised by models, indicate that when smoking was permitted aloft, 95% of the harmful respirable suspended particle (RSP) air pollution in the smoking sections and 85% of that in the non-smoking sections of aircraft cabins was caused by SHS. Typical levels of SHS-RSP on aircraft violated current (PM2.5) federal air quality standards ,threefold for flight attendants, and exceeded SHS irritation thresholds by 10 to 100 times. From cotinine dosimetry, SHS exposure of typical flight attendants in aircraft cabins is estimated to have been .6-fold that of the average US worker and ,14-fold that of the average person. Thus, ventilation systems massively failed to control SHS air pollution in aircraft cabins. These results have implications for studies of the past and future health of flight attendants."

Pion, M.; Givel, M.S., "Airport smoking rooms don't work," *Tobacco Control 13(Suppl I): i37-i40,* March 2004.

This study cited internal tobacco industry documents to describe strategies to prevent the Lambert-St Louis International Airport from going smokefree and tested whether the smoking rooms in the airport are effective in protecting nonsmokers from secondhand smoke (SHS) exposure. The authors stated that, "Nicotine vapour air monitoring in a non-smoking area of the airport, adjacent to a smoking room located in Terminal C, reveals elevated levels of ambient nicotine vapour in excess of what would be expected in a completely non-smoking environment. This study shows that airport smoking rooms expose non-smokers in adjacent non-smoking areas to a significant concentration of nicotine vapour from SHS." The Missouri Group Against Smoking Pollution Inc (GASP) opposed the construction of the smoking lounges, and sponsored two studies to determine if SHS was leaking from the rooms into the adjacent smokefree areas. [Ed. note: the bibliographic citations were not indexed.]

Alevantis, L.; Wagner, J.; Fisk, W.; Sullivan, D.; Faulkner, D.; Gundel, L.; Waldman, J.; Flessel, P., "Designing for smoking rooms," *ASHRAE Journal 45(7): 26+,* July 2003.

This article described California's AB 13, a law that created smokefree workplaces. The article stated that the law exempts "breakrooms designated by employers for smoking, under specified conditions." The authors "studied the effectiveness of various smoking-area designs in containing ETS within smoking areas in 23 public buildings." The study found that "enclosed areas with no air recirculation to nonsmoking areas and with exhaust to the outside were clearly the most effective in reducing exposure of non-smokers to ETS." The current study identified the most important design variables in creating a smoking room and provided design criteria for construction of such rooms, e.g., ventilation types, types of doors, exhaust systems. The authors also conducted a survey of local tobacco control jurisdictions in the state and found that many of

them have local ordinances that prohibit smoking breakrooms in the workplace.

Carrington, J.; Watson, A.F.R.; Gee, I.L., "The effects of smoking status and ventilation on environmental tobacco smoke concentrations in public areas of UK pubs and bars," *Atmospheric Environment 37(23): 3255-3266,* July 2003.

This study examined the effect of smoking status and ventilation on secondhand smoke concentrations in bars in the United Kingdom and concluded that smoke from smoking sections migrated into nonsmoking sections and that "the use of ventilation systems (sophisticated HVAC systems and extractor fans in either the on or off model) did not have a significant effect (P > 0.05) on ETS marker concentrations in either the smoking or non-smoking areas."

Repace, J., "A killer on the loose: an Action on Smoking and Health special investigation into the threat of passive smoking to the U.K. workforce," *Action on Smoking and Health (ASH-UK) — http://www.ash.org.uk,* April 9, 2003.

This study stated that, "An estimated 12,000 U.K. nonsmokers die annually from secondhand smoke (SHS) exposure at home, at work, and in social venues." The study estimated how many employees in various types of jobs die as a result of SHS exposure. The report argued, "Under the hospitality-industry-sponsored Public Places Charter on Smoking, which promotes ventilation as a control for secondhand smoke, it is estimated that five of every 100 bar workers would die from workplace passive smoking, yielding 66 deaths per year," and explained why ventilation systems are ineffective at protecting people from SHS exposure. [Ed. note: footnotes were not indexed.]

Repace, J., "An air quality survey of respirable particles and particulate carcinogens in Delaware hospitality venues before and after a smoking ban," *Bowie, MD: Repace Associates, Inc.,* February 7, 2003.

This study examined levels of tobacco smoke pollutants in eight Delaware hospitality venues prior to and following the enactment of a smokefree air law; the establishments were heavily polluted prior to the smokefree law taking effect.

Repace, J., "An air quality survey of respirable particles and particulate carcinogens in Boston pubs before and after a smoking ban," *Bowie, MD: Repace Associates, Inc.,* [2003].

This study measured respirable particles and particulate carcinogens in six Boston, Massachusetts, bars before and after implementation of a smokefree ordinance and concluded that ventilation systems were ineffective in reducing secondhand smoke exposure.

[n.a.], "Indoor air quality: states weigh the science of second-hand smoke," *State Health Notes 23(383): 3+,* November 4, 2002.

This article describes how many states are trying to determine what, if any, ventilation systems might be effective at reducing the health risks of secondhand smoke. The article notes that only California and Delaware have enacted comprehensive smokefree laws, although New York City and Florida are considering ones. The article reviews the science surrounding the health hazards of secondhand smoke, and notes that the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has revised its Standard 62 Ventilation for Acceptable Indoor Air Quality so that it does not set any minimum ventilation

rates for areas in which smoking is present. Larry Schoen of the Standard Project Committee 62.1 stated, "With second-hand smoke, until someone says you have to get the [carcinogen] level down to X, we don't know how much air to add to make it safe." The article describes ventilation programs being pushed by Options, Philip Morris USA, the Hospitality Coalition on Indoor Air Quality (HCIAQ), and the National Restaurant Association (NRA) as solutions to accommodate smokers. Tim Filler of the American Nonsmokers' Rights Foundation (ANRF) stated that ventilation "is a tobacco industry tactic to create and institutionalize smoking sections in hospitality venues," and that "The root problem is that ventilation cannot eliminate the harmful components of ETS to a degree that can be claimed safe. Neither the tobacco companies promoting the systems nor the manufacturers selling the equipment claim otherwise." The article also states that public health officials favor relying on sales tax data to measure any economic impact of smokefree laws, while Philip Morris (PM) contends that such data is a flawed measurement tool, and prefers to survey business owners.

Elovitz, K.M.; Gordon, D.; Cashman, D.J., "ETS in restaurants," *ASHRAE Journal: 41-47,* October 2002.

This article reported on a study of 40 Boston, Massachusetts, restaurants, which sought "to determine whether nicotine and other air contaminants generated in the smoking section would migrate to non-smoking areas." The article describes the research methods used, and made recommendations for the most effective type of ventilation system to use to separate a smoking section. However, the article acknowledged that, "This article addresses the smoking/non-smoking dichotomy primarily from the non-smoking customer's point of view. It does not address comfort in the smoking section or the (valid) concerns of the wait staff. Perhaps a restaurant can be laid out so employees who work in the non-smoking area never have to walk through the smoking area. However, no HVAC system can be expected to protect non-smoking staff that work in the smoking area of the restaurant from exposure to tobacco effluents."

[n.a.], "Air conditioning fails to remove all smoke: study," *ABC Online,* September 30, 2002.

A study conducted in South Australia has found that air conditioning and ventilation systems failed to clear the air of secondhand smoke.

Mendell, M.J.; Fisk, W.J.; Kreiss, K.; Levin, H.; Alexander, D.; Cain, W.S.; Girman, J.R.; Hines, C.J.; Jensen, P.A.; Milton, D.K.; Rexroat, L.P.; Wallingford, K.M., "Improving the health of workers in indoor environments: priority research needs for a national occupational research agenda," *American Journal of Public Health 92(9): 1430-1440,* September 2002.

This study examined the health impacts of contaminants in indoor work environments in the U.S., and the potential health and economic benefits of improving the environments (ventilation research needs were listed); the study estimated that 10-30 million workers are exposed to secondhand smoke, resulting in 2,000-11,000 deaths from cardiovascular disease and 100-600 cases of lung cancer; the economic costs of the exposure are between $30 to 140 million in health care costs alone; costs of absence from work and other performance losses were not estimated.

Junker, M.H.; Danuser, B.; Monn, C.; Koller, T., "Acute sensory responses of nonsmokers at very low environmental tobacco smoke concentrations in controlled laboratory settings," *Environmental Health Perspectives 109(10): 1045-1052,* October 2001.

This study examined the odor detection threshold and acute sensory responses of nonsmokers for low levels secondhand smoke, the authors concluded that the study "strongly supports the

implementation and control of smoking policies such as segregating smoking areas from areas where smoking is not permitted or instituting smoking bans in public buildings," and that ventilation would be an impractical means of protecting nonsmokers.

Fisher, B., "Setting the standard: industry scientists are close to setting a standard for measuring sidestream smoke," *Tobacco Reporter 128(8): 22+,* August 2001.

This article describes attempts by CORESTA to: develop a standard for measuring secondhand smoke in the air; determine the various constituents of secondhand smoke; study the effectiveness of ventilation and smoking area designs; provide recommendations for conducting representative sampling; and "provide guidance on the interpretation of ETS measurements in the context of overall air quality." The group is reported to be close to "standardizing a method for the measurement of sidestream smoke, one of the major contributors to ETS." Jean-Jacques Piade, an employee with Philip Morris International and chair of the CORESTA task force studying the issue, indicated that measuring the components of sidestream smoke was a complicated task. CORESTA hopes to develop an international standard for measurement of tar, nicotine, and carbon monoxide for use by the industry and by government agencies, and plans to submit the standard to the ISO in early 2002. The article goes on to describe how the measurement standard is being developed and the work that it is based upon.

Ontario Tobacco Research Unit, "Protection from second-hand tobacco smoke in Ontario: a review of the evidence regarding best practices," *Toronto, Ontario: University of Toronto, Ontario Tobacco Research Unit,* May 2001.

This report presents evidence for the best practices to protect nonsmokers in Ontario, Canada, from secondhand smoke exposure; the report concludes that ventilation provides no solution to the problem and recommends that all workplaces be made smokefree.

Bartholomew, A., "What you don't know about secondhand smoke: and why kids are especially vulnerable," *Reader's Digest,* November 20, 2000.

This article describes the respiratory and other health problems, such as ear infections and Sudden Infant Death Syndrome (SIDS), caused by secondhand smoke exposure in children; the article also discusses the research of Dr. Joseph DiFranza.

Repace, J., "Can ventilation control secondhand smoke in the hospitality industry? An analysis of the document "Proceedings of the Workshop on Ventilation Engineering Controls for Environmental Tobacco Smoke in the Hospitality Industry", sponsored by the Federal Occupational Safety and Health Administration and the American Conference of Governmental Industrial Hygienists," *Bowie, MD: Repace Associates, Inc.,* June 2000.

An analysis of a paper on ventilation and the hospitality industry with sections on the tobacco industry position and appendices with the poisons and chemicals contained in secondhand smoke.

Walker, J.C.; Nelson, P.R.; Cain, W.S.; Utell, M.J.; Joyce, M.B.; Morgan, W.T.; STeichen, T.J.; Pritchard, W.S.; Stancill, M.W., "Perceptual and psychophysiological responses of non-smokers to a range of environmental tobacco smoke concentrations," *Indoor Air 7: 173-188,* 1997.

This study estimated the perceptual, psychophysiological and cognitive impact of secondhand smoke on nonsmokers.

Lambert, W.E.; Samet, J.M.; Spengler, J.D., "Environmental tobacco smoke concentrations in no-smoking and smoking sections of restaurants," *American Journal of Public Health 83(9): 1339-1341,* September 1993.

This study measured two markers of secondhand smoke in the smoking and no-smoking sections of seven restaurants, and concluded that the mean measurements in the no-smoking sections were 40% and 65% lower than in the smoking sections.

Lofroth, G., "Environmental tobacco smoke: multicomponent analysis and room-to-room distribution in homes," *Tobacco Control 2: 222-225,* 1993.

This study evaluated room-to-room distribution of secondhand smoke in homes with low ventilation rates and found that nonsmoking occupants in typical smoking homes will be exposed to ETS in whichever room they stay.

Environmental Protection Agency, "Report to Congress on indoor air quality volume II: assessment and control of indoor air pollution," *Washington, DC: Environmental Protection Agency,* August 1989.

The third of a four part report by the Environmental Protection Agency to Congress mandated by Title IV of the Superfund Amendments and Reauthorization Act (SARA) of 1986, discusses health and economic effects of poor indoor air quality, ventilation and other control mechanisms, and the legislative acts and government agencies that govern control of indoor air quality.

Environmental Protection Agency, "Report to Congress on indoor air quality volume III: indoor air pollution research needs statement," *Washington, DC: Environmental Protection Agency,* August 1989.

The fourth of a four part report by the Environmental Protection Agency to Congress mandated by Title IV of the Superfund Amendments and Reauthorization Act (SARA) of 1986, discusses methods of researching health effects of secondhand smoke and, very briefly, regulatory and physical methods of controlling smoke.

Committee on Airliner Cabin Air Quality, Board on Environmental Studies and Toxicology, Commission on Life Services, National Research Council, "The airliner cabin environment: air quality and safety," *Washington, DC: National Academy Press,* 1986.

This 12-page report was the culmination of 18 months of research into cabin air quality, cabin environment, emergency procedures, cabin regulations, and records; it was found that cabin air quality at the lowest ventilation rate was only acceptable in nonsmoking situations, that secondhand smoke was a hazardous substance, and that secondhand smoke generated the most passenger complaints.

Repace, J.L.; Lowrey, A.H., "An indoor air quality standard for ambient tobacco smoke based on carcinogenic risk," *New York State Journal of Medicine 85: 381-383,* July 1985.

This paper argues that, in order to achieve an acceptable risk level of secondhand smoke in the air, the only effective means are the complete physical separation of smokers and nonsmokers using separate ventilation systems or prohibiting smoking in the workplace

altogether.

Repace, J.L.; Lowrey, A.H., "Tobacco smoke, ventilation, and indoor air quality," *ASHRAE Transactions 88: 895-914,* 1982.

This paper examined secondhand smoke and ventilation issues.

THE FOLLOWING DOCUMENTS SHOW TOBACCO INDUSTRY INFLUENCE REGARDING VENTILATION…

Aguinaga Bialous, S.; Glantz, S.A., "ASHRAE Standard 62: tobacco industry's influence over national ventilation standards," *Tobacco Control 11(4): 315-328,* December 2002.

This study analyzed tobacco industry internal documents in order to illustrate how the tobacco industry has influenced the development of ventilation standards in the U.S.. The study outlines the strategies used by the industry to accomplish its goals. The industry has been involved with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and its ventilation standards since the 1980s. A June 1983 Philip Morris (PM) memo noted that the company had been able to block ASHRAE Standard 62-1981 and stated that, if the standard "...were enacted into law, it would take big bucks to bring existing buildings up to standard. The hooker is that, by designating an entire building as a 'no smoking building', no added expense at all would be involved... It is mind boggling to attempt to calculate the harm that this code would have done to our company and our industry had it been adopted...." The study concludes that, "The tobacco industry determined that allowing smoking in ventilation standards for indoor air quality was a high priority and dedicated significant human and financial resources to ensure that its interests were represented. The health groups, until recently, have largely ignored the policy implications for tobacco control of standard development." The paper includes a timeline of ASHRAE Standard 62 actions from the 1970s to 2000. A table that includes a partial list of people involved at ASHRAE who have tobacco ties is also included. [Ed. note: footnotes were not indexed.]

Barnes, D.E.; Bero, L.A., "Industry-funded research and conflict of interest: an analysis of research sponsored by the tobacco industry through the Center for Indoor Air Research," *Journal of Health Politics, Policy and Law 21(3): 515-542, Fall,* 1996.

This study concerns the Center for Indoor Air Research (CIAR). CIAR was created in 1988 by three U.S. tobacco companies to fund research on indoor air and secondhand smoke. CIAR funds two kinds of research: peer-reviewed projects which are awarded after review by a group of scientists, and special-reviewed projects which are awarded directly by tobacco industry executives. This study found that CIAR's special-reviewed projects were more likely than its peer-reviewed projects to support the tobacco industry position on secondhand smoke. These studies are used by the industry to argue that smoking should not be restricted in public places. The study suggests that the industry may be funding CIAR's peer-reviewed research to give CIAR good publicity and to divert attention from the issue of secondhand smoke.

Drope, J.; Chapman, S., "Tobacco industry efforts at discrediting scientific knowledge of environmental tobacco smoke: a review of internal industry documents," *Journal of Epidemiology & Community Health 55: 588-594,* 2001.

This research study examined internal tobacco industry documents to analyze the use of scientific consultants to discredit research into the health hazards of secondhand smoke. The

study concluded that, "The industry built up networks of scientists sympathetic to its position that ETS is an insignificant health risk. Industry lawyers had a large role in determining what science would be pursued. The industry funded independent organisations to produce research that appeared separate from the industry and would boost its credibility. Industry organized symposiums were used to publish non-peer reviewed research. Unfavourable research conducted or proposed by industry scientists was prevented from becoming public." The study focuses primarily on internal documents from 1985-1995, and quotes extensively from these documents to illustrate how the industry worked to develop an international network of scientists and to create controversy around secondhand smoke, in an attempt to ward off the threat posed by what one document called "...the most important single issue facing the industry...."

Dearlove, J.V.; Bialous, S.A.; Glantz, S.A., "Tobacco industry manipulation of the hospitality industry to maintain smoking in public places," *Tobacco Control 11: 94-104,* 2002.

This study analyzed tobacco industry internal documents and found that the tobacco industry in the United States, and in particular Philip Morris (PM) funded hospitality trade associations and created its own associations where none existed, for the purpose of stopping smokefree policies. The study found that the industry used the hospitality groups to push the idea of "accommodating" smokers, and, by false warnings of economic harm from going smokefree, convinced the hospitality industry to invest in expensive ventilation systems. The study quotes extensively from internal documents to illustrate how the tobacco industry has used this strategy internationally and concludes that, "The tobacco industry has effectively turned the hospitality industry into its de facto lobbying arm on clean indoor air." The study includes a chart of hospitality groups with known affiliations with the tobacco industry. [Ed. note: footnotes were not indexed.]

Neilsen, K.; Glantz, S.A., "A tobacco industry study of airline cabin air quality: dropping inconvenient findings," *Tobacco Control 13(Suppl. I): i20-i29,* March 2004.

This study examined a tobacco industry-funded study on in flight air quality (IFAQ), using internal tobacco industry documents. The authors concluded that the tobacco industry designed, funded, and conducted the study using scientists and attorneys to mask the involvement of tobacco interests. According to the authors, "Industry lawyers and scientists deleted results unfavourable to the industry's position from the study before delivering it to the airline. The published version of the study further downplayed the results, particularly with regard to respirable suspended particulates. The study ignored the health implications of the results and instead promoted the industry position that ventilation could solve problems posed by secondhand smoke." [Ed. note: the bibliographic citations were not indexed.]

Drope, J.; Bialous, S.A.; Glantz, S.A., "Tobacco industry efforts to present ventilation as an alternative to smoke-free environments in North America," *Tobacco Control 13(Suppl I): i41-i47,* March 2004.

This study examined internal tobacco industry documents to provide a detailed description of how the industry created a network of consultants to promote ventilation systems as an alternative to smokefree policies and laws. The authors stated, "As with its other strategies to undermine the passage of clean indoor legislation and regulations, the tobacco industry used consultants who represented themselves as independent but who were promoting the industry's ventilation ''solution'' strategies under close, but generally undisclosed, industry supervision. The nature of the industry's use of ventilation consultants evolved over time. In the 1980s, the industry used them in an effort to steer the concerns about indoor air quality away from secondhand smoke, saying SHS was an insignificant component of a much larger problem of indoor air quality and inadequate ventilation. By the 1990s, the industry and its consultants were

maintaining that adequate ventilation could easily accommodate ‘‘moderate smoking’’. The consultants carried the ventilation message to businesses, particularly the hospitality business, and to local and national and international regulatory and legislative bodies." The study described industry funded ventilation research and consultants from Virginia Polytechnic Institute, ACVA Atlantic (Air Conditioning & Ventilation Analysis), Healthy Buildings International (HBI), Oak Ridge National Laboratory (ORNL), Chelsea Group, Theodore D. Sterling and Associates, etc., as well as industry programs, such as Philip Morris' (PM) Accommodation Program and Options program. [Ed. note: the bibliography was not indexed.]