

C-86

INDOOR AIR POLLUTION

REPORT OF PUBLIC HEARING
SPONSORED BY THE NEW JERSEY CLEAN AIR COUNCIL

New Brunswick, New Jersey
March 17, 1986

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Let's protect our earth



NEW JERSEY CLEAN AIR COUNCIL

Department of Environmental Protection

CN 027

Trenton, New Jersey 08625-0027

September 12, 1988

Honorable Christopher J. Daggett
Acting Commissioner
New Jersey Department of
Environmental Protection
401 East State Street
Trenton, NJ 08625

Dear Acting Commissioner Daggett:

Enclosed please find the report of the Public Hearing on INDOOR AIR POLLUTION held by the Clean Air Council on March 17, 1986.

It is our general finding that since indoor air pollution exposure consists of most of the outdoor-generated air pollution plus all of the indoor-generated air pollution, indoor exposures are likely to have more profound public health effects than exposures from outdoor air pollution alone.

In addition to our specific recommendations given in the report, it is strongly recommended that the Commissioner of the DEP establish a permanent working group within the DEP with responsibilities to monitor all aspects of indoor air pollution (including the scientific literature, actual health effects events, legislation, activities of other state agencies, and public education) and report periodically to the Commissioner and to the Clean Air Council. We understand that the New Jersey Department of Health has the primary function related to indoor air pollution. It is imperative that such a working group have the necessary funding, prestige and executive support to maintain within the DEP a long-range coordinated attack on indoor air pollution.

We wish you the very best in your latest endeavor. The Clean Air Council looks forward to working with you and your staff during your term as Commissioner.

Sincerely,



Wesley R. Van Pelt, Ph.D.
Chairman, Public Hearing Committee



John D. Grant, P.E.
Vice Chairman, Clean Air Council

hb

Enclosure

c: Donald A. Deieso, Assistant Commissioner
Jorge H. Berkowitz, Director
Herbert Wortreich, Deputy Director

I. Summary

The New Jersey Clean Air Council held a public hearing on Indoor Air Pollution on March 17, 1986 at the Lewis Herrmann Labor Education Building, Ryders Lane, in New Brunswick, New Jersey.

Indoor air pollution is the sum of general or outdoor air pollution which enters buildings plus air pollution generated within the building.

The Clean Air Council has identified many components of indoor air pollution, including: formaldehyde, chlordane, carbon monoxide, radon, asbestos, cigarette smoke, particulates, nitrogen oxides, and volatile organic compounds (VOCs).

Exposure to these substances in buildings has caused many hundreds of known health related complaints in New Jersey. Much testimony, both scientific and first-hand, supports the conclusion that exposure to indoor air pollution is causing acute and chronic health effects in humans. Air pollutants are substances to which most people are susceptible, in contrast to substances causing allergic reactions, which affect relatively few people.

The Clean Air Council recommends that action be initiated to reduce the health effects of indoor air pollution. Various arenas for these initiatives include: legislation, regulations, modification of building codes, public education, labelling, and coordination among various government agencies.

II. Recommendations of the Clean Air Council

- 1) The approach New Jersey has taken to the radon problem should serve as a model for other indoor air pollutants. That is: exposure modeling (i.e., how is the exposure distributed among the population and can it be predicted by a model?), exposure measurements, public health quantitative risk analysis, epidemiological studies of persons in high exposure groups, public relations (toll free information lines, public talks and well written brochures), and assistance to individual residents with high exposures.
- 2) The jurisdiction among government agencies in this area should be made explicit. Information on the roles of the DEP, DOH and local government should be distributed to offices that handle indoor air pollution complaints. The Department of Health (Environmental Health Service) should take primary responsibility for outreach to the public and to local health agencies concerning indoor air pollutants, including:
 - a. Major contaminants: their hazards and sources
 - b. Testing procedures and facilities: a consumers' guide
 - c. Control methods available: a consumers' guide
 - d. Who is responsible

There should be modifications or supplements of the Environmental Health Act enabling municipal health departments to receive funds directly to address indoor air pollution, and personnel and/or equipment for municipalities for air pollution abatement or prevention.

- 3) In education and regulation activities, the distinction between short-term reversible and long-term irreversible effects should be kept in focus at all times.
- 4) In evaluating scientific controversies about risk, the health consequences of erring should be considered; since mortality may result or may be prevented by public health actions, or their absence, we should err on the side of safety. A prime example, in view of the controversy on the health effects, is second hand smoking; action to prevent exposure should be taken.
- 5) Comparative risk assessments for indoor air pollutants are needed for citizens. It should include various chemical hazards from different sources. A "universal brochure" in laypersons' terms, describing general issues of indoor air pollution should be published by the DEP or DOH to be distributed broadly by local health departments and environmental agencies. Included should be lists of approved private contractors who can test for indoor air pollutants.

- 6) Federal EPA should attempt a primarily educational program for indoor air quality rather than a regulatory one under the current circumstances. Epidemiologic and toxicity studies of household product exposure would also be valuable. Regulation of new sources, however, is appropriate.
- 7) Consumer products should have labeling requirements indicating toxicity of contents and safe handling procedures, written in terms intelligible to the public. Citizens should be better informed on glues, resins, pressed board, laminates, paints, insulations, plastics and aerosol sprays.
- 8) Incorporate a general vocabulary (glossary) into all communications on indoor air pollution.
- 9) A public education campaign to alert the public to the dangers of indoor air pollution and remedial measures should be instituted by Federal, State and local environmental and health officials.
- 10) Production and distribution of posters that could be used in schools and homes to educate the public about indoor air pollution would be a useful activity for the DOH.
- 11) Health education on indoor air pollutants and ventilation should be included in regular primary and secondary school health curricula. Comparisons with risks such as smoking, alcohol, driving, etc. should be made to keep perspective.
- 12) Building codes assuring adequate ventilation should be promoted. Buildings which are sealed and depend on air handling systems should be under government construction and operation standards so that an adequate supply of clean fresh air is maintained inside, and contaminants from local outdoor sources or from within the building are not introduced. Heating and cooking systems should be permanently labeled with information on the hazards to occupants if there should be malfunction, misuse, or inadequate ventilation. Increased public awareness of the contribution of HVAC systems to the spread of disease is needed. Department of Community Affairs should sponsor a conference for local building health officials, DEP, and DOH staff. Ventilation principles, practices and procedures to counteract "stuffy building" syndrome should be noted. There should be a requirement for exhaust fans to be installed in all bathrooms in new homes and for radon resistant construction of basements prior to occupancy. Also, air change measurements for new buildings and homes as recommended by the New Jersey Builders Association would help insure adequate in-take of fresh air.
- 13) More resources should be devoted to prevention of second hand smoke exposure through education and regulation. According to current estimates the possible benefit is prevention of even more disease than are caused by environmental asbestos exposure and many other diseases and accidents for which significant funding

is currently allocated. To prevent secondary smoke exposure, the following are recommended:

- a. Adequate smoke-free areas of all enclosed public places should be required.
 - b. In all enclosed public areas beneath a specified size, smoking should be prohibited.
 - c. Smoke-free areas in all workplaces should be required.
 - d. Labeling of cigarettes should include warnings of the hazard of secondary smoke to adults, children, and the unborn.
- 14) Use of biological markers of toxicity should be promoted.
- 15) The relationship between energy conservation and indoor air quality should be considered.
- 16) Efforts should be made to rank indoor air pollutants in order of risk. This will help prioritize all other efforts.

III. Invited Testimony

A. Testimony of Dr. Terry Shehata

Dr. Terry Shehata is the Director of the Environmental Health Service in the Division of Occupational and Environmental Health branch of the New Jersey Department of Health (DOH). His topic was the New Jersey Department of Health's program in indoor air pollution.

Dr. Shehata testified as follows:

The experience that the DOH's Environmental Health Program has accumulated over the past several years has led to the consideration of a new strategy to address indoor air problems.

From 1980 to 1985 the program received over 700 requests from private citizens to conduct air sampling in their homes. These requests have been screened, and sampling has been carried out in approximately 200 homes. Levels of such pollutants as formaldehyde, chlordane and carbon monoxide have been investigated.

In the majority of cases, these measurements of chemical levels in the indoor environment could not be used to link exposure levels and health effects. The measured chemical levels in emergency type investigations do not reflect actual exposure conditions due to time delays between the first reporting and a response by state government. The degree of hazard present in exposure to the low or moderate levels found in long-term, non-emergency type investigations is difficult to evaluate. Health-based guidelines do not exist for exposure to low concentrations of the majority of chemicals found in indoor air, with the exception of criteria pollutants.

These investigations have led to the realization of the importance of local involvement. The Environmental Health Service is considering the enlisting of local or county health departments as the first line of response. Local involvement helps to insure that investigation of homeowner complaints, necessary sampling, and response to questions occur promptly.

The State Environmental Health Program plans to provide training and assistance to local health departments, and participates in response to extremely difficult cases. State program staff are also developing consumer alert fact sheets describing air pollutants, their health effects, and ways homeowners may protect themselves.

Historically, the Department of Environmental Protection has been the lead agency in the outdoor ambient air category. Indoor air quality is the Department of Health's responsibility. The Environmental Health Service relies on the DEP for outdoor data in evaluating the extent of exposure to selected indoor air pollutants and assessing possible health effects. For example, the Department has assessed indoor airborne asbestos fibers from asbestos cement ducts in hot air heating systems and, with data from the Department of Environmental Protection, asbestos fibers from drinking water and showering.

Investigations of the consequences of environmental spills has also led to the measurement of high levels of benzene in the breathing zone of the shower area of bathroom. Chlorination of the water, cosmetics, and hair sprays introduce other pollutants to the bathroom air. Evaluation of better ventilation in the bathroom as a public health issue needs to be addressed.

The base of information does not yet exist that would be needed to recommend population-based indoor air pollution exposure guidelines. Such guidelines would be based on the health effects of estimated total exposures. We need to collect more information on the spectrum of both indoor and outdoor pollutants and their effects individually and in combination in order to make an evaluation of the health impact of indoor air pollutants here in the State of New Jersey.

B. Testimony of Dr. Michael Gochfeld

Dr. Michael Gochfeld is a physician in occupational medicine in the Department of Environmental and Community Medicine, University of Medicine and Dentistry of the New Jersey Robert Wood Johnson Medical School. His topic was indoor air pollution in office environments.

Dr. Gochfeld testified as follows:

Most people blame indoor air pollution on the oil crisis of the early 70's resulting in air-tight buildings with inadequate ventilation, and with synthetic carpets, curtains and other materials.

However, the environmental movement had begun at the same time and people began to realize that discomfort and irritation were not

acceptable, and also questioned the long-term effects of indoor air pollution.

A common kind of indoor air complaint we get at the Department of Environmental and Community Medicine is related to local sources of pollution (e.g., vehicles with their motors running, air exhaust vents) very near to air intake vents on buildings. Another common type of complaint is related to curtains, carpets and other synthetic materials installed with solvents.

Four incidents illustrate the variety of air pollution episodes that occur. A microfilm machine in a school was found to be releasing sulfuric acid mist from an electronic circuit board which caused teachers to complain of burning eyes, choking, and other discomfort. A group of people working on terminals in a large work room complained of irritations and a burning sensation. The management thought it was a hysterical reaction, but when an overheating compressor was overhauled, the complaints stopped. A third case involved a clean room type assembly area for rocketry parts. It turned out that the air intake was located 15 feet from a sewer vent which on occasion discharged vapors from paint sludge. A fourth example was a high school which was having its roof re-tarred with coal tar pitch, which is more hazardous than asphalt, and the school officials would not cease the operations until a high official from the State Health Department prevailed on them to do so.

Anxiety over being continually exposed to hazardous or toxic chemicals is an unacceptable stress in the modern workplace. In almost every case we can identify a cause which can be corrected with a simple administrative or engineering procedure. Effort is required; for example, electrostatic precipitators installed in multiple dwellings and commercial buildings to remove particulates are effective only if a commitment is made to clean the plates.

The DOH and DEP may take a fragmented approach to addressing indoor air pollution problems, responding to each complaint singly. Or they may take a generic approach, assessing the risk of both acute and chronic health effects in different categories of facilities and coming forth with proposed standards for new construction and occupational health practices. Common problems include smoking, improper maintenance of air conditioning systems, and the presence of such specific pollutants as asbestos, sulfuric acid, benzene and other solvents.

Air pollutants are substances to which most people are susceptible, in contrast to substances causing allergic reactions, which affect relatively few people. Also an allergic reaction involves the immune system whereas a reaction to air pollutants often does not. The reaction of a few sensitive allergic individuals may emphasize a chronic problem, however, where everyone exposed is at enhanced risk.

C. Testimony of Dr. Lee Reichman

Dr. Lee Reichman is Professor of Medicine and Director of the Pulmonary Division, University of Medicine and Dentistry of the New Jersey Medical School, President of the American Lung Association of New Jersey and a National Board Member of the American Lung Association. His topic was cigarette smoke as an indoor air pollutant.

Dr. Reichman testified as follows:

Involuntary smoking is the exposure of non-smokers to tobacco combustion products in the indoor environment. Involuntary smoke arises directly from a burning cigarette (sidestream) or from exhalation of a smoker (mainstream).

Involuntary smoke can produce particulate levels up to 20 times the federal air quality standards. It also contributes phenol, benzo-a-pyrene, nitrosamines, and carbon monoxide to the air, in addition to tar and nicotine.

Health effects of involuntary smoking include eye irritation, nasal symptoms, coughing, wheezing, infection of the lower respiratory tract and headaches. Excess angina and ischemic heart disease are also associated in adults.

Infants exposed to involuntary smoke have been shown to have increased nicotine and its metabolites in their blood and saliva, reductions in lung growth, and greater occurrence of pneumonia and bronchitis. Also parental smoking is a significant prediction of children taking up cigarette smoking.

Adults who share their air with smokers also excrete increased levels of nicotine metabolites compared with non-exposed persons and have lowered pulmonary function. Lung cancer has been reported to be induced by involuntary smoke in numerous studies conducted in many localities and with varying designs.

The EPA estimates that involuntary smoking causes between 500 and 5,000 deaths annually; this can be controlled by keeping smoking private.

D. Testimony of Dr. Gerald Nicholls

Dr. Gerald Nicholls is Acting Assistant Director of the Bureau of Radiation Protection, New Jersey Department of Environmental Protection. His topic was indoor radon in New Jersey.

Dr. Nicholls testified as follows:

Radon is a chemically inert invisible radioactive gas which comes from uranium which is in soils and rock. It has been studied as a health hazard in underground mines since the 1930's, but it was not until

just three years ago that it was discovered that radon could reach unacceptably high levels in residences.

Radon enters homes from the soil underneath through cracks or penetrations in the basement.

While the geological formation called the Reading Prong has generally higher uranium, and hence radon concentrations, uranium in New Jersey is not at all confined to the Reading Prong. While Pennsylvania has about 22,000 homes in their portion of the Reading Prong, New Jersey has about 250,000 homes in its portion.

A statewide preliminary scientific study of radon has been conducted by a contractor and has led to prioritization of the high-risk areas of the state and high-risk types of housing. The scientific model was tested by sampling about 6,000 homes for radon.

The New Jersey Department of Health is doing an epidemiological study to further investigate the link between lung cancer and radon exposure in a residential setting.

Another aspect of New Jersey's radon program is providing residents with free confirmatory radon testing if a contractor measures greater than 4 picocuries per liter (approximately 0.02 Working Levels) in a homes.

Yet another component of New Jersey's radon program is public relations consisting of a toll-free radon information line and a public relations firm to generate material for public dissemination. In addition, members of the Bureau of Radiation Protection staff are giving talks on radon to any group which requests one.

Of the first 13,000 New Jersey radon measurements obtained by the state, over 4,000 were above the EPA guidelines of 4 picocuries per liter in at least one part of the house at the time of testing.

The risk of radon exposure is often expressed as the equivalent number of packs of cigarettes smoked per day. Using that comparison 0.1 Working Level (about 20 picocuries per liter) is equivalent to smoking about one pack per day.

The risks due to cigarette smoking and radon are at least additive and may be more than additive, that is, a cigarette smoker is at extra risk than a non-smoker from his or her exposure to radon.

E. Testimony of Mr. Steve Bromberg

Mr. Steve Bromberg is on the staff of the United States Environmental Protection Agency (EPA). His topic was the EPA's program in indoor air pollution.

Mr. Bromberg testified as follows:

Reflecting the uncertainty within the federal government about its role in indoor air pollution, EPA initiated a checkered involvement in 1976 by monitoring air quality first in private dwellings, then in public access buildings including schools, offices, homes for the elderly, and, later, hospitals.

Reports of strange odors and health effects resulting from tighter insulation of homes triggered concern in Congress that led in 1984 to a direct Congressional mandate to the EPA to study indoor air pollution. To assure interagency cooperation Congress specified that planning for indoor air pollution research should be coordinated through an interagency Committee on Indoor Air Quality (CIAQ).

This 16-agency committee has two goals: (1) to develop an understanding of the magnitude of the risk to human health from exposures to indoor air pollutants, and the contributions of various energy conservation measures and introduction of new building materials and consumer products; and (2) to provide technical information and guidance, including cost-effective mitigation measures, to state and local governments, the private sector and the general public.

The CIAQ has identified six broad areas in which the participating agencies will work to attain these goals. These areas are: (1) identification of indoor air pollutant sources and factors affecting human exposure; (2) characterization of distribution of indoor air quality throughout the country; (3) determination of the relationship between energy conservation and indoor air quality; (4) determination of the health effects of indoor air pollution; (5) development of optional control and mitigation techniques; and (6) development and conduct of national multi-pollutant field studies. The EPA is the only federal agency looking at these six areas from a national perspective.

Several studies of health effects are already underway. In conjunction with Swedish researchers, we are examining the neurological effects of exposure to organics. We are doing chamber studies of criteria pollutants such as nitrogen dioxide. The Baltimore TEAM and other studies around the country are monitoring personal exposure to volatile organic compounds. The integrated air cancer project is studying the carcinogenicity of the organic vapors and particles from unvented combustion heaters and gas stoves. A Jacksonville study is examining pesticides exposure.

The majority of the pollutants we find indoors will be outdoors also, although some, such as organics, may be more concentrated inside. The EPA is carrying out an epidemiological study of the health effects of outdoor ozone and organics; the results can be applied to indoor health effects.

Both radon and asbestos are considered so important by the EPA that they have been established as separate programs within the agency. Nationwide radon surveys will begin next year.

Multi-pollutant studies will probably consume the bulk of the EPA budget for the next three years. This will begin with a nationwide survey of air quality in homes. Thirty homes at each of 50 locations will be sampled for NO₂, formaldehyde, heavy metals, volatile organic compounds (e.g. benzene), semi-volatile organic compounds (e.g. naphthalenes), particulate organics, H₂O, air exchange rates, and temperature. The study will identify possible sources contributing to indoor levels. Modernized, less costly, and more compact monitoring equipment, including passive monitors which can be stuck on a wall, will be utilized.

The EPA wants to provide state and local groups with information which will help them better address indoor air pollution problems. "Congress is not anxious for us to develop regulatory standards. We do not want to go into your home and tell you that you cannot smoke. We have a better chance of doing something if it's an educational rather than a regulatory program."

F. Testimony of Dr. Paul Liroy

Dr. Paul Liroy is a Professor of Medicine, University of Medicine and Dentistry of the Robert Wood Johnson Medical School. His topic was the relation between indoor and outdoor air pollution.

Dr. Liroy testified as follows:

Patterns of daily life and work can be analyzed in term of the proportion of time spent indoors and outdoors. For many people in our society most daily activities occur indoors. Greater exposure to outdoor air can be expected for children and the elderly, for those who live in un-air conditioned environments, and for the population as a whole in certain seasons.

The health risk to a person resulting from air pollution is dependent upon the number of sources and the availability of the sources for potential accumulation in the environment for potential inhalation and adsorption into the lung. Before standards are promulgated let us not be negligent in getting the data we need to determine the real risk involved in exposure to indoor air pollutants.

The concentration of pollutants in outdoor and indoor air is not the same. In general, carbon monoxide and radon concentrations are higher inside; sulfur dioxide is higher outside. The sources for some pollutants are primarily outdoors; some have both indoor and outdoor sources; and some are from primarily indoor sources.

Ozone is an outdoor air pollutant. Indoor exposure is related to penetration of outdoor air. Exposure will depend on the extent to which your environment is sealed.

Sources of particulates are found both indoors and outdoors. We have done a very good job in controlling outdoor particulate levels with vigorous and appropriate regulations. We have stopped the burning of leaves. Smoke stacks have been controlled.

Indoor concentrations of particulates in a non-air conditioned, non-smoking environment are commensurate with outdoor levels, unless the occupants are engaged in cooking on a gas stove or other activity that requires a combustion process. In the wintertime indoor particulate concentrations are related to the number of uncontrolled or unvented heating sources, including wood-burning stoves and fireplaces. So we are at a point where occupants can affect the particulate levels to which they are exposed directly by controlling sources within individual environments.

Nitrogen dioxide is very much an indoor pollutant. Anyone with a gas stove, especially the person who does the cooking, will be exposed for a certain number of hours per day to nitrogen dioxide. Homes with electric stoves or microwaves will have a NO₂ level near zero, commensurate with levels in outdoor air. In the northeast, where homes are tightly sealed and gas cooking is common, you get high NO₂ concentrations indoors.

Potential health hazards of NO₂ include acute respiratory infection and chronic respiratory diseases. The people most affected are asthmatics. Inga Goldstein of Columbia University is studying the relationship between NO₂ exposure and asthma in poor children in Harlem.

NO₂ is a national problem. Perhaps there should be guidelines to homeowners as to the type of stove they should buy or how they should ventilate their home. Here we are dealing with a transfer of technology from the state to the homeowner.

Volatile organic compounds (VOC) concentrations are also higher indoors. One should be aware of potential VOC exposure from building materials, consumer products, and personal activities such as woodworking where one uses shellacs and polishes. Concentrations are going to be higher in confined spaces. Nine times out of ten people don't have adequate ventilation in their homes. Again we have an instance where we ourselves can address the problem; we do not need any regulations.

If you are located near any small industrial VOC source such as a chemical plant, auto body shop, dry cleaners, or diesel smoke from a train yard, the probability exists that you will have elevated VOC concentrations injected into your home from the outdoors. A large number of these minor sources do exist. Volatiles from such sources affect you both outdoors and indoors.

There are several key features to a control strategy for indoor air pollution: prevention, ventilation and filtration. If it is possible, prevention by control of sources is preferable. Unvented space heaters should not be used. Ventilation is required in any homes. A charcoal filter above your stove in the kitchen is a very effective means of controlling air pollution.

Who should have jurisdiction within the State of New Jersey? There are two very effective regulatory bodies whose efforts relate to

indoor air pollution issues. The DEP is very effective in terms of developing and implementing control strategies. The DOH has the epidemiologists who best can deal with assessing the risks of exposure. The State Office of Science and Research should work with the DOH to determine what levels of risk exist and what are the most important issues to deal with.

IV. Public Comments

A. Comments of Ms. Jeanne Hanson

Jeanne Hanson is Program Consultant for the Chest and Health Association of Southern New Jersey, an independent regional health agency with programs on chest diseases, personal health, environmental health, and changes in the New Jersey Medicare system.

Summary of comments:

Information is not readily available to the average citizen about risks of long-term exposure to air pollutants in the home. We at the Chest and Health Association would like to see a list of comparative risk assessments where the health risks of radon, asbestos, and formaldehyde are compared to those of better known hazards such as cigarette smoking and not wearing seat belts. Currently published material is often difficult even for health professionals to obtain.

A "universal brochure" in laypersons' terms should be published by DEP or DOH to be distributed broadly by local health departments and environmental agencies. Included should be lists of approved private contractors who can test for indoor air pollutants.

B. Comments of Dr. Mark Reasor

Dr. Mark Reasor is a Professor of Pharmacology and Toxicology at the West Virginia University Medical Center who has evaluated for the Tobacco Institute the chronic health effects of environmental tobacco smoke or passive smoking.

Summary of comments:

Very commonly studies of the chronic health effects of passive smoking have used active smoking as a surrogate for passive smoking. Due to the lack of validated exposure data, it cannot be concluded that adverse health outcomes associated with passive smoking have been demonstrated. Actual exposure measurements, rather than questionnaires asking about exposure, are required because chemicals emitted from cigarettes disperse and change form, depending on ventilation.

We need chemical and physical characterization of environmental smoke and both short-term and long-term epidemiological study of people exposed to environmental smoke before we have a basis for establishing a hypothesis as to whether there are adverse health effects.

Development of a reputable biological monitor of environmental smoke exposure would be very helpful to the epidemiological studies.

There are many sources of indoor air pollution which are probably more important than environmental tobacco smoke. A recent study showed that 50 percent of the health complaints associated with the sick building syndrome were due to carbon monoxide exposure; only 2 percent were due to tobacco smoke.

One of the most serious sources of indoor air pollution is inadequate ventilation. Ventilation systems should not only be adequately designed and installed, but also adequately used and inspected.

C. Comments of Mr. Jack Farley

Mr. Jack Farley is Director for the Suburban Regional Health Commissioner, a street-level air control enforcement agency organized under the Clean Air Act of 1967 and serving approximately 800,000 citizens in Essex and Union Counties.

Summary of comments:

Degradation of air quality, no matter what the primary source, is the factor that first raises citizen concern. During 1985 our agency responded to approximately 900 citizen air complaints, of which approximately 20 percent resulted from indoor air pollution problems.

Indoor incidents, usually initiated by an odor, commonly involve organic compounds including perchloroethylene, PCBs and dioxins; gases including carbon monoxide and formaldehyde; and particulates such as asbestos, and radon decay products.

Presently, control programs that can deal with interior pollution are either limited in their capability or non-existent. Local health departments lack expertise and refer the problem to us.

But we have a technical jurisdictional problem because the state and local code defines air pollution as contaminants in the outdoor atmosphere. This restriction precludes our initiating local court action when mediation fails to resolve an indoor air pollution situation. To attack indoor air pollution we need modern codes that provide the unencumbered investigation, enforcement and abatement.

Local air pollution control programs also require training in detection and sampling techniques, access to a moderate cost analysis facility with a reasonable sample turn around time, and an advisory source that can recommend moderate cost abatement procedures that are in code compliance.

The Suburban Regional Health Commission receives local support which exceeds its Clean Air Act funding by 150 percent. The Commission's intimate knowledge of its jurisdictional area has generated additional assignments from state and federal agencies, such as investigation of leaking underground storage tanks. Though welcome from a local public

health protection viewpoint, these assignments increase our work load. Local agencies and the State DEP should enter into a formal agreement similar to the interagency agreements that currently exist between selected local agencies and the DEP to assure that assistance requested is supported by a fair funding allocation.

D. Comments by Ms. Susan Hnatt-Topf

Ms. Susan Hnatt-Topf is an environmental sanitary inspector with the Paterson Health Department, President of the Hackensack River Coalition and a member of the Board of Trustees of the Association of New Jersey Environmental Commissions. She is also a former teacher and practical nurse.

Summary of comments:

I spent two years nursing terminally ill cancer patients and sat by my patients' bedsides thinking we need to do a lot more preventive work.

NOW is the time to regulate products which end up in our homes and offices - and ultimately in our lungs and livers. Many products are making us sick when they give off vapors indoors.

We need to explain to people, at their level, what chemicals go into home and office products and furnishings so that when they choose new items or work with new building materials, they will know just what poses a potential health risk.

I am proposing an extension of the Right-to-Know concept to include the labeling of consumer products with more detailed yet more easily understood information on the chemicals in the various products which remain in our homes and offices for years.

The State should take an aggressive stand on mandating labeling materials which could create future health hazards. The Right-to-Know law itself states that "individuals have an inherent right to know the full range of the risks they face so that they can make reasoned decisions and take informed action concerning their ... living conditions".

We, as citizens, should be informed about what's inside the glues, resins, pressedboard, laminates, lacquers, insulations, plastics, aerosol sprays, etc. that we bring into our homes and offices continually. It has been proven that these items can give off noxious fumes which blend and may become concentrated when we seal up our homes for energy conservation purposes:

Aerosols - Beyond the potential hazards of the active ingredients in aerosol spray cans and the possibility of fire or explosion, the propellants themselves are either nitrous oxide (which is associated with brain damage upon direct inhalation) or propane (which is highly flammable). Aerosol sprays can produce vapors that can easily be inhaled deep into the lungs depending on their concentration and

solubility, greatly increasing the hazards of any toxicants contained in the product or carried with it into the lungs.

Sodium Hypochlorite (chlorine bleach) - Inhalation may cause bronchial irritation and pulmonary edema.

Ammonia - Inhalation of concentrated vapors may cause edema of respiratory tract, spasms of the glottis and asphyxia.

Formaldehyde - Common in air fresheners, interior plywood, particleboard, facial tissues, upholstery, drapes, paper bag binders, synthetic fibers, carpeting, panelling, wallpaper glue, and shampoos; may cause irritation of the eyes, nose, throat, and skin. Causes nausea, headaches, nosebleeds, dizziness, memory loss, shortness of breath, allergic reactions of lungs and skin. Suspected human carcinogen - associated with nasal carcinoma.

Perchloroethylene and Tetrachloroethylene - Active ingredients in do-it-yourself dry-cleaning products. Inhalation of vapors may cause dizziness, sleepiness, nausea, tremors and liver damage; suspected human carcinogen.

1,1,1 Trichloroethane (Methyl Chloroform) - Used in water proofing; associated with impairment of perceptual speed, reaction time and manual dexterity.

It has been said by Dixon in New Jersey Environment and Cancer that we spend approximately 80 percent of our time indoors. We may understand some of the effects of few chemicals but we'll probably NEVER know the combined effects of the thousands of substances we breathe in the course of our lives. The federal Environmental Protection Agency has just released their comments suggesting that the consequences of unchecked indoor air pollution are more serious than previously thought.

A guest editorial in a 1977 issue of the Journal of the National Cancer Institute says, "Individuals tend to ignore their own responsibilities and blame harmful occurrences, including carcinogenic exposure, on outside forces." That was NINE years ago and we are still ignoring our responsibilities.

E. Comments of Ms. Diana Crowder

Ms. Diana Crowder is an industrial hygienist with the Hudson Regional Health Commission.

Summary of comments:

Approximately 50 percent of the complaints I receive through the occupational health program result from the tight building syndrome. They come from workers in office buildings, hospitals, and schools. Because these workers tend to be women and because the symptoms (headaches, nausea, fatigue, respiratory difficulties) could have many causes, management tends to discount the complaints. There is need

for broader understanding that complaints about indoor air pollution are valid.

The National Institute of Occupational Safety and Health (NIOSH) has studied air pollution in offices but has not issued a criteria document with official recommendations. The Occupational Safety and Health Act (OSHA) governs work place conditions but does not specifically address indoor air pollution. The OSHA administration does not even respond to indoor air complaints. New Jersey has a new Public Employee OSHA Act, but its implementation is in too early a stage to be sure it will be used to address indoor air problems. A complainant then can only call the local health department; the Health Commission does have a nuisance code, but I have never heard of it being used for indoor air pollution.

Some indoor air problems can be traced to their specific source, perhaps construction practices, pesticides, asbestos. But we have no law that allows us to halt health-threatening construction work or pesticide application or to require asbestos removal in the home. Or none that I'm aware of.

At other times indoor air problems have no specific source, but are due to malfunctioning of the heating, ventilation, air conditioning (HVAC) system. These systems are designed and installed with cost, not comfort or health, in mind. They require regular maintenance.

If you educate workers about contaminants and HVAC systems, but have no code or authority to do anything about problems, you may only create stress which itself is damaging to health. Codes need to be established and enforced.

F. Comments of Mr. Stanley Kolt

Mr. Stanley Kolt is Chairman of American Energy Products and developer of a passive ventilation system.

Summary of comments:

Ventilation provides the air change necessary to maintain air quality in homes, buildings and restaurants. In 1977 there was great concern about formaldehyde in manufactured houses. HUD now requires manufacturers to offer ventilation as an option in new manufactured homes.

In this room, as long as no one is smoking, the air quality looks good. But if you look up at where air comes out of the air conditioning duct, you see black in the area around it. That's mold spores. They are being blown into the air we are breathing. Maintenance and testing of air conditioning systems is important.

There are many chemicals in your home - paints, cleaners, solvents, glues, formaldehyde. Rather than analyze for all of them, ventilate the air and the problem is gone. If the Legislature mandated every

home to have a controlled one air change per hour, most indoor air pollutants would no longer be a problem.

My product is called the thinking cap ventilation system. We close the gable vents of the home making the attic an accumulation chamber. Through vents in room ceilings, hotter air rises naturally carrying pollutants with it. Because it is a passive system, it conserves energy and saves money.

Radon daughters are the toxic derivatives of radon gas. The ventilation system controls these both by the removal of toxics the airborne particles of smoke or dust that radon daughters cling to, and by the balancing of inside and outside barometric pressure, making radon gas less likely to come into the house. Balancing the barometric pressure of buildings is a very important part of controlling pollutants.

G. Comments of Roger Braman

Mr. Roger Braman is from the Respiratory Health Association in Paramus, New Jersey.

Summary of comments:

Our organization is particularly concerned with the health impacts of biological contaminants in indoor air.

Biological contaminants can be classified as viruses, bacteria, molds and fungus. A majority are less than 50 microns in size, which enables them to be inhaled deep into the respiratory tract.

Upper respiratory diseases, according to a 1975 National Health survey, account for more than half of all acute health problems and result in loss of productivity and medical costs.

Indoor biological contaminants have two main sources: the occupants themselves and heating, ventilation, and air conditioning (HVAC) systems.

Contaminants spread by occupants consist mainly of viruses and bacteria. These can be controlled by better personal hygiene, improved housekeeping and increased knowledge of the transmission of disease.

HVAC systems may include humidifiers, cooling towers, collection pans, and drain systems which provide growth media for bacteria, molds, and fungi. Most HVAC systems have no means to remove contaminants from the air stream. To protect building occupants, better designed and maintained HVAC systems are needed.

H. Comments of Mr. William S. Kerbel

Mr. William S. Kerbel is an industrial hygienist who is Vice President of Atlantic Environmental Incorporated of Denville, New Jersey, and

Vice Chairman of the Environmental Quality Committee of the American Industrial Hygiene Association.

Summary of comments:

It is the perception of Atlantic Environmental that indoor air pollution has not been addressed as a single issue in this state. Pollution problems such as asbestos, radon, cigarette smoking formaldehyde, and pesticides have all been addressed individually.

The state agencies have not taken a unified approach. The New Jersey Department of Environmental Protection, Department of Community Affairs and Department of Health have disagreed about who has authority and jurisdiction. Even worse, they have been at odds about standards and limits over such things as asbestos, radon, and formaldehyde. We would challenge the leadership of the various state agencies to try to find a way to take a unified approach to indoor air pollution.

In industrial hygiene, or outdoor air pollution, the effort has been directed toward identifying the specific agent or agents and then attempting to deal with them. Unfortunately, the agents involved in indoor air pollution may be in such small quantities or so numerous that it is difficult to identify them and relate them to a specific effect on a building occupant.

Although attempts to identify specific agents should be continued, it is our feeling that it is even more important to attempt to characterize the environment in which those agents can exist or accumulate. Often an indoor air pollution problem can be solved through identifying the environment under which accumulation or growth has occurred and correcting that situation - even though the specific agents were not identified. For example, use of a carbon monoxide tracer can identify whether a building has adequate ventilation. If it is shown that not enough fresh air is being introduced, one can assume an accumulation of other pollutants as well as carbon monoxide. In Sweden measurement of levels of total volatile organics are used, rather than trying to identify the small amounts present of each compound.

Unless the current approach (or lack thereof) is changed, we can only sit by and wait until the epidemiologist identifies a problem from death records or the medical profession identifies an epidemic.

I. Comments of Mrs. Linda Stansfield

Mrs. Linda Stansfield is a program consultant for environmental affairs with the American Lung Association of New Jersey.

Summary of comments:

Lung disease is on the rise. Lung cancer mortality is up 33 percent. Other forms of pulmonary mortality including asthma and chronic bronchitis are up 25 percent. Lung disease affects millions.

A 1985 EPA report found people breathe three times more carcinogens inside their homes as in the street, even in highly industrialized urban areas. The carcinogens were in cleansers, paints, room deodorants, pesticides, propellants, plastics, adhesives, resins, and insulation. Radon and formaldehyde were not studied.

Cigarette smoke is the major culprit. It is responsible for 80 percent of lung cancer cases. We can be encouraged by the new laws providing relief from smoking in public places, but cigarette smoking inside mass transit vehicles - trains, buses, and planes - should also be banned. The public remains unaware of the connection between cigarette smoking and the health impact of radon. Particles from smoke become vehicles to carry radon daughters deep within the lungs.

The other major indoor pollutants are nitrogen oxide from gas appliances, fireplaces, wood stoves, and coal stoves; carbon monoxide from those same sources and also unvented kerosene stoves, gasoline engines running in garages, and tobacco smoke; formaldehyde from some insulation, particle board, fiber board and wood paneling, carpeting, upholstery, and drapery fabrics; radon from soils and rocks beneath homes; asbestos from roofing, flooring, and insulation; microbes and fungi from air ducts, air conditioners, humidifiers and dehumidifiers, damp walls and floors; and many toxic air pollutants from household cleaners, pesticides, paints, solvents and personal care products.

Government has a regulatory role in protecting air quality in buildings used by many people, such as workplaces and theatres, but it has no legal right to enter a private home unless invited by the owner. Its role in controlling air pollution in individual residences is one of education and research. The public needs to know how to determine if they have a problem and to have guidance on testing devices, reputable monitoring companies and effective mitigation techniques. In the case of radon, Pennsylvania and New Jersey are doing this in a meaningful way.

Labeling consumer products for toxic materials should be required to help the public protect itself. The user of a product for paint stripping, if boldly labeled, "Contains cancer-causing formaldehyde," would be more apt to be sure to have good ventilation than if the label merely says, "Caution, use in a well-ventilated room."

The best method to control indoor air pollution is to remove the source entirely. When source removal is difficult or impossible, mitigation techniques which reduce all air pollutants are preferred over methods aimed at a single pollutant.

In Sweden, building codes require new residences to have balanced ventilation. This not only keeps radon levels low but also lowers the level of other pollutants emitted into the building. We strongly recommend adopting building codes here that require balanced ventilation.

J. Comments of Mr. William Kramer

Mr. William Kramer is Principal Hydrogeologist with the New Jersey Geological Survey's Bureau of Ground Water Pollution Analysis within the Department of Environmental Protection.

Summary of comments:

Our investigations, carried on in conjunction with the Division of Waste Management, have revealed widespread ground water contamination with gasoline and No. 2 fuel oil from leaking underground storage tanks and associated piping in the state.

Leaking tanks and piping systems also result in indoor air quality degradation primarily due to vaporization of subsurface gasoline and No. 2 fuel oil. Indoor effects from gasoline and No. 2 fuel oil can range from entry of free product into basements causing explosive vapor concentrations and strong odors to the presence of relatively low level concentrations (below detection thresholds).

The vapor phase of gasoline and fuel oil consists of a variety of organic compounds. Of particular concern from the public health perspective is the benzene component of gasoline.

Vapor entry to a structure can occur by volatilization from a contaminated water-supply well, for example during a shower; by directed movement through basement walls, floors, and sump pumps; or by backing up through sanitary sewer systems. Structures with basements and in close proximity to underground storage tanks and piping in areas with shallow water tables are at the greatest risk.

The upcoming New Jersey underground storage tank law and regulations should include assessment of risk posed by the vapor phase of the regulated substances to indoor air quality. Existing and proposed regulations, however, exempt small tanks. The state should address the threat that home heating oil tanks, usually with a 500 gallon capacity, pose to both ground water and indoor air quality.

Remedial actions for impacted structures currently include venting, installation of toxic, combustible gas alarms, and soil suction systems installed outside around the foundation of the affected structure. But soil suction systems discharge gasoline or other vapors to the outdoor atmosphere. The need to regulate gasoline vapor discharges from soil suction systems should be evaluated.

K. Comments of Mr. John J. Sheridan

Mr. John J. Sheridan is president of the New Jersey Builders Association.

Summary of comments:

We are very concerned about constructing affordable homes and other buildings that provide a safe living and working environment.

Among the common indoor air pollutants found in today's homes we believe that radon presents the greatest threat to the health of the general public, at least in New Jersey. High levels of exposure to radon daughters can result in lung cancer.

We urge the New Jersey Clean Air Council to petition the New Jersey Departments of Environmental Protection, Community Affairs and any other concerned agencies to secure funding to initiate a study to determine the impacts and cost-effectiveness of using various construction techniques in new housing to reduce the hazards from radon gas. Current research is all geared toward mitigating hazards in existing homes. Meanwhile, new homes are being built in this radon-affected area everyday without the benefit of this critically needed information.

Our National Association of Home Builders (NAHB) Research Foundation would be an ideal group to conduct this study. The Research Foundation has already contacted the New Jersey Department of Environmental Protection. The plans are to seek multiple source funding from the United States Environmental Protection Agency as well as the States of New York and Pennsylvania.

On a related matter, the Research Foundation offers a new low-cost device called the Air Infiltration Measurement Service (AIMS) to accurately ascertain the number of air changes per hour occurring in the home. Knowledge of air change rates is essential to providing data on the transport of pollutants and their effect on indoor air quality. In addition, it can help to assess heating loads and define zones in need of weatherization. It generally costs users about \$50 per 500 square feet of floor area and may be conducted under normal occupancy conditions. The foundation will provide a detailed analysis of the results.

We believe that more attention needs to be given to educating consumers to the hazards of products that they readily buy and use in the home. Construction materials are already regulated to a large degree.

Lastly, we request that the regulatory agencies carefully evaluate the full impact of restricting the use of new materials prior to imposing regulations. Consideration should be given to whether the tests are economically feasible, if the restriction can be enforced and by whom, who will pay for the testing, and whether the findings are based on conclusive data supported by controlled experiments on human health.

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