BY THE COMPTROLLER GENERAL

# Report To The Congress

OF THE UNITED STATES

# Indoor Air Pollution: An Emerging Health Problem

Traditionally it has been presumed that a person was protected from polluted air when indoors. Recent research has shown, however, that this may not always be true. Various harmful pollutants--including radon, formaldehyde, and nitrogen dioxide--have been found in the air in homes, offices, schools, and even in recreational facilities. The problem may even be made worse by Government energy conservation programs which encourage the "buttoning-up" of buildings.

Federal efforts to deal with the problem have been piecemeal, receiving little support primarily because no one Federal agency has responsibility for the problem. Until responsibility is assigned to one agency to oversee Federal efforts, they will continue to be ineffectual.

In this report GAO recommends actions that the Environmental Protection Agency and the Congress can take to help resolve the situation.



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WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

Indoor air pollution is an emerging health problem which affects everyone. Federal efforts to deal with the problem have been ineffectual primarily because no one Federal agency has responsibility for the quality of air in the nonworkplace. This report discusses the problem and the role of various Federal agencies and describes actions that can be taken to help resolve the problem.

We are sending copies of this report to the Director, Office of Management and Budget; the Chairman, Council on Environmental Quality; the Administrator, Environmental Protection Agency; and the Secretaries, Departments of Energy and Housing and Urban Development.

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

# INDOOR AIR POLLUTION: AN EMERGING HEALTH PROBLEM

## D I G E S T

While Government and industry have concentrated on cleaning up the Nation's outdoor air, they have paid little attention to the quality of indoor air in the nonworkplace. Yet indoor air pollution may pose a potentially more serious health problem since we spend 70 to 80 percent of our time indoors--at home, at work, or at play.

Harmful pollutants have been found in various indoor environments in greater concentrations than the surrounding outdoor air. In some cases, indoor pollution exceeds the national standards set for exposure outdoors.

Harmful pollutants are present in all types of indoor air environments. For example:

--Higher than average levels of radioactive radon (a decay product of radium, a natural trace element found in soil and rock) have been discovered in homes throughout the country--with the highest levels found in mining areas. Prolonged exposure to radioactive radon in levels greater than that normally found in the atmosphere can lead to lung cancer. (See pp. 4 to 5.)

--Unhealthy levels of carbon monoxide have been found in a variety of places, including homes, public buildings, and even in school buses. A 1978 Department of Transportation study estimates that many school children daily may undergo excessive exposure to carbon monoxide. Exposure to high levels of carbon monoxide can cause respiratory ailments. (See p. 5.)

--Formaldehyde, emitted by urea foam insulation, recently has been detected in homes in Massachusetts. Some occupants were hospitalized while others were forced to evacuate their homes. Other States have reported similar problems. (See pp. 5 to 6.)

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--Nitrogen dioxide has been found in homes where gas stoves have been used without adequate ventilation. The pollutant was measured in peak concentrations several times greater than the outdoor level and greater than recommended exposure standards. Exposure to high levels of nitrogen dioxide is associated with respiratory ailments. (See pp. 6 to 7.)

--Smoking is a major indoor source of respirable particles (matter small enough to be inhaled), a potential cause of lung cancer. A recent study found that nonsmokers can suffer lung damage from breathing other people's cigarette smoke. (See p. 7.)

Ironically, some measures intended to reduce energy use in buildings contribute to the buildup of indoor air pollution. Efforts to "button-up" homes, schools, and office buildings to decrease their energy use permits less air to enter or escape. Pollutants produced indoors are trapped and their concentrations increase.

Also, the Federal Government is using tax credits to encourage citizens to better insulate their homes. One material qualifying for this incentive is urea formaldehyde foam insulation, which is a source of potentially harmful indoor air pollution. In attempting to resolve the Nation's energy shortage, the Government may very well be advocating solutions which will adversely affect public health.

## WHAT ARE FEDERAL AGENCIES DOING ABOUT INDOOR AIR POLLUTION?

While Federal officials agree that indoor air pollution poses a potentially serious health problem, they have been reluctant to invest resources to study it because they lack clear responsibility for addressing the problem. Federal actions have, therefore, been piecemeal, each agency addressing only that aspect of the overall problem that falls within its purview. (See p. 11.)

Researchers and program managers are beginning to recognize the need for a coordinated, comprehensive approach to the problem. A recent voluntary effort by various Federal agencies to discuss such a coordinated approach has been initiated. However, a similar attempt in the past has found that little could be done to resolve the problem, largely due to the lack of specific Federal responsibility and authority. (See pp. 13 to 14.)

The lack of clear responsibility and authority has also caused other problems. For instance, some agencies have similar research programs because of their respective needs for data. Currently, both the Department of Energy (DOE) and the Environmental Protection Agency (EPA) are conducting similar research on radon in the indoor environment. (See p. 14.)

Agencies also find themselves assuming adversarial roles when assessing the impact of Federal actions on indoor air quality. Currently, EPA and DOE disagree over proposed measures in DOE's Residential Conservation Service Program. EPA believes that a lessening of the air exchange rate, as DOE proposes to improve energy efficiency, could increase radon buildup. The subsequent exposure to radon may lead, according to EPA statistics, to a potential increase of between 10,000 to 20,000 additional deaths per year due to lung cancer. DOE disagrees, believing the potential effect to be far less significant. As of late August 1980 this dispute was unresolved. (See p. 16.)

## WHAT CAN BE DONE TO DEAL WITH THE PROBLEM?

Some European countries have recognized the significance of the indoor air pollution problem and have enacted indoor air quality standards for certain pollutants. They have also taken other measures to control the problem, such as restricting the use of materials known to emit pollutants. (See p. 19.)

There are low-cost ways to minimize indoor air pollution, including proper ventilation and use of ventilating equipment and filtering devices.

Federal agencies need to disseminate this kind of information to the public to increase their awareness. (See p. 21.)

A long-term solution to the indoor air pollution problem requires a clear mandate to one Federal agency that can oversee and direct Federal efforts relating to indoor air. GAO believes this agency should be EPA, due to its past experience with air pollution. The Clean Air Act could be amended to provide EPA the responsibility and necessary authority to address the indoor air quality problem in the nonworkplace. (See p. 22.)

While GAO recognizes that eventually some costs will be involved, a massive new Federal program is not necessary now. Rather, given a clear mandate and authority for addressing the overall problem, EPA can develop a comprehensive, coordinated program using existing resources in both the public and private sectors. (See p. 22.)

## RECOMMENDATIONS TO THE CONGRESS

GAO recommends that the Congress amend the Clean Air Act to provide EPA with the authority and responsibility for the quality of air in the nonworkplace. (GAO will be available to assist the respective committees in drafting the appropriate language.)

## RECOMMENDATIONS TO THE ADMINISTRATOR, EPA

While GAO believes that EPA does not now have a specific legislative mandate for the quality of air in the nonworkplace, there are actions which the Agency can take. GAO therefore recommends that the Administrator establish a task force which will:

--Identify research activities of other Federal agencies and private institutions relating to indoor air pollution so that EPA's activities can be coordinated with them.

--Compile available data on indoor air pollution and use this data to inform the public and other governmental organizations of the problem and available actions.

--Provide advice to the Administrator on what EPA research and development efforts are needed to deal with the indoor air pollution problem.

Such efforts will aid in identifying and guiding Federal research activities, act as a clearinghouse for research data, and also serve as a focal point for assisting State and other local governments and citizens in dealing with indoor air pollution problems. (See p. 23.)

AGENCY COMMENTS

EPA said GAO's report was both accurate and informative. EPA suggested that the goals of energy conservation and maintaining indoor air quality need not necessarily be in conflict. (See p. 17 for these comments and GAO's response.)

The Department of Housing and Urban Development pointed out its involvement in research on the indoor air pollution problem. (See p. 17.)

DOE said that the report underplayed DOE's dedication and accomplishments in dealing with the problem. DOE also disagreed with the recommendation that EPA be given responsibility and authority for the quality of air in the nonworkplace, stating that if the recommendation was retained, a further clarification of the role of Federal agencies was needed. In view of EPA's already existing responsibility for outdoor air pollution and its experience in this area, GAO continues to believe that EPA is the appropriate agency to be given authority and responsibility for the quality of indoor air in the nonworkplace. (See pp. 17, 18, and 22 for these comments and GAO's response.)

# Contents

APPENDIX



## ABBREVIATIONS

| | |
|---|---|
| CO | carbon monoxide |
| CPSC | Consumer Product Safety Commission |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| EPA | Environmental Protection Agency |
| GAO | General Accounting Office |
| HUD | Department of Housing and Urban Development |
| NO2 | nitrogen dioxide |
| OSHA | Occupational Safety and Health Administration |
| OTA | Office of Technology Assessment |

# CHAPTER 1

## INTRODUCTION

The control and eventual elimination of air pollution has been a national goal since passage of the Clean Air Act in 1963. Both the public and private sectors have spent billions of dollars developing and implementing control strategies designed to clean up the Nation's outdoor air. A recent Council on Environmental Quality report estimates that more than $213 billion will be spent from 1977 through 1986 in pursuit of clean outdoor air.

Little attention has been paid, however, to the quality of indoor air. It has traditionally been thought that if the outdoor air was relatively pollution-free then the air indoors was likewise good. Furthermore, it was presumed that even if pollution was in the outdoor air a person could take refuge indoors with the building acting as a barrier.

These presumptions are becoming increasingly suspect. Harmful pollutants have been found in the indoor air in concentrations greater than the outdoor surrounding air and in some instances greater than recommended exposure standards. Nitrogen dioxide, for example, has been found indoors in concentrations exceeding the national air quality standard set for outdoor exposure.

The average person spends about 75 percent of his or her time indoors. Certain groups, such as infants, the elderly, the handicapped, and homemakers, spend even a greater percentage of their time indoors. Therefore, the potential health effects of exposure to harmful pollutants indoors can be widespread.

While various Federal agencies are indirectly involved in the overall indoor air pollution problem, none has specific responsibility for the quality of air in the nonworkplace. The following agencies have some involvement with the issue:

--Consumer Product Safety Commission (CPSC).

--Department of Energy (DOE).

--Department of Housing and Urban Development (HUD).

--Environmental Protection Agency (EPA).

--Occupational Safety and Health Administration (OSHA), Department of Labor.

(A discussion of these agencies' specific roles is found in chapter 3.)

## OBJECTIVE, SCOPE, AND METHODOLOGY

The purpose of this review was to explore a relatively new, emerging air pollution problem which affects all of us and to determine what, if any, Federal responsibility and authority exist for dealing with the problem.

Because no one Federal agency has specific responsibility for protecting the quality of indoor air in the nonworkplace, we conducted our review at those agencies which are indirectly involved in the indoor air pollution issue. To establish the significance of the problem and its health effects, we talked to researchers in both the private and public sectors in the United States and also in Europe. We also gathered and reviewed available studies on indoor air pollution. (See app. I.)

We contacted researchers at EPA's Research Triangle Park, Durham, North Carolina; the Lawrence Berkeley Laboratory, University of California, Berkeley, California; and the Harvard School of Public Health, Boston, Massachusetts.

We spoke with researchers and officials from other countries that have taken or are considering taking actions to address the indoor air pollution problem:

--Great Britain.

--Sweden.

--Denmark.

--The Netherlands.

We also talked to State government officials in Massachusetts concerning the indoor air pollution problems experienced in that State and the Federal agencies' role in assisting the State.

We used a two-step process for conducting this review. We first documented the significance of the indoor air pollution problem by talking to and gathering data from researchers. Because most of these studies were based on highly technical

research efforts, we did not attempt to verify their findings. We did, however, corroborate findings through talks with various researchers.

Secondly, we identified, through talks and review of legislation, EPA's responsibilities and authority for air quality. The major legislation reviewed included the Clean Air Act, as amended in 1977, and the Toxic Substances Control Act of 1976.

## CHAPTER 2

## WHAT IS INDOOR AIR POLLUTION AND HOW DOES IT AFFECT US?

During a day's activities indoors we may be exposed to a variety of harmful pollutants that until recently were thought to exist only in the outside air. These pollutants can occur in our homes, in our offices, in our schools, and even in our recreational facilities. Some of the more harmful pollutants include radon, carbon monoxide, formaldehyde, nitrogen dioxide, respirable particles, and asbestos. These pollutants can be emitted from a variety of sources--certain building materials and insulation, tobacco smoke, and unvented gas stoves.

The following highlights various pollutants and shows the pervasiveness of the problem.

### RADON

Radon is a radioactive gas, produced by the decay of radium, which occurs naturally in a variety of substances, including soil and rock. When these substances are used in building materials, radon is emitted into the indoor environment. Radon can also enter the indoor air from radium-bearing soil underlying or in the vicinity of a building or from ground water or tap water passing through radium-bearing rock formations. A third way radon can enter the indoor air is through rocks containing radon, which are used as thermal storage mediums for the energy that residential solar heating systems collect.

Unless remedial action is taken, the soil under a building as well as the building materials will continuosly introduce radon into the indoor air throughout the building's life. In homes with relatively high, steady rates of air infiltration, the radon level is diluted and the concentration reduced; conversely when the fresh air normally entering the home is lowered, dilution does not occur and the concentration increases.

Prolonged exposure to radon in concentrations above that normally found in the outdoor atmosphere can result in an increased incidence of lung cancer. Both DOE and EPA have recently identified areas around the country where radon was measured indoors in concentrations several times higher than the outdoor level. In certain areas of the country, where large deposits of radioactive materials are found,

indoor levels of radon have been measured well above EPA's recommended safety limits. In one such area the indoor radiation levels were so high that homes had to be tested to determine the radon levels before HUD would approve Federal financing. HUD is considering similar action elsewhere in the country.

CARBON MONOXIDE

Generated indoors by a variety of sources, including gas appliances, leaking furnaces, chimneys, and vehicles in attached garages, carbon monoxide (CO) is a colorless, odorless gas which can cause, in extreme cases, death due to asphyxiation. The aged, the very young, and those with cardiac or respiratory diseases are particularly affected by carbon monoxide.

Exposure to CO is not limited to the air in buildings --a 1978 Department of Transportation study found that a significant number of school children may be exposed to harmful levels of carbon monoxide when traveling in school buses. The study was conducted as a result of several incidents of carbon monoxide poisoning involving school children and bus drivers. No deaths resulted but many instances of headache, sickness, and nausea were reported. If the test results were projected on a nationwide basis, using an exposure dosage level recommended by the American Industrial Hygiene Association, the report estimates that on a daily basis over 1.5 million children may, while riding school buses, be exposed to carbon monoxide levels that exceed the recommended safe dosage. 1/

Even during our indoor recreational activities we may be exposed to potentially serious levels of carbon monoxide. A 1978 Harvard School of Public Health study found the national air quality standard set for outdoor exposure to CO was exceeded in over 80 percent of the sampled hours in ice skating rinks located in the Boston area. The use of gasoline powered ice resurfacing machines and the improper or inadequate venting of exhaust emissions was the cause of this excessive level of CO.

FORMALDEHYDE

Approximately 6 billion pounds of formaldehyde are produced annually in the United States. Among other things,

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1/We did not evaluate the accuracy of the study's projected statistics.

it is used in building materials and insulation, furniture, and textiles.

Formaldehyde has a very characteristic odor that is easily detected. Low levels of formaldehyde can cause mild irritation to the eyes, nose, and throat, but most people can tolerate it. At moderate levels formaldehyde causes a mild reaction such as watery eyes. High levels cause immediate, strong discomfort. Preliminary results of a recent study found that formaldehyde caused cancer in rats. 1/

The use of urea formaldehyde foam insulation was recently banned in Massachusetts when it was determined that the insulation emitted levels of formaldehyde which caused a variety of adverse physical symptoms. Over 100 persons were hospitalized and families had to evacuate their homes--some of whom are still unable to return to their residences because of the formaldehyde concentration.

During the past several years various Federal agencies have also received complaints from mobile home owners raising serious questions about the use of urea formaldehyde in mobile home construction. A subsequent National Academy of Sciences report has recommended that exposure to formaldehyde in the home be kept at the lowest practicable level. According to the Consumer Product Safety Commission, this report may lead to a requirement for a warning label on all contracts that consumers sign for the installation of urea formaldehyde foam insulation.

NITROGEN DIOXIDE

In a 1979 Harvard School of Public Health study it was reported that nitrogen dioxide ($NO_2$) levels were significantly higher in homes with gas stoves than homes with electric stoves (in some cases seven times higher). The report emphasized that in some cases the daily peak levels in gas stove households exceeded the Federal air quality standard for nitrogen dioxide. Similar studies have arrived at the same conclusion.

While some disagreement exists between researchers on the severity of the health effects of varying levels of exposure to $NO_2$, the original health studies done to support

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1/Chemical Industry Institute of Toxicology, Long Term Formaldehyde Study, Jan. 1980.

the national air quality standard found overall that exposure to NO2 did affect respiratory functions, thus supporting the need for a standard.

A study done in England in 1977 compared respiratory illness of children living in homes where natural gas and electric stoves were used. The study reported that children living in homes with gas stoves had more instances of respiratory disease than children living in homes with electric stoves. The researchers concluded that elevated levels of nitrogen dioxide from gas stoves might have caused the increased incidence of respiratory illness.

## RESPIRABLE PARTICLES

Respirable particles are any particles of matter small enough to be inhaled into the human body, such as, dust, soot, or ash. Particulates resulting from tobacco smoking, for example, pose a serious problem because they are small enough to pass into the body's respiratory system and are deposited in the lungs. Additionally, tobacco smoke, like gas, remains suspended in the indoor air. A 1975 "Architectural Environmental Health" article states that the smoke from one cigar, for instance, completely overcomes the effect of an air filtration device for at least 1 hour and even at the end of 2 hours the particulate concentration is high.

The significance of tobacco smoke as a health hazard was emphasized in the latest Surgeon General's report on smoking and health. That report also asserts that tobacco smoking can be a significant source of pollution indoors. A recent study published in the "New England Journal of Medicine" now states that for nonsmokers even breathing tobacco smoke is a definite health hazard.

## ASBESTOS

Asbestos has been identified as a cancer-causing agent in humans. Workers exposed to asbestos fibers have experienced an increased incidence of lung cancer and cancer of the stomach and intestinal lining. In 1972 EPA declared asbestos a hazardous air pollutant stating that any exposure to asbestos involves some health risk. No "safe" level of exposure has been established.

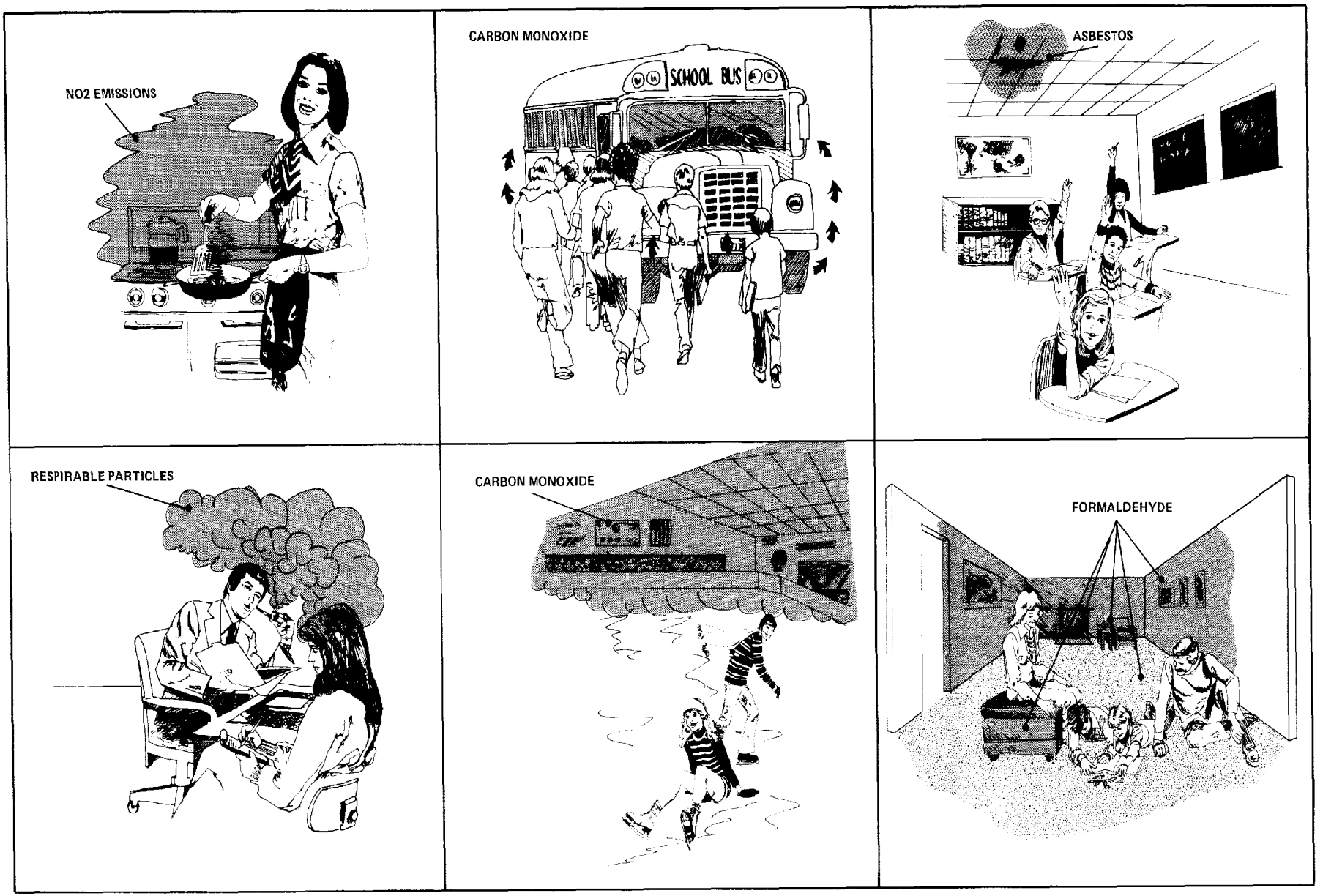
In 1973 EPA banned certain uses of asbestos in building materials; however, prior to 1973 asbestos was commonly used in construction and poses a significant source of indoor air pollution. Of particular concern is the children's exposure to asbestos in school buildings built before the ban. The

potential health effects of such exposure are unique because a large number of students can be exposed early in their lives. Their remaining life expectancy thus provides a long development period for asbestos-related diseases.

The use of asbestos in the Unites States has been steadily increasing. Since the beginning of this century, approximately 30 million tons have been used with the total increasing annually by about 750,000 tons. EPA estimates that between 2,000 to 3,000 products contain asbestos, for example, brake linings and clutch facings in various vehicles (cars, trucks, and subway cars).

The following chart shows our potential daily exposure to various pollutants indoors:

## INDOOR AIR POLLUTION: OUR CONTINUAL DAILY EXPOSURE



## CHAPTER 3

## FEDERAL EFFORTS TO DEAL WITH THE INDOOR AIR POLLUTION PROBLEM ARE NOT EFFECTIVE

No one Federal agency has responsibility or authority for indoor air quality in the nonworkplace. Several agencies are studying varying aspects of the indoor air pollution problem, but these efforts are piecemeal and have low priority. The possibility for duplication of research exists among Federal agencies, and there is no formal coordinated network to share knowledge. Some Federal programs may even exacerbate the problem, causing agencies to be at odds in assessing the potential effect of these programs on the quality of indoor air.

As a consequence, Federal actions have not been effective and have not provided a focal point for helping States, localities, and citizens with their particular indoor air pollution-related problems. Perhaps the Federal effort is best summed up by a recent Office of Technology Assessment (OTA) report which concluded that "the Federal government does not appear to have recognized the significance of indoor air quality as a potential health problem * * *."

### NO CLEAR-CUT RESPONSIBILITY FOR INDOOR AIR QUALITY

None of the Federal agencies included in our review acknowledged a mandate for assessing and ensuring the quality of air in the nonworkplace. EPA, which is the lead agency for air pollution, derives this responsibility from the Clean Air Act. EPA's interpretation of the act, however, limits its responsibility to pollution occurring in the outside air, a view we share.

Under other legislation EPA becomes indirectly involved with certain pollutants in the indoor environment. The Toxic Substances Control Act provides EPA with the authority to control or even limit the manufacture and use of hazardous chemical substances, such as asbestos. EPA is also largely responsible for radiation policy and is currently researching the radon problem in the indoor environment.

Other agencies involved in the indoor air pollution problem include: the Occupational Safety and Health Administration, the Department of Energy, the Consumer Product Safety Commission, and the Department of Housing and Urban Development.

--OSHA is responsible for safeguarding the worker's health in the workplace. This includes setting and enforcing indoor air quality standards for certain known pollutants. These standards are established to protect the majority of workers.

--DOE, by congressional mandate, establishes energy conservation programs for residences and new buildings. While DOE is concerned with the environmental impact that these programs have on indoor air quality, its primary interest and responsibility is energy conservation and not indoor air quality.

--CPSC evaluates the safety and health effects of consumer products, including those which may emit indoor pollutants such as formaldehyde and asbestos. CPSC can, if warranted, force a product off the market if sufficient evidence demonstrates that the product is hazardous. CPSC can also set standards for products and has responsibility for providing information on product safety to consumers.

--HUD establishes building standards for certain HUD-sponsored properties and material standards for mobile home construction. HUD is therefore concerned with the impact of various pollutants, such as radon and formaldehyde, on the quality of indoor air.

## PROBLEMS CAUSED BY A LACK OF CLEAR RESPONSIBILITY

The lack of clearly assigned responsibility has impeded Federal actions to study indoor air pollution and to develop adequate control measures by causing efforts to be

--limited in scope,

--uncoordinated and sometimes duplicative, or

--lacking a focal point.

### Limited Federal study

Federal agencies have limited their efforts regarding indoor air pollution to that part of the problem which falls within their program's purview. DOE's energy conservation programs, for example, identified a range of indoor pollutants which would be affected by energy conservation measures. However, because of its mandated responsibility for energy conservation, the primary emphasis of its $5 million research project was to support its building ventilation

and energy conservation standards. Additionally, many Federal actions have been reactive--stimulated by State request or citizen complaint. For example, the Governor of Montana in September 1979 requested that the EPA Administrator set an indoor standard for radon after excessively high levels of radon were found in many Montana homes. Therefore, EPA's Office of Radiation Programs, together with the State, has begun conducting a monitoring study of radon levels in Montana. However, EPA expects that it will require about 2 years to develop such a standard for the State.

Various agency research officials agree that Federal research efforts on indoor air pollution are limited, stating that they are reluctant to invest scarce resources because of unclear legislative responsibility. For example, EPA first began studying indoor air in 1976, but program managers have systematically cut research proposals during the last 2 fiscal years. Although EPA program managers agree that indoor air pollution may present a health problem, they say they are unable to assume any additional "non-mandated" responsibility given their present resources.

As part of an overall study of Federal energy conservation programs, a 1979 Office of Technology Assessment report noted that agencies collectively spent about $1 million annually for research on indoor air quality. The report found this "low level" of support for research difficult to understand. OTA characterized Federal research efforts on indoor air quality as piecemeal and not designed to increase the knowledge of sources, characteristics, or effects of indoor air pollution even though OTA believes DOE and EPA should have been aware of this "obvious problem." However, OTA made no specific recommendation to correct this situation.

Agency officials also say they are limited by insufficient technical resources. CPSC and HUD program officials, for example, state they lack the technical personnel and equipment to fully study indoor air pollution. Some HUD researchers and program officials believe their agency is ill-suited to best address the significant health questions related to indoor air quality and look to an agency such as EPA, which has experience in air pollution matters, to offer assistance and guidance.

## Ineffective coordination and duplication of research

As discussed, the lack of a clear mandate for indoor air quality has caused agencies to develop their own limited research data; however, there has been little effective

coordination between agencies to share this data. Voluntary interagency committees have been established within the last year to bridge this gap. Without specific responsibility and authority, agency representatives say they are handicapped to fully address and coordinate the various research activities and, therefore, the possibility for duplicative research exists.

For example, both DOE and EPA have research efforts underway with plans for additional studies on indoor radon. During the last 2 years DOE has contracted for over $500,000 with national laboratories to study the effects of randon indoors and plans to spend an additional $350,000 in fiscal year 1981. EPA has also implemented a similar research program plan. Though aware of the DOE effort, EPA's Deputy Assistant Administrator for Radiation Programs intends to reprogram $2 million of his budget to support the proposed radon research program, explaining EPA's needs require such an effort.

Researchers in both DOE and EPA agree that duplicative research exists, stating such duplication is not necessarily wasteful. But as the Project Manager for DOE ventilation studies at the Lawrence Berkeley Laboratory pointed out, given limited resources, similar or duplicative research is not the most effective use of resources for any Federal indoor air pollution program. He suggested that a lack of specific authority can cause duplicative research, as it has with the problem of indoor radon, since both agencies have a need for the data and, therefore, a need to develop their own research capability.

Over the last year middle level managers of several agencies (DOE, EPA, and HUD) have tried to bridge this coordination gap through an ad hoc interagency committee on indoor air pollution. The group was brought together in April 1979 by DOE managers to discuss the formaldehyde problem and to elicit interagency funds for a large-scale epidemiological (health effects) study. The committee members quickly realized that formaldehyde was only one indoor pollutant of concern and thus expanded their focus to include all indoor air pollutants. Their mission was to determine the activities of various agencies and to prepare a white paper on indoor air pollution to send to appropriate legislative committees and executive departments. With this paper, which is still in draft, the committee hopes to call attention and generate support for indoor air quality research.

In March 1980 EPA research managers initiated a similar effort and devised an overall plan of action for addressing the indoor air quality issue. Again, both the plan and the committee call for voluntary interagency support. Members of both committees agree that voluntary efforts may not be successful but are needed in the absence of a clear mandate.

No Federal focal point

Since no Federal agency has responsibility for the study and control of indoor air pollution, no Federal focal point exists. No Federal office currently provides information or guidance on indoor air quality--material that could cause awareness of indoor air pollution and suggest effective, low-cost solutions. Therefore, State and local officials and the public do not know where to present their problems or address their questions.

The problem of urea formaldehyde foam insulation in Massachusetts demonstrates both the lack of a Federal focus and insufficient Federal response. The Massachusetts Consumer Affairs Department began receiving complaints about this insulation in 1978. The health symptoms of these complaints were acute with more than 100 children and adults being hospitalized. Many residents had homes in which excessively high levels of formaldehyde emissions were identified and had to evacuate their residences. Massachusetts, through its own limited monitoring, documented the high formaldehyde levels and then requested Federal support. Various Federal agencies were contacted for technical assistance and advice but little was forthcoming. According to State government officials, the total Federal assistance could best be characterized as "less than satisfactory."

In a 1978 letter to the President, the Lieutenant Governor of Massachusetts summarized the situation by stating that

> "* * *several Federal agencies * * * have acknowledged receiving numerous health complaints * * * none have given the matter high priority. Instead, time is spent haggling over the jurisdictional aspect of the problem. * * * How the Federal Government can continue to virtually ignore this question is beyond our comprehension."

The Lieutenant Governor concluded his letter by formally requesting a study of the health effects of urea formaldehyde foam insulation, a study which has never been done.

Many Federal officials stated that they receive calls about indoor air quality from the public but most say they are able to provide only informal, oral responses. While few officials have written material available to send requestors, they do agree that there is general information concerning the problem which the public should be aware of.

## ENERGY CONSERVATION ACTIONS MAY ACTUALLY EXACERBATE THE PROBLEM

Paradoxically, in attempting to foster energy conservation, some Federal programs may be exacerbating the indoor air pollution problem. By buttoning up buildings (reducing the air exchange), the pollutants generated indoors are trapped and their concentration increases. Additionally, by encouraging citizens through tax credits to better insulate their homes, the Federal Government actually may be introducing a program that could have an adverse impact on their health.

The Department of Energy's recently proposed program to achieve more energy efficient buildings contains recommended actions to lower the air exchange rate, thus reducing energy usage. These actions (weather stripping, caulking, etc.) will allow less air to enter or leave the building, causing indoor air pollution to substantially increase. EPA has taken exception to this aspect of the proposed program stating that if implemented for all residences, the increased likelihood of exposure to radon alone could result in a potential increase of between 10,000 to 20,000 additional deaths per year due to lung cancer. DOE disagrees with EPA's estimate, believing the potential effect to be substantially less because not every home will undergo the suggested buttoning up. This impasse over the potential effect of DOE's program was unresolved as of late August 1980. 1/ Representatives of both agencies expressed their mutual concern for protecting human health, but the question remains regarding what is an acceptable level of risk and how that level will be determined.

Citizens are also being encouraged (by tax credits) to better insulate their homes as one method of achieving a more energy efficient home. One type of insulation eligible for the tax credit is urea formaldehyde foam insulation, previously identified as a potential source of indoor air

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1/We did not evaluate the accuracy of either agencies' statistical data on the potential effect of implementing DOE's energy conservation program.

pollution. This apparent dichotomy between energy goals and potential adverse health effects was highlighted in the letter by the Lieutenant Governor of Massachusetts to the President in which he said

> "* * *On the one hand we publicly support home insulation and constantly urge the public to invest in insulation, * * * yet * * * we also have a responsibility to make sure that what people are putting in their homes is not a threat to their health * * *."

## AGENCY COMMENTS AND OUR EVALUATION

In commenting on our report, EPA found it to be both accurate and informative. EPA suggested that the goals of energy conservation and maintaining indoor air quality need not necessarily be in conflict. We agree that there need not be a conflict between these goals and believe that such a possibility underscores the need for one Federal agency to have responsibility and authority over indoor air quality in the nonworkplace, thus ensuring that this conflict does not occur. EPA also provided technical comments on the report which we incorporated where appropriate.

HUD expressed its concern for the problem and the need for continued liaison with other agencies in conducting research on the problem.

DOE stated that the report underplayed its dedication and accomplishments in this area. DOE points to its funding commitment for research on ventilation and indoor air quality as evidence of its continued concern for the problem. We recognized this financial commitment in the report and commend DOE for its support. However, as DOE notes, other Federal agencies have limited their research on indoor air quality, believing it is not within their purview.

DOE also believes its support of private sector actions in developing a voluntary ventilation standard reflects its concern for the problem. We agree its actions have aided the development of this proposed standard; we also believe this demonstrates our view that resources do exist in both the private and public sectors which can be marshaled and directed at solving the problem. The private standard, however, is now in its proposal phase, thus no guarantee exists that it will be accepted as is or when it will be presented in final form. Furthermore, it is also only a

voluntary ventilation standard which, while recognizing the need for acceptable indoor air quality, does not prescribe the control methodology to achieve such a level.

DOE also questions OTA's estimate of Federal funding efforts. While we did not determine the accuracy of that estimate, it should be noted that the OTA report cited its estimate as being solely for research on indoor air quality and not, as DOE states, for research on ventilation and indoor air quality.

DOE has consistently challenged the accuracy and applicability of EPA's estimated impact of DOE's Residential Conservation Service Program (RCS). The report notes this disagreement between the agencies and also points out that we did not evaluate EPA's statistical data supporting its estimated increase for the annual lung cancer fatality rate. We believe this disagreement over the potential impact of programs underscores the need for one agency to have final responsibility and authority to resolve such differences.

DOE's response to the report also points to the many energy benefits to be gained from the RCS program which DOE states may be accomplished without any increased health risk. While we agree there are energy benefits to be gained from implementing the program, according to various studies, potential health risks exist unless certain actions are taken. For example, a December 13, 1979, DOE memorandum discusses EPA's concerns with the RCS program and points out the need for a "screening" process to identify areas where a "high risk" of radon exists. These areas, according to the memorandum, need to be identified so that actions can be taken to lessen the potential of increased indoor radon concentrations which would result from implementing the RCS program.

# CHAPTER 4

## WHAT NEEDS TO BE DONE TO DEAL WITH THE INDOOR AIR POLLUTION PROBLEM

Only in recent years has indoor air pollution been recognized as a potentially serious health hazard in the United States. Interestingly, some European countries have already recognized the severity of the problem and have taken actions to deal with it by setting indoor air quality standards and establishing material standards. While the United States does not have indoor air quality standards to adhere to, there still is much that can be done to minimize the problem. The first step suggested is establishing a comprehensive, coordinated program to oversee and marshal resources existing in both the private and public sectors. Such a program does not necessarily require massive additional funding but rather better use of existing resources.

Until such a program is implemented, there are low-cost actions the public can take to minimize the indoor air pollution problem. Such actions as proper use of ventilation systems and airing out of homes can do much to dissipate indoor air pollution, but this general information needs to be made known to the public.

### WHAT OTHER COUNTRIES HAVE DONE ABOUT THE PROBLEM

Several European countries have recognized indoor air pollution as a serious health problem. They are actively researching its health effects, identifying its sources, exploring possible solutions, and establishing controls. Of the four countries we visited, three have already established air quality standards and/or product control standards for formaldehyde. A private standards institute in the fourth country has developed a formaldehyde content restriction, which private industry will probably follow. In addition to setting air quality standards and/or product control standards for formaldehyde, European countries are currently reviewing the health effects of radon and nitrogen dioxide in the indoor environment.

Most foreign researchers and government officials agreed that product quality control is the most effective and easiest corrective measure to enforce. They pointed out that what is needed is a determination of material standards for the product and appropriate test methods.

Enforcement of the standards is achieved through testing at time of production to control those products which have been identified as sources or emitters of indoor pollutants.

There were differing opinions on the usefulness of air quality standards, primarily because of the difficulty in enforcing them. It was stated that it is extremely difficult and costly to measure air quality and ventilation factors on a large scale--thus the difficulty in enforcing standards. Additionally, current testing procedures are complex and time consuming.

Foreign officials agreed that the public should be made aware of various sources of pollutants, their medical effects, and available solutions. Awareness of the need for proper ventilation was stressed, particularly in view of current energy conservation measures which result in less natural ventilation of buildings. In Sweden, for example, research on radon levels in homes was underway as early as the 1950s. There was a general awareness of the problem but the risks were regarded as small since there was adequate ventilation in homes. Later, in the 1970s, when energy conservation became an issue and homeowners were taking steps to reduce ventilation, Sweden's National Institute of Radiation Protection warned the public of the increased radon risks resulting from reduced ventilation and offered advice on ways to minimize the problem.

## A COMPREHENSIVE, COORDINATED PROGRAM IS NEEDED

In the United States indoor air pollution has been recognized as a potentially significant health hazard only in the last few years. While various research programs do exist, researchers agree that much remains to be done. They suggest starting with the establishment of a comprehensive, coordinated Federal program to oversee and marshal ongoing activities, directing them toward a common goal. For instance, researchers agree that a need for epidemiological studies exists. These studies would establish the long-term health effects associated with indoor air pollution by evaluating not only individual pollutants but also the health effects resulting from their interaction. Such overall studies are not now ongoing at any Federal agency. Several agencies do, however, have studies either underway or proposed which evaluate the health effects of specific pollutants, but the pollutants are individually evaluated.

Considerable research and development effort is also needed to develop and implement effective control strategies. While various techniques are available which can help minimize the indoor air pollution problem, still others are only in the evaluation stages. Installing filtering devices on known pollutant sources or the proper use of ventilation systems have been shown to reduce pollutant concentrations. Other devices are also being studied; for example, DOE has recently started evaluating residential size mechanical ventilation/heat exchange systems. DOE believes these devices can be an effective means of achieving good indoor air quality while providing a reasonable level of heat and coolant at an energy-efficient rate. There are still other cases, however, where certain building features and/or building materials may need to be changed or eliminated, such as the use of asbestos or the current concern over the use of urea formaldehyde foam insulation.

Finally, according to various researchers, there are relatively low-cost (some are even free) actions available to the public; however, they may not be well known simply because the public has not been informed. Specifically, the following actions can minimize the indoor air pollution problem:

--A general awareness of the consequences of buttoning up a home. To offset the potential buildup of pollutants, a periodic airing out of the home can be quite successful. Installing air purifying or filtering equipment is also a potential remedy.

--Use of already existing ventilation systems. For example, when using a gas stove researchers strongly recommend that a vent be used to remove the resulting nitrogen dioxide.

--Encapsulating potential sources of emission, such as covering asbestos with a sealant.

# CHAPTER 5

## CONCLUSIONS, RECOMMENDATIONS, AND AGENCY COMMENTS

### CONCLUSIONS

Indoor air pollution poses a potentially serious health hazard. Federal actions, however, have not been effective primarily because no one agency is clearly responsible for the issue. Given such responsibility, one agency could implement a program to oversee the many Federal actions currently underway or proposed. Such a program would direct efforts toward a common goal, ensuring that scarce resources are used to their maximum benefit. Knowledge gained can be shared not only between Federal agencies but also with private institutions, State and local governments, and the public. In short, the program would act as a clearinghouse of information on the problem.

A Federal program to oversee the many current or planned programs which address the indoor air pollution problem does not, at this time, necessitate either a massive new Federal effort or expenditure. Rather, better use of existing resources both in Government and private sectors is needed. For instance, similar or duplicative research may not necessarily be bad, but in terms of limited resources and the need to economize Federal expenditures it may not be the most cost-effective method. An oversight program, such as recommended by this report, would ensure that research efforts add to, and not repeat, a body of knowledge. Additionally, such a program would provide a valuable mechanism through which the public can be informed of the problem and the various low-cost actions available to offset or minimize the indoor air pollution problem.

We believe that EPA should be assigned the responsibility of overseeing the implementation of a program addressing the issue of indoor air quality in the nonworkplace. EPA has experience with air pollution problems and, in fact, other agencies look to EPA for guidance and leadership on this issue.

### RECOMMENDATIONS TO THE CONGRESS

We recommend that the Congress amend the Clean Air Act to provide EPA with the authority and responsibility for the quality of air in the nonworkplace. (We will be available to assist the respective committees in drafting the appropriate language.)

## RECOMMENDATIONS TO THE ADMINISTRATOR, EPA

While we believe that EPA does not now have a specific legislative mandate for the quality of air in the nonworkplace under its overall authority, there are actions which it can take. We therefore recommend that the Administrator establish a task force which will:

--Identify the research activities of other Federal agencies and private institutions relating to indoor air pollution. The Administrator can then coordinate EPA's activities to maximize resources.

--Request and compile available data on indoor air pollution and use this data to inform the public of the problem and available actions. Additionally, this data can serve as a focal point for States to use when they have indoor air pollution-related problems.

--Provide advice to the Administrator on what EPA research and development efforts are needed to deal with the indoor air pollution problem.

Such efforts will aid in identifying and guiding Federal research activities, act as a clearinghouse for research data, and also serve as a focal point for assisting State and other local governments and citizens with their particular indoor air pollution problems.

## AGENCY COMMENTS AND OUR EVALUATION

DOE disagreed with our recommendation to the Congress that EPA be given responsibility for the quality of air in the nonworkplace, stating the recommendation was based on incomplete or inaccurate data. Additionally, DOE requested that if the recommendation was retained a further clarification of the role of Federal agencies was needed. Our review was based on currently available data which shows that the Clean Air Act provides EPA the responsibility for air pollution control in the outdoors and that other Federal agencies have indirect involvement in the problem. Therefore, in view of EPA's existing responsibility for outdoor air pollution and the Agency's experience in dealing with that problem, we continue to believe that it is the most logical agency to be given the responsibility and authority for the quality of air in the nonworkplace. Also, our recommendation is aimed at resolving the issue of which agency is responsible for the indoor air problems.

Amending the Clean Air Act to specifically provide EPA with the responsibility and authority over the quality of indoor air in the nonworkplace should eliminate the confusion as to which agency is responsible for this issue.

## BIBLIOGRAPHY

Asbestos Contamination of the Air in Public Buildings. EPA 68-02-1346. United States Environmental Protection Agency: Oct. 1975.

Asbestos - Sources/Effects Review. Office of Toxic Substances. United States Environmental Protection Agency: Dec. 1978.

Assessment of Airborne Radon Daughter Concentration in Dwellings in Great Britain by K.D. Cliff. Phys. Med. Biol., Vol. 23, No. 4, Feb. 1978.

Association Between Gas Cooking and Respiratory Disease by R.J. Melia, C. Florey, D.G. Altman, and A.V. Swann. British Medical Journal, July 1977.

Final Environmental Impact Study--The Residential Conservation Service Program. (DOE/EIS-0050), United States Department of Energy: Nov. 1979.

High Carbon Monoxide Levels Measured in Enclosed Skating Rinks by J.D. Spengler, K.R. Stone, and F.W. Lilley. Journal of the Air Pollution Control Association, Vol. 28 - No. 8, Aug. 1978.

Human Disease from Radon Exposures: The Impact of Energy Conservation in Buildings. (DOE W-7405-ENG-48), United States Department of Energy: Aug. 1978.

Indoor Air Pollution, Tobacco Smoke, and Public Health by J.L. Repace and A.H. Lowrey. Science. May 1980.

Indoor Air Quality by W.A. Wade III, W.A. Cole, and J.E. Yocum. Journal of the Air Pollution Control Association, Sept. 1975.

Indoor Air Quality: DOE Office of Conservation Perspective. United States Department of Energy: Mar. 1980.

Indoor-Outdoor Air Pollution Relationships: A Literature Review. United States Environmental Protection Agency: Aug. 1972.

Indoor Radiation Exposure Due to Radium-226 in Florida Phosphate Lands. (EPA 520/4-78-013), United States Environmental Protection Agency: Feb. 1979.

Indoor Radiation Exposures from Radon and its Daughters by A. Nero. Lawrence Berkeley Laboratory, University of California, Feb. 1980.

Residential Energy Conservation. Office of Technology Assessment, Vol. I, July 1979.

School Bus Carbon Monoxide Intrusion. NHTSA Technical Report (DOT HS-803 705), United States Department of Transportation: Sept. 1978.

Sulfur Dioxide and Nitrogen Levels Inside and Outside Homes and the Implications on Health Effects Research by J.D. Spengler, B.G. Ferris, Jr., D.D. Dockery, and F.E. Speizer. Environment Science and Technology, Vol. 13, Oct. 1979.

Survey of Indoor Air Health Criteria and Standards. (EPA Contract No. 68-02-2294), United States Environmental Protection Agency: Oct. 1978.

The Effects of Home Ventilation Systems on Indoor Radon - Daughter Levels. (EPA-520/5-77-011), United States Environmental Protection Agency: Oct. 1978.

The Status of Indoor Air Pollution Research 1976. Final Report (EPA-600/4-77-029), United States Environmental Protection Agency: May 1977.

Total Human Exposure to Air Pollution by J.L. Repace, W.R. Ott, and L.S. Wallace. United States Environmental Protection Agency: June 1980.

Urban Exposure to Carbon Monoxide by G. Godin, G. Wright, and R.J. Shepard. Architectural Environmental Health, Vol. 25, Nov. 1972.

APPENDIX II

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 21 1980

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Community & Economic
Development Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

The Environmental Protection Agency (EPA) has reviewed the General Accounting Office (GAO) draft report entitled "Indoor Air Pollution: A Growing Health Peril," CED 80-. In general we found the report to be both accurate and informative. We have enclosed a few technical changes which we suggest be incorporated in the final report. In addition, we suggest that the report point out more clearly that the goals of energy conservation and maintaining indoor air quality need not necessarily be in conflict. Although the report acknowledges the availability of various indoor air pollution mitigation measures, it fails to discuss the possibility of their use in conjunction with conservation measures which reduce air infiltration rates. Without this added emphasis readers may be left with the mistaken impression that the two goals are irreconcilable.

We appreciate this opportunity to comment on the draft and look forward to the publication of a final report.

Sincerely yours,

C William Crayton

William Drayton, Jr.
for Assistant Administrator for
Planning and Management

Enclosures

APPENDIX II

List Of Suggested Changes

Pg. i: In the paragraph beginning with "...Higher than average radon..." make the following (underlined) changes:

> "...Higher than average levels of radioactive radon (a decay product of radium, a natural trace element found in soil and rock) have been discovered in homes throughout the country, with the highest levels in mining areas. Prolonged exposure to radioactive radon and its decay products can lead to lung cancer."

Radium is the source of radon. It is misleading to refer to radon (a gas) in soil and rock. Radon is found in homes everywhere, not just in mineralized areas. Any exposure to radon and its decay products is assumed to carry some risk of lung cancer. The amount of risk is assumed to be proportional to the amount of exposure at levels commonly found in the environment.

Pg. ii: We question the use of the word "potential" in reference to smoking as a cause of lung cancer. The evidence implicating smoking as a causative factor in lung cancer cases is overwhelming.

Pg. iv: 1. In the second line, "could" should be replaced with "would." We believe that lessening air exchange would lead to radon build-up, and there is more than an adequate amount of research which supports this position.

2. In the third paragraph, we would point out that ventilation is not always a "low cost action" during the heating and cooling seasons.

Pg. 4: 1. The first three sentences of the first paragraph under the radon heading should read as follows:

> "Radon is a radioactive gas, produced by the decay of radium, which occurs naturally in trace amounts in most soil and rock. Sources of indoor radon include the soil under structures, and building materials such as concrete and brick which are composed of soil - and rock - derived materials. Radon can also enter the indoor air from groundwater or tapwater passing through radium-bearing rock formations."

Radium is the source of radon, continuously creating it at a rate proportional to the total amount of radium. Since soil is the primary source of indoor radon, GAO should give this factor appropriate emphasis.

2. We suggest that the second paragraph begin as follows:

> "Unless remedial measures are taken, the soil under a building, as well as the building materials, will continuously introduce radon throughout the building's life. In homes..."

Building materials are not the primary source of indoor radon. The suggested wording recognizes the importance of soil as a source of indoor radon.

3. In the third paragraph, the first sentence should be replaced with the following:

> "Exposure to radon and radon decay products increases the risk of lung cancer in proportion to the amount and duration of exposure."

Pg. 11: Under the heading "Problems Caused By A Lack Of Clear Responsibility," we suggest that the first sentence be modified as follows:

> "The lack of clearly assigned responsibility has impeded Federal actions to study indoor pollution, to develop adequate control measures, and to establish standards and guidelines, by causing..."

Pg. 12: After the clause in the first paragraph ending in "stimulated by State request or citizen complaint," we suggest the following addition:

> "For example, in 1975, the State of Florida requested that EPA investigate indoor radiation exposure in Florida phosphate lands. In July 1979, EPA published formal recommendations to the Governor. EPA is now working with the State of Florida on the implementation of those recommendations. In another example, the Governor of Montana..."

Pg. 13: EPA does not agree that any significant duplication of research has occurred in the past. However, as both DOE and EPA radon programs expand, unproductive duplication could occur in the absence of close coordination.

APPENDIX II

Pg. 15: 1. In the second paragraph under the "Energy Conservation" heading, we suggest changing the clause "by the public" to "for all United States residences." This makes it clear that the health estimate applies only if all residences are tightened up.

2. After the clause "deaths per year due to lung cancer," insert the following sentence:

> "EPA has recommended that actions to lower the air exchange rate be limited to those homes where the current number of air changes per hour is greater than one, unless measures to control indoor pollution are implemented concurrently."

Pg. 19: A "periodic" airing out of the home will do little good for pollutants, like radon, which are continuously generated. However, continuous natural ventilation, accomplished by opening the windows (at the times of the year when heating and cooling systems are not in use), is particularly effective in eliminating radon and other indoor pollutants.

APPENDIX III

**Department of Energy**
**Washington, D.C. 20585**

JUL 15 1980

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U. S. General Accounting Office (GAO)
Washington, DC 20548

Dear Mr. Peach:

We appreciate the opportunity to review and comment on the GAO draft report entitled "Indoor Air Pollution: A Growing Health Peril." The Department of Energy (DOE) believes that sound Federal programs to improve energy efficiency while maintaining or improving public health are both needed and accomplishable in the near future. DOE has been conducting research and development for this expressed purpose for the past several years. The draft GAO report consistently underplays the DOE dedication and accomplishments in this area in its discussion of current Federal activities and in justifying its recommendations.

The draft GAO report appears to accept the rationale that little has been done or is being done in the evaluation of indoor air pollutant levels in energy-efficient buildings, and that further Federal legislation is necessary to accelerate efforts in this area. It cites repeatedly the 1979 Office of Technology Assessment (OTA) report statements concerning Federal funding efforts. The OTA report concludes that Federal activity is limited to $1.0 million in ventilation and indoor air quality. The DOE funding commitment in Fiscal Year 1979 and Fiscal Year 1980 alone exceeds $4.0 million, and the total commitment in these areas will exceed $10.0 million by Fiscal Year 1985. While the draft GAO report is correct in stating that other agencies have been reducing funds in this area, it is not true in regard to DOE. DOE has been steadily increasing its commitment to ventilation and indoor air quality. These funds have supported considerable, successful research and development, as well as accelerated by three to five years the development and issuance of a currently proposed private sector standard entitled, "Ventilation Required for Minimum Acceptable Indoor Air Quality." The independent private sector organization, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc, has been setting ventilation standards for more than eighty years, and is looked to by most building code jurisdictions for leadership in setting health, safety, and comfort building standards. By allowing the voluntary consensus standard process to take place, DOE is keeping to a minimum government regulation and intervention in accordance with general Office of Management and Budget guidelines.

APPENDIX III

DOE intends to continue its support for research and development in this area at least until a second (1985/86) updating of the standards can be accomplished. As an example of its intended support, recently DOE entered into an agreement with eight countries through the International Energy Agency to further develop the technical basis of minimum ventilation rates found in several countries building standards and guidelines, and to develop economical means to design and retrofit buildings for the needed ventilation rates.

The draft GAO report recommends that the Environmental Protection Agency (EPA) should be given lead responsibility for the generic area of indoor air quality through an amendment of the Clean Air Act. Presumably, this recommendation is based partially on the review of current Federal activities. We believe this review to be incomplete or inaccurate as stated above, and request that GAO reconsider its recommendations based on more complete information. If, however, the GAO recommendations remain unchanged, then we request that substantial clarification of Federal agencies' responsibilities be included in the report.

The draft GAO report states repeatedly that EPA has estimated for the Residential Conservation Service (RCS) regulatory program implementation an increase in the annual lung cancer fatality rate by 10,000 to 20,000. This statement is incorrect or misleading in several respects, and needs clarification and expansion should it remain in the report. The EPA estimate, one which we consider highly speculative and extremely uncertain, is based on a program which reaches all of the nation's dwellings and reduces infiltration rates by 50%. The RCS program, by Congressional mandate, is not responsible for the entire residential building stock, nor is it expected to cause a 50% reduction in air infiltration rates. The EPA estimates of average annual exposure levels, the attendant health risk from low level radiation exposure, and the average infiltration rate are not yet well founded and have been based on data collected from very small and differing populations of houses and people. Most importantly however, the speculative EPA estimates and the draft GAO report do not discuss or consider the known benefits of infiltration reduction. These benefits include the avoidance of construction of tens of new power plants (each with its own environmental and health risks, as the new power plants are expected to be either coal or nuclear-powered), an improved standard of living (increased comfort, noise reduction, and the use of formally drafty rooms), reduced structural damage to the building shell, and finally the saving of vast amounts of our energy resources and an attendant increased national independence from foreign oil sources. The draft GAO report fails to recognize these substantial benefits which may in fact be accomplished without any increased health risk if the DOE research and development programs prove to be continually successful. We are working on methods by which air infiltration can be greatly reduced and ventilation air provided mechanically at little energy or economic penalty. If these efforts are successful, and preliminary indications are very encouraging, then both residential energy efficiency and public health will actually be improved.

APPENDIX III

By its mandate DOE will continue to assess the environmental effects of its energy programs. It is largely due to the DOE research and development efforts that this potential problem has reached public and Federal attention. The draft GAO report states that there is a need to inform the public on indoor air quality. At DOE's urging, an interagency task force of Federal agencies and private industry was formed to address the potential environmental impact of urea-formaldehyde insulation; this task force later expanded its mandate to address the entire question of energy conservation and indoor air quality and has drafted a consensus whitepaper on the subject. For the general public, DOE has discussed for four years with several newspapers and magazines the subject of energy conservation and indoor air quality; in the same time period DOE national laboratories and contractors have published more than twenty-five technical articles in referred journals. As a result of its research and development efforts, in the near future DOE will publish for the consumer a booklet on tightening the home including information on indoor air quality issues and control methods. No other Federal agency has made similar commitments or progress. The draft GAO report ignores these achievements in trying to justify its conclusions and recommendations.

Comments of an editorial and detailed nature have been provided directly to members of your staff. We appreciate the opportunity to comment on this draft report and trust you will consider our comments in preparing the final report.

Sincerely,

for Jack E. Hobbs

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

ASSISTANT SECRETARY FOR
POLICY DEVELOPMENT AND RESEARCH

IN REPLY REFER TO:

JUL 11 1980

Mr. Henry Eschwege
Director, Community and
Economic Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

Thank you for the opportunity to review the draft of a proposed report titled, "Indoor Air Pollution: A growing Health Peril". Consistent with the long-standing national goal of "a decent home and a suitable living environment for every American family" set forth in the Housing Act of 1949 and subsequent relevant legislation, the subject of residential indoor air quality is of concern to us.

We already participated in research related to this field. An example of our interagency work is the 1976 joint study with the Environmental Protection Agency which we believe contributed significantly to the earlier studies in this field.

Although your report does not contain specific recommendations for the Department of Housing and Urban Development, we believe the subject to be sufficiently important to warrant our continued liaison with other involved agencies and to conduct such specific studies deemed necessary to carry out the Department's programs.

Sincerely yours,

Donna E. Shalala

(089080)



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