



Project Summary

A Summary of Indoor Air Quality Research Through 1984

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This report reviews indoor air quality research from 1980 through December 1984. It is also a compilation of two documents that review relevant literature on the subject and summarize the efforts of leading research scientists. The first effort involved: (1) a review of journal articles, symposium presentations, and bibliographic reports from 1980 through 1983; (2) a list of contacts with approximately 30 prominent researchers in the indoor air quality field; and (3) a list of significant articles that appeared prior to 1980. The second effort updated the initial literature review to January 1985. Again articles, symposium proceedings, and reports were screened in developing the update report.

The vast majority of the material found in the two reports, "Review of Recent Research in Indoor Air Quality" (EPA/600/2-84/099) and "Update of Indoor Air Quality Bibliography" (draft), has been retained in this document. This report integrates the material from the two reports, following the organization of the earlier.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Indoor air quality is recognized as a significant factor affecting the well-being of the average American. In recent years, energy conservation practices such as weatherizing buildings and the greater

use of unvented combustion (heating) devices have apparently increased indoor concentrations of hazardous air pollutants. Thus, the identification and evaluation of sources of indoor air pollution and their control have increasingly received attention from numerous Federal and State agencies concerned with health and environmental protection.

The objective of this report is to summarize indoor air quality research for the period 1980-1984. This was done by contacting prominent researchers in the field, summarizing their efforts and capabilities, and by reviewing published articles and reports. The report is intended to assist the indoor air quality research community in assessing the content and quality of its recent research efforts, to highlight milestone indoor air quality studies or symposia, and to identify research facilities available to the user community. This information should serve to enhance coordination of government and private research efforts.

Two separate efforts were made to review relevant literature and publications. From October 1983 through February 1984, an annotated bibliography was developed, prominent researchers in the field were interviewed, and earlier citations (important to the indoor air quality field) were listed. Then, in early 1985, the bibliographic review period was extended from October 1983 to January 1985. Both reviews are in Section 4 of the full report and are consistent in organization, using a common outline.

Results and Conclusions

The attempt to define the state-of-the-art in indoor air pollution research used two approaches: a review of recent

literature, and telephone contacts to prominent investigators. The literature review covers several sources including searches of computer files, the citation lists in the NAS *Indoor Pollutants* document, in *Indoor Air Pollution* by Wadden and Scheff, and in review articles such as "Indoor Air Pollution: A Public Health Perspective" by Spengler and Sexton (1983), and in the 1984 Stockholm International Symposium on Indoor Air Pollution. Manual searches of several journals that frequently publish indoor air quality research provided articles current through December 1983. Primary emphasis was placed on peer-reviewed journal articles rather than government reports of symposium presentations. Roughly 30 prominent investigating laboratories were contacted to assess the extent of on-going research in indoor air quality. Specific inquiries as to the nature of the work, the measurements performed, funding levels, sponsor, and special facilities provided an up-to-date inventory.

The review of literature covering the period 1980-1983 and the telephone survey of prominent investigators indicated that the greatest share of indoor air quality research was directed toward the characterization and measurement of a limited number of indoor pollutants. Within this area many studies sought to establish an average concentration level of a pollutant or the relationship of indoor concentrations to outdoor pollutant levels.

A small, but significant, body of research provided preliminary information on source types and emissions. Emphasis was directed toward the characterization of sources of formaldehyde and home combustion sources.

Control and mitigation of indoor air quality problems generally emphasized the use of ventilation techniques.

Mathematical modeling of indoor air concentrations has been attempted: the results indicate some success based on comparisons with pollutant monitoring results.

As with the initial bibliography, articles from October 1983 through December 1984 dealing with the characterization and measurement of indoor air pollutants dominate the literature. Radon and radon daughters have continued to be an important indoor air quality problem receiving attention. Combustion sources and gaseous pollutants are well represented in the bibliography. In the area of "Control Methods," ventilation studies dominate, although air purification studies are also included. A growing body

of information is found on the relationship between indoor air pollutants and health. Smoking is by far the single biggest concern, and the whole field of indoor exposure is receiving increased attention.

The modeling of indoor air quality is becoming more sophisticated as scientists and engineers give it increased attention. Recent articles have provided more complex and comprehensive models for assessing indoor air quality.

Several other trends may be seen from this bibliographic update. Some attention has been given to developing emission rate data. Increasingly, studies are looking at the total exposure of individuals to both indoor and outdoor pollutants. Regulatory agencies have only begun to address the problems and potential impacts of indoor pollutants.

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The complete report, entitled "A Summary of Indoor Air Quality Research Through 1984," (Order No. PB 87-234332/AS; Cost: \$24.95, subject to change) will be available only from:

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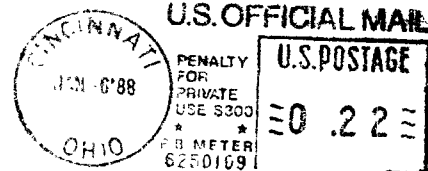
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