



Design and Protocol for Monitoring Indoor Air Quality

Nagda/Harper, editors



STP 1002

STP 1002

Design and Protocol for Monitoring Indoor Air Quality

N. L. Nagda and J. P. Harper, editors



ASTM
1916 Race Street
Philadelphia, PA 19103

Library of Congress Cataloging-in-Publication Data

Design and protocol for monitoring indoor air quality / N. L. Nagda and J. P. Harper, editors.
(STP; 1002)

Papers presented at the Symposium on Design and Protocol for Monitoring Indoor Air Quality, held in Cincinnati, Ohio, April 26-29, 1987 and sponsored by the ASTM Committee D-22 on Sampling and Analysis of Atmospheres in cooperation with the Air Pollution Control Association and the American Industrial Hygiene Association.

"ASTM publication code number (PCN):04-010020-17."

Includes bibliographies and index.

ISBN 0-8031-1176-2

1. Air—Pollution, Indoor—Measurement—Congresses. 2. Air quality—Measurement—Congresses. I. Nagda, Niren Laxmichand, 1946- . II. Harper, Jerome P. III. Symposium on Design and Protocol for Monitoring Indoor Air Quality (1987: Cincinnati, Ohio) IV. ASTM Committee D-22 on Sampling and Analysis of Atmospheres. V. Air Pollution Control Association. VI. American Industrial Hygiene Association. VII. Series: ASTM special technical publication; 1002.

TD890.D46 1989

628.5'3—dc19

88-37486

CIP

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1991, 1989

NOTE

The Society is not responsible, as a body,
for the statements and opinions
advanced in this publication.

Peer Review Policy

Each paper published in this volume was evaluated by three peer reviewers. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM.

Foreword

This publication, *Design and Protocol for Monitoring Indoor Air Quality*, contains papers presented at the Symposium on Design and Protocol for Monitoring Indoor Air Quality, which was held in Cincinnati, Ohio, 26–29 April 1987. The symposium was sponsored by ASTM Committee D-22 on Sampling and Analysis of Atmospheres in cooperation with the Air Pollution Control Association and the American Industrial Hygiene Association. Niren L. Nagda was the symposium chairman and Jerome P. Harper and James E. Woods presided as symposium co-chairmen. Drs. Nagda and Harper have edited this publication.

Contents

Overview	1
-----------------	---

COMMERCIAL AND OFFICE BUILDINGS

Comparison of Effects of Ventilation, Filtration, and Outdoor Air on Indoor Air at Telephone Office Buildings: A Case Study—C. J. WESCHLER, H. C. SHIELDS, S. P. KELTY, L. A. PSOTA-KELTY, AND J. D. SINCLAIR	9
Investigation of a Washington, D.C. Office Building—A. K. PERSILY, W. A. TURNER, H. A. BURGE, AND R. A. GROT	35
Factors That May Affect the Results of Indoor Air Quality Studies in Large Office Buildings—O. SEPPANEN AND J. JAAKKOLA	51
The NIOSH Approach to Conducting Indoor Air Quality Investigations in Office Buildings—R. W. GORMAN AND K. M. WALLINGFORD	63
Project and Problem Definition in Building Air Quality Investigations—P. F. ALLARD	73
Indoor Air Quality Diagnostics: Qualitative and Quantitative Procedures to Improve Environmental Conditions—J. E. WOODS, P. R. MOREY, AND D. R. RASK	80
Discussion	98
Indoor Air Quality and Ventilation Measurements in Energy-Efficient California State Office Buildings—H. LEVIN AND T. J. PHILLIPS	99
Workshop: Data Collection Aspects of Building Investigations—W. A. TURNER, H. A. BURGE, AND A. K. PERSILY	111

RESIDENTIAL BUILDINGS

Case Study: Multipollutant Indoor Air Quality Study of 300 Homes in Kingston/Harriman, Tennessee—A. R. HAWTHORNE, C. S. DUDNEY, R. L. TYNDALL, T. VO-DINH, M. A. COHEN, J. D. SPENGLER, AND J. P. HARPER	129
---	-----

Experimental Design and Protocols for Research at GEOMET's Test Houses: A Case Study—M. D. KOONTZ AND N. L. NAGDA	148
Discussion	163
Selected Protocols for Conducting Field Surveys of Residential Indoor Air Pollution Due to Combustion-Related Sources—G. W. TRAYNOR	166
Discussion	177
Design of a Total Human Environmental Exposure Study (THEES) for Benzo(a)pyrene in New Jersey: The Microenvironmental Survey—R. HARKOV, J. WALDMAN, P. J. LIOY, A. GREENBERG, AND F. DARACK	178
Discussion	184
Prediction of Long-Term Exposure to Indoor Air Pollutants Using Short-Term Measurements—J. H. WHITE	185
Workshop: Designing Indoor Air Quality Survey Studies—M. KOLLANDER, R. WHITMORE, L. WALLACE, AND F. C. BRENNER	198
Workshop: Development of Questionnaires and Survey Instruments—M. D. LEBOWITZ, J. J. QUACKENBOSS, M. L. SOCZEK, S. D. COLOME, AND P. J. LIOY	203
INSTRUMENTATION AND METHODS	
Workshop: Instrumentation and Methods for Measurement of Indoor Air Quality and Related Factors—R. G. LEWIS AND L. WALLACE	219
Real-Time On-Line Chromatographic Determination of Volatile Organic Emissions—C. W. BAYER AND M. S. BLACK	234
Application of a Multisorbent Sampling Technique for Investigations of Volatile Organic Compounds in Buildings—A. T. HODGSON AND J. R. GIRMAN	244
A Computer-Controlled System for Measuring Ventilation Rates of Buildings Using Sulfur Hexafluoride as a Tracer Gas—L. E. ALEVANTIS	257
A Tracer Gas Decay System for Monitoring Air Infiltration and Air Movement in Large Single Cell Buildings—J. R. WATERS, G. V. LAWRENCE, AND N. JONES	266
A Multiple Tracer System for Real-Time Measurement of Interzonal Airflows in Residences—R. C. FORTMANN, H. E. RECTOR, AND N. L. NAGDA	287
Author Index	299
Subject Index	301

ISBN 0-8031-1176-2