



ANSI/AIHA Z9.10-2010

# Fundamentals Governing the Design and Operation of Dilution Ventilation Systems in Industrial Occupancies

*A Publication by  
American Industrial Hygiene Association*



BY THE ANSI/AIHA Z9.10 Subcommittee



**ANSI/AIHA® Z9.10–2010**

**American National Standard —  
Fundamentals Governing the Design  
and Operation of Dilution Ventilation  
Systems in Industrial Occupancies**

Secretariat

**American Industrial Hygiene Association®**

Approved: November 16, 2010

**American National Standards Institute, Inc.**

## American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standard's developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objection be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the Standards, or not, from manufacturing, marketing, purchasing, or using products, processors, or procedures not conforming to the Standards.

The American national Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

**CAUTION NOTICE:** This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this Standard no later than five years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by  
**American Industrial Hygiene Association®**  
2700 Prosperity Ave., Suite 250  
Fairfax, VA 22031  
www.aiha.org

Copyright © 2008 by the American Industrial Hygiene Association®  
All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Printed in the United States of America.

Stock No: IVEA10-739  
ISBN: 978-935082-23-1

## Contents

	Page
Foreword .....	iii
1. Scope .....	1
2. Referenced Standards and Publications .....	2
3. Definitions .....	2
4. General Requirements .....	7
5. Plant Layout.....	12
6. HVAC System Equipment.....	14
7. Dilution Air .....	19
8. Operations and Maintenance .....	25
9. Inspection, Monitoring, Testing, Balancing, and Operational Checks .....	27
10. Management of Dilution HVAC Systems .....	30
Appendix A — Supplementary Information .....	33
Appendix B — Audit Form .....	39

This is a preview of "ANSI/AIHA/ASSE Z9.10...". [Click here to purchase the full version from the ANSI store.](#)

**FOREWORD** (This foreword is not part of the American National Standard/AIHA Z9.10–2010)

This standard describes fundamental good practices related to the commissioning, design, selection, installation, operation, maintenance, and testing of dilution ventilation (DV) or general exhaust ventilation (GEV) systems used for the control of employee exposure to airborne contaminants.

It is intended for use by individuals who have involvement in the design, installation, operation and maintenance of DV/GEV system; such individuals may include owners, employers, industrial hygienists, facility engineers, maintenance personnel, testing and balancing personnel, ventilation system designers, and other with responsibility for such systems.

It is thought to be compatible with related and recognized and standards of good practice.

The standard is presented in a two column format. The left column presents the requirements of the standard; the right column provides clarification and explanation of the requirements plus “*how to comply*” information. The Appendix provides supplementary information by Standard section number. The letter "(A)" at the end of a section or paragraph designates an Appendix entry for that section or paragraph.

Standard requirements should be considered minimum criteria and can be adapted to the needs of the User establishment. Demonstrably equal or better approaches are acceptable. When deviating from the Standard, documentation should be provided. The Standard is auditable by those trained in local exhaust ventilation. An Audit Form is provided in the Appendix.

*Overlap.* For Sections to be mutually exclusive and to stand alone, similar requirements may be stated in more than one section of the Standard.

*Flexibility.* Requirements are minimum criteria and can be adapted to the needs of the User. Demonstrably equal or better approaches are acceptable.

Where standard provisions are in conflict with other standards and codes, the more stringent should be applied. Where the User deviates from the Standard's requirements, the User should document justification for the deviation.

*Auditing.* The Standard is auditable. An Audit Form is provided in the Appendix.

Suggestions for improvement of this standard are welcome. The Committee will carefully consider all comments and suggestions. Comments should be sent to Attn: Scientific and Technical Initiatives, AIHA®, 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031.

The Z9 Accredited Standards Committee on Health and Safety Standards for Ventilation Systems prepared, processed, and approved this Standard for submittal to ANSI. Committee approval of the Standard does not necessarily imply unanimity among all members of the Committee. At the time of approval, the Z9 Committee had the following members:

J. Price, CIH, CSP, PE, Chair  
T. Knutson, PE, Vice Chair  
Mili Mavely, Secretariat Representative

***Organization Represented***

Alliance of American Insurers  
American Chemical Society  
American Conference of Governmental Industrial Hygienists  
American Foundrymen's Society  
American Society of Heating, Refrigerating, and Air Conditioning Engineers  
American Society of Safety Engineers  
Massachusetts Institute of Technology  
National Association of Metal Finishers  
National Spray Equipment Manufacturers Association  
U.S. Department of Labor Occupational Safety and Health Administration

***Name of Representative***

S. Ecoff  
D. Walters  
G. Knutson  
R. Scholz  
T.C. Smith  
P. Osley  
L.J. DiBerardinis  
K.C. Hankinson  
D.R. Scarborough  
I. Wainless

***Individual Members***

D. Blackburn  
D.J. Burton  
S. Crooks  
C. Figueroa  
S.J. Gunsel  
L. Hathon  
T. Knutson  
N. McManus  
D. O'Brien  
K. Paulson  
E. Pomer  
J.M. Price  
J.C. Rock  
M. Rollins  
J.W. Sheehy

The list of Z9.10 subcommittee members include:

D. Jeff Burton, Chair  
Lou Diberardinis  
Crescente E. Figueroa  
Lee Hathon  
Jeffrey B. Hicks  
Gerhard Knutson  
Theodore Knutson  
Rodney R. Larsen  
Dennis O'Brien  
Monte Robinson

## American National Standard — Fundamentals Governing the Design and Operation of Dilution Ventilation Systems in Industrial Occupancies

### Requirements of the Standard

#### 1. Scope

1.1 Scope. This Standard establishes minimum requirements for the commissioning, design, specification, construction, installation, management, operation, maintenance, and testing of dilution ventilation systems (including demand dilution ventilation) used for the reduction, prevention, and control of employee exposure to harmful airborne substances in the industrial environment. The Standard establishes minimum requirements to provide safe and healthful working conditions in industrial employee occupancies.

1.2 Exclusions. The Standard does not cover:

- o ventilation used exclusively for comfort
- o HVAC and dilution ventilation systems used in non-industrial employee occupancies
- o ventilation of laboratories
- o LEV systems
- o displacement ventilation systems

1.3 Conflicts with other Standards and Codes.

Where Standard provisions may be in conflict with building codes or other recognized standards, the more stringent should be applied.

### Explanatory Materials

#### 1. Scope

1.1 Properly operating dilution ventilation systems are used to maintain acceptable air quality in the industrial occupational work environment through dilution and removal of air contaminants.

The standard also applies to supply and makeup air systems where the makeup air is used for dilution.

The standard also applies to supplied-air islands and similar ventilation systems where the supply air is also used for dilution.

Employee comfort is a secondary factor in the standard.

1.2 Exclusions.

LEV systems are covered in ANSI/AIHA® Z9.2–2006. Lab ventilation systems are covered in ANSI/AIHA® Z9.5–2003.

HVAC and dilution ventilation systems for non-industrial employee occupancies are covered in current versions of other standards and guidelines, e.g., ASHRAE 62 and the AIHA® guideline, *Recommendations for the Management, Operation, Testing, and Maintenance of HVAC Systems*.