

Please note the American Society of Safety Engineers (ASSE) is now the Secretariat of the Z9 ASC and holds the copyright to this standard.



American Society of Safety Engineers  
[www.asse.org](http://www.asse.org)



ANSI/AIHA Z9.4-2011

# Abrasive-Blasting Operations— Ventilation and Safe Practices for Fixed Location Enclosures

*A Publication by  
American Industrial Hygiene Association*



BY THE ANSI/AIHA Z9.4 SUBCOMMITTEE



Please note the American Society of Safety Engineers (ASSE) is now the Secretariat of the Z9 ASC and holds the copyright to this standard.

American Society of Safety Engineers  
www.asse.org

ANSI/AIHA® Z9.4–2011

# American National Standard — Abrasive-Blasting Operations — Ventilation and Safe Practices for Fixed Location Enclosures

Secretariat

**American Industrial Hygiene Association**

Approved: April 15, 2011

**American National Standards Institute, Inc.**

## American National Standard

Approval of an American National Standard requires verification by ANSI that the requirement 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**CAUTION NOTICE:** This American National Standard may be revised or withdrawn at any time.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](http://www.aiha.org)

Copyright © 2011 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: IVEA11-770  
ISBN: 978-1-935082-29-3

**FOREWORD** (This foreword is not part of ANSI/AIHA® Z9.4–2011)

This standard was processed and approved for submittal to ANSI by the Z9 Accredited Standards Committee on Health and Safety Standards for Ventilation Systems. Committee approval of the Standard does not necessarily imply that all committee members voted for its approval. At the time it approved this Standard, the Z9 Committee had the following members:

T. C. Smith, Chair  
T. Knutson, PE, Vice Chair  
Mili Mavely, Secretariat Representative

| <i>Organization Represented</i>  | <i>Name of Representative</i> |
|--|-------------------------------|
| Alliance of American Insurers  | S. Ecoff                      |
| American Chemical Society  | D. Walters                    |
| American Conference of Governmental Industrial Hygienists                  | G. Knutson                    |
| American Foundrymen's Society  | R. Scholz                     |
| American Society of Heating, Refrigerating, and Air Conditioning Engineers | T.C. Smith                    |
| American Society of Safety Engineers                                       | P. Osley                      |
| Massachusetts Institute of Technology                                      | L.J. DiBerardinis             |
| National Association of Metal Finishers                                    | K.C. Hankinson                |
| National Spray Equipment Manufacturers Association                         | D.R. Scarborough              |
| U.S. Department of Labor Occupational Safety and Health Administration     | I. Wainless                   |

*Individual Members*

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

Subcommittee Z9.4 on Exhaust Systems: Abrasive-Blasting Operations – Ventilation and Safe Practices for Fixed Location Enclosures, which developed this standard, had the following members:

Kathleen Paulson, Chair  
Crescente Figueroa  
John Llibre  
Mark Rollins  
Michael Marthens  
Ellen Pomer

## Contents

|  | Page |
|--|------|
| 1. Scope and Purpose.....  | 1    |
| 1.1 General.....   | 1    |
| 1.2 Selection of Abrasive and Equipment .....                                  | 1    |
| 2. Referenced Standards and Publications.....                                  | 2    |
| 2.1 General.....   | 2    |
| 2.2 American National Standards.....   | 2    |
| 2.3 Occupational Safety and Health Administration Standards and Guidance ..... | 3    |
| 2.4 Other Publications .....   | 3    |
| 3. Definitions.....  | 5    |
| 4. Dust Hazards from Abrasive Blasting .....                                   | 8    |
| 4.1 Dust Sources and Hazards .....   | 9    |
| 4.2 Types of Abrasives .....   | 9    |
| 4.3 Types of Coatings.....   | 10   |
| 4.4 Wet Abrasive Blasting.....   | 10   |
| 4.5 Carbon Dioxide Pellet Blasting .....                                       | 10   |
| 4.6 Concentration of Contaminants.....   | 11   |
| 4.7 Use of Combustible Abrasives .....   | 11   |
| 5. Blasting Enclosures.....  | 13   |
| 5.1 Construction .....   | 13   |
| 5.2 Exhaust Ventilation .....  | 13   |
| 5.3 Make-up Air .....  | 13   |
| 5.4 Booth Operations .....   | 13   |
| 5.5 Observation Window .....   | 13   |
| 5.6 Access Openings .....  | 14   |
| 5.7 Blasting Cabinet Gloves.....   | 14   |
| 5.8 Nozzle .....   | 14   |
| 5.9 Grounding .....  | 14   |
| 6. Exhaust Ventilation Systems.....  | 14   |
| 6.1 Exhaust Systems Principles.....  | 15   |
| 6.2 Abrasive Separator.....  | 16   |
| 6.3 Dust-Collecting Equipment.....   | 16   |
| 6.4 Disposal of Waste.....   | 17   |
| 7. Personal Protective Equipment .....   | 18   |
| 7.1 Respiratory Protection Program .....                                       | 18   |
| 7.2 Personal Protective Clothing and Shoes.....                                | 19   |
| 7.3 Eye Protection .....   | 20   |
| 7.4 Hearing Protection.....  | 20   |
| 8 Air Supply and Air Compressors (Breathing Air Supply) .....                  | 20   |
| 9 Operational Procedures and General Safety .....                              | 21   |
| 9.1 Housekeeping.....  | 21   |
| 9.2 Pressurized Tanks for Abrasive Supply .....                                | 21   |
| 9.3 Nozzles.....   | 21   |
| 9.4 Cold Weather Tempered Air .....  | 22   |
| 9.5 Design Specifications for Pressure Vessels Used in Abrasive Blasting ..... | 22   |
| Appendix A: Exhaust Rates, Air Velocities, and Ventilation.....                | 23   |
| Appendix B: Audit Form.....  | 26   |

## American National Standard for Exhaust Systems — Abrasive-Blasting Operations – Ventilation and Safe Practices for Fixed Location Enclosures

### 1. Scope and Purpose

- 1.1 General.** This standard applies to all operations in fixed location abrasive-blast enclosures in which an abrasive forcibly comes in contact with a surface by pneumatic or hydraulic pressure or by centrifugal force. It does not apply to steam blasting, steam cleaning, or hydraulic cleaning methods in which work is done without the aid of abrasives. It also does not apply to abrasive blasting conducted outdoors (e.g., bridges, water towers) even though temporary enclosures may be built at such locations.

The final criterion for the designed equipment's performance and operation will preclude any accident, health hazards, or violation of governmental regulations. The exhaust ventilation must:

- keep the escape of dust from the enclosure to a minimum;
  - maintain a reasonable visibility in blast-cleaning rooms and cabinets, and
  - provide for rapid clearance of the dust-laden air within the enclosure after the cessation of blasting to permit the enclosure to be opened.
- 1.2 Selection of Abrasive and Equipment.** Prohibit the use of silica sand as an abrasive-blasting agent.

### 1. Scope and Purpose

- 1.1 General.** The rules and principles established in this standard are intended to protect employees engaged or working in the vicinity of abrasive blasting in fixed location enclosures from: 1) significant risk of health impairment; and 2) physical injury due to explosions, high velocity jets of abrasive-blasting particles, or moving equipment involved in abrasive blasting.

### 1.2 Selection of Abrasive and Equipment.

Each type of abrasive and equipment has its particular advantages in producing the quality of work desired, and the selection depends on the specific requirements of the user. From a health standpoint silica sand is currently the most hazardous abrasive commonly used. Therefore, with the single exception of prohibiting the use of silica sand as an abrasive-blasting agent, no rule or