ANSI/ASSP Z9.4-2011 (R2021)

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

AMERICAN SOCIETY OF SAFETY PROFESSIONALS

Approved American National Standard
ANSI

ANSI/ASSP Z9.4 – 2011 (R2021)

American National Standard

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

Secretariat

American Society of Safety Professionals
520 N. Northwest Highway
Park Ridge, Illinois 60068

Approved March 16, 2021

American National Standards Institute

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 standards 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 objections 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 they have approved the standards or not, from manufacturing, marketing, purchasing or using products, processes or procedures not conforming to the standards. The American National Standards Institute does not develop standards and will in no circumstance 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 interpretation 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Caution Notice: This American National Standard may be revised or withdrawn at any time.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 periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published April 2021 by:

American Society of Safety Professionals
520 N. Northwest Highway
Park Ridge, Illinois 60068
(847) 699-2929 • www.assp.org

Printed in the United States of America

Foreword

(This Foreword is not a part of American National Standard Z9.4 – 2011 (R2021).)

This standard, national in scope, was developed by the Z9 standards committee functioning under the procedures of the American National Standards Institute, with the American Society of Safety Professionals (ASSP) as secretariat.

Normative Requirements: This standard uses the single-column format. The normative requirements appear aligned to the left margin. To meet the requirements of this standard, users must conform to these normative requirements. These requirements typically use the verb "shall".

> *NOTE: The informative or explanatory note in this standard appears indented, in italics, in a reduced font, in an effort to provide a visual signal to the reader that this is an informative note, not normative text, and is not to be considered part of the requirements of this standard; this text is advisory in nature only. The suppliers and users are not required to conform to the informative note. The informative note is presented in this manner in an attempt to enhance readability and to provide explanation or guidance to the sections they follow.*

Suggestions for Improvements: Suggestions for improvements to this standard are welcome. They should be sent to American Society of Safety Professionals (ASSP), 520 N. Northwest Highway, Park Ridge, IL 60068 Attention: Z9 Secretariat.

Revisions: The Z9 Committee welcomes proposals for revisions to this standard. Revisions are made to the standard periodically (usually five years from the date of the standard) to incorporate changes that appear necessary or desirable, as demonstrated by experience gained from the application of the standard. Proposals should be as specific as possible, citing the relevant section number(s), the proposed wording and the reason for the proposal. Pertinent documentation would enable the Z9 Committee to process the changes in a timely manner.

Interpretations: Upon a request in writing to the Secretariat, the Z9 Committee will render an interpretation of any requirement of the standard. The request for interpretation should be clear, citing the relevant section number(s) and phrased as a request for a clarification of a specific requirement. Oral interpretations are not provided.

Only the Z9 Committee (through the Z9 Secretariat) is authorized to provide any interpretation of this standard.

Approval: Neither the Z9 Committee nor the American National Standards Institute (ANSI) approves, certifies, rates or endorses any item, construction, proprietary device or activity.

Committee Meetings: Persons wishing to attend a meeting or join the committee should contact the Secretariat for information.

Standard Approval: This standard was developed and approved for submittal to ANSI by the Z9 Secretariat. Committee approval of the standard does not necessarily imply (nor is it required) that all members voted for its approval. At the time this standard was approved, the Z9 Committee had the following members:

Geoffrey Raifsnider, P.E., Chair
Terry Ketchum, Vice-Chair
Lauren Bauerschmidt, MS Eng, CSP, STS, Secretary
Timothy R. Fisher, CSP, CHMM, CPEA, CAE, ARM, STS, Assistant Secretary
Jennie Dalesandro, Administrative Technical Support

Organization Represented	**Name of Representative**
AIHA	Lou DiBerardinis, CIH, CSP
	Brian Spears
American Foundry Society	Robert Scholz
	Thomas Slavin, CIH, CSP, CSHM, CPEA
American Society of Safety Professionals	Paul Osley, P.E., CSP, CIH, CHMM
	Jeffrey Nesbitt, CIH, CSP
ASHRAE	Thomas Smith
AstraZeneca	Victor D'Amato
	Matthew Thomas
Burton, D. Jeff	D. Jeff Burton, P.E.
Covestro LLC	Terry Ketchum
Figueroa, Crescente	Crescente Figueroa, Ph.D., CIH
Global Finishing Solutions	Geoffrey Raifsnider, P.E.
	Brian Schadrie, P.E.
Job Safety Associates, LLC	Peter Engelbert, CIH, CSP, CHST, CET
Knutson Ventilation Inc.	Theodore Knutson, MS, P.E.
	Gerhard Knutson, Ph.D., CIH
National Association for Surface Finishing	Kyle Hankinson
	Kenneth Hankinson
National Institutes of Health	Farhad Memarzadeh, Ph.D., P.E.
NorthWest Occupational Health & Safety	Neil McManus, DSc, CIH, ROH, CSP
Price, John	John (Jack) Price
Robson Forensic, Inc.	Ronald Schaible, CSP, CIH
Rutgers University	Alejandro Ruiz, CIH, CSP, CHMM, CET, SMS
Saint-Gobain Abrasives Inc.	Holly Colt
Sherwin-Williams Company	Brian Haynack
	Jay Dick
Thermo Fisher Scientific	Daniel Kallin

Observers and Non-Voting Members

U.S. Department of Labor - OSHA	James Nelson, P.E.

Subgroup Z9.4 had the following members:

Geoffrey Raifsnider, P.E., Chair
Peter Engelbert, CIH, CSP, CHST, CET, Vice-Chair
Holly Colt
Charlie McCray

Contents

1. Scope and Purpose 9
1.1 General 9
1.2 Selection of Abrasive and Equipment 9
2. Referenced Standards and Publications 10
2.1 General 10
2.2 American National Standards 10
2.3 Occupational Safety and Health Administration Standards and Guidance 10
2.4 Other Publications 11
3. Definitions 11
4. Dust Hazards from Abrasive Blasting 13
4.1 Dust Sources and Hazards 14
4.2 Types of Abrasives 14
4.3 Types of Coatings 14
4.4 Wet Abrasive Blasting 15
4.5 Carbon Dioxide Pellet Blasting 15
4.6 Concentration of Contaminants 15
4.7 Use of Combustible Abrasives 16
5. Blasting Enclosures 16
5.1 Construction 17
5.2 Exhaust Ventilation 17
5.3 Makeup Air 17
5.4 Booth Operations 17
5.5 Observation Window 17
5.6 Access Openings 17
5.7 Blasting Cabinet Gloves 17
5.8 Nozzle 17
5.9 Grounding 18
6. Exhaust Ventilation Systems 18
6.1 Exhaust Systems Principles 18
6.2 Abrasive Separator 19
6.3 Dust-Collecting Equipment 19
6.4 Waste Disposal 20
7. Personal Protective Equipment 20
7.1 Respiratory Protection Program 20
7.2 Personal Protective Clothing and Shoes 21

7.3 Eye Protection 22
7.4 Hearing Protection 22
8. Air Supply and Air Compressors (Breathing Air Supply) 22
9. Operational Procedures and General Safety 22
9.1 Housekeeping 22
9.2 Pressurized Tanks for Abrasive Supply 23
9.3 Nozzles 23
9.4 Cold Weather Tempered Air 23
9.5 Design Specifications for Pressure Vessels Used in Abrasive Blasting 23
Appendices 24
Appendix A – Exhausts Rates, Air Velocities and Ventilation 24
Appendix B – Audit Form 26

AMERICAN NATIONAL STANDARD Z9.4 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.

> *NOTE: 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

Prohibit the use of silica sand as an abrasive-blasting agent.

> *NOTE: 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 suggestion is given in this standard for the selection of a particular abrasive or equipment.*
>
> *If properly designed equipment is operated and maintained in accordance with the manufacturer's recommendations, all types of abrasives and equipment can be used safely; however, the health hazards of silica sand to abrasive-blasting operators is sufficiently severe to prohibit its use, since feasible alternative abrasives are available. Abrasives that create minimum hazards should be used whenever feasible.*
>
> *The presence of silica sand or crystalline silica as a contaminant on or a component of the object being subjected to abrasive blasting (e.g., mold sand adhering to a casting, stone with crystalline silica content) is not prohibited by this standard. Reasonable efforts should be made to minimize the amount of silica sand contamination on the work, however.*