NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.
Contact ASTM International (www.astm.org) for the latest information

Designation: E1132 – 13

StandardPractice for Health Requirements Relating to Occupational Exposure to Respirable Crystalline Silica[1]

This standard is issued under the fixed designation E1132; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Silicon dioxide (silica, SiO_2) is encountered in nature and industry in a wide variety of forms. These range from essentially anhydrous types with or without a very high degree of crystallinity, to highly hydroxylated or hydrated types which are amorphous by x-ray diffraction examination. Crystalline silica[2] exists in a number of forms or polymorphs. The three major forms, quartz, cristobalite, and tridymite, pertain to this practice. Quartz (or alpha quartz) is the more common form encountered as airborne particulates. Two of the polymorphs, cristobalite and tridymite, are formed at elevated temperatures and are much less common in nature, but might be encountered in several occupations where silicas are fired (calcined) at high temperatures.[3] These silica materials have a broad range of physical and chemical properties.

1. Scope

1.1 This practice covers a description of several actions that should be taken to reduce the risk of harmful occupational exposures to humans in environments containing respirable crystalline silica. This practice is intended for, but not limited to, industries regulated by the U.S. Mine Safety and Health Administration (MSHA) and the U.S. Occupational Safety and Health Administration (OSHA). A separate practice, designed for the unique conditions of the construction industry has been designated Practice E2625.

1.2 Nothing in this practice shall be interpreted as requiring any action that violates any statute or requirement of any federal, state, or other regulatory agency.

1.3 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. It is the responsibility of the user to consult all material safety data sheets and labels pertaining to any hazardous materials used in this standard.*

2. Referenced Documents

2.1 *ASTM Standards:*[4]

D4532 Test Method for Respirable Dust in Workplace Atmospheres Using Cyclone Samplers

E2625 Practice for Controlling Occupational Exposure to Respirable Crystalline Silica for Construction and Demolition Activities

2.2 *ANSI Standards:*[5]

ANSI/AIHA Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Systems

ANSI Z9.7

Z88.2 American National Standard Practice for Respiratory Protection

[1] This practice is under the jurisdiction of ASTM Committee E34 on Occupational Health and Safetyand is the direct responsibility of Subcommittee E34.16 on Silicas.

Current edition approved July 1, 2013. Published July 2013. Originally approved in 1999. Last previous edition approved in 2006 as E1132 - 06. DOI: 10.1520/E1132-13.

[2] Smith, Deane K., Opal, cristobalite, and tridymite: Noncrystallinity versus crystallinity, nomenclature of the silica minerals and bibliography, *Powder Diffraction*, Vol 13, 1998, pp. 1–18.

[3] Miles, W. J., Crystalline silica analysis of Wyoming bentonite by X-ray diffraction after phosphoric acid digestion, *Analytical Chemistry Acta*, Vol 286, 1994, pp. 97–105.

[4] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

2.3 *Code of Federal Regulations:*[6]
29 CFR 1910.94, Ventilation
29 CFR 1910.134, Respiratory Protection
29 CFR 1910.1000, Air Contaminants
29 CFR 1910.1200, Hazard Communication
29 CFR 1926.57 Ventilation
29 CFR 1926.103 Respiratory Protection
30 CFR 47, Hazard Communication
30 CFR 56, Title 30, Subpart D, Air Quality, Radiation, and Physical Agents (MSHA)
42 CFR 84 Title 42, Part 84, Approval of Respiratory Protective Devices, Tests for Permissibility, Fees

2.4 *NIOSH Publications:*[7]
Manual of Analytical Methods, 4th Ed., DHHS (NIOSH), Publication No. 94-113, August 1994
Method 7500 for Silica, Crystalline, Respirable (XRD)
Method 7601 for Silica, Crystalline Visible Absorption Spectrophotometry
Method 7602 for Silica, Crystalline (IR)
Method 7603 for Coal Mine Dust by IR
Guidelines for the Use of the ILO International Classification of Radiographs

2.5 *Other References:*
American Thoracic Society, Standardization of Spirometry

3. Significance and Use

3.1 These practices and criteria were developed for occupational exposures. They are intended to *(a)* protect against clinical disease from exposure to respirable crystalline silica, *(b)* be measurable by techniques that are valid, reproducible, and readily available, and *(c)* be attainable with existing technology and protective practices.

4. General Requirements

4.1 *Occupational Exposure Limits (OEL):*

4.1.1 *Permissible Exposure Limit (PEL) established by U.S. Occupational Health and Safety Administration (OSHA) General Industry* (see 29 CFR 1910.1000)—Workers shall not be exposed to respirable dust containing 1 % or more quartz exceeding 10/(% quartz + 2) mg/m^3 as an 8-h time weighted average in any 8-h work shift of a 40-h work week or, for total dust (respirable plus non-respirable), 30/(% quartz + 2) mg/m^3. The PEL for respirable cristobalite and tridymite is one-half the value for quartz.

4.1.1.1 PEL (mg/m^3) (respirable fraction):

$$10 \div [\%\ \text{quartz} + (\%\ \text{cristobalite} \times 2) + (\%\ \text{tridymite} \times 2) + 2]$$

4.1.1.2 PEL (mg/m^3) (total dust):

$$30 \div [\%\ \text{quartz} + (\%\ \text{cristobalite} \times 2) + (\%\ \text{tridymite} \times 2) + 2]$$

NOTE 1—Federal OSHA PEL is approximately equivalent to a quartz level of 100 µg/m^3.

4.1.2 *PEL established by U.S. Mine Safety and Health Administration (MSHA) (non-coal)* (see 30 CFR 56.5001)—Workers shall not be exposed to respirable dust containing 1 % or more quartz exceeding the PEL as determined for a time weighted 8-h workday and 40-h workweek based on the following formula: PEL = 10/(% quartz + 2) mg/m^3. The PEL for respirable cristobalite and tridymite is one-half the value for quartz.

4.1.3 Occupational Exposure Limits may vary country by country. Please consult the authority in the country, where the operation exists. Examples of other OELs are provided in Appendix X2.

4.1.4 Employers shall determine the appropriate OEL for their operation, but in no case shall the OEL be less stringent than the applicable government limit.

4.2 *Exposure Assessment and Monitoring:*

4.2.1 Risk can be assessed qualitatively based on Safety Data Sheets (SDS), prior information, likelihood of dust generation, proximity of airborne dust to workers, nature of the industrial process (example: wet work—low risk; dry work—higher risk), and location of workers (example: control room). Note that the absence of visible dust is not a guarantee of lack of risk.

4.2.2 Where qualitative risk assessment indicates that a potential risk is present, initial sampling of tasks or representative workers' exposures shall be made to characterize the exposure and its variability, to determine compliance with standards given in 4.1, and to establish a baseline exposure level in all areas where workers are or have the potential to be exposed to silica. Initial task sampling would be not required for short duration or transient tasks, tasks where sampling results would not be timely, representative concentrations are already known or proved task protection is in place. Conduct exposure sampling when needed to detect overexposures due to significant and deleterious change in the contaminant generation process or the exposure controls. This is particularly true for areas or operations where conditions can change dramatically within a short span of time.

4.2.3 Sampling strategy should follow good industrial hygiene practice.

4.2.4 Recordkeeping required under this practice shall be maintained and made available for review by employees and consistent with federal or state requirements.

4.2.5 For workers with regular exposure to high silica concentrations that are placed inside of supplied air respirators or ventilated enclosures, such as in sandblasting, sampling should be conducted inside of the control device to determine employee exposure. The sampling line shall not interfere with the fit of the respirator. Consultation with the respirator manufacturer may be necessary to achieve the above requirement.

4.2.6 In areas where overexposures are persistent, a written Exposure Control Plan shall be established to implement engineering, work practice, and administrative controls to reduce silica exposures to below the OEL, or other elected limit, whichever is lower, to the extent feasible. A root cause analysis should be conducted for all exposures in excess of the OEL that cannot be accounted for. Root cause analysis involves

[6] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

[7] Available from National Institute for Occupational Safety and Health, Division of Physical Sciences and Engineering, 4676 Columbia Parkway, Cincinnati, OH 45226.

iTeh Standards (https://standards.iteh.ai) Document Preview
ASTM E1132-13
https://standards.iteh.ai/catalog/standards/sist/22f5e20e-5...

investigating cause(s) for the excessive exposure, providing remedies, and conducting follow-up sampling to document that exposures are below the OEL.

4.2.7 Sampling shall be done at a frequency that provides reliable information for determining an appropriate control strategy. Sampling information and recommended frequency is summarized in Table 1.

4.2.8 Because people have different work habits, sampling should be rotated among different employees performing the same task with a goal of sampling each individual at least once every three years or use statistical random sampling.

4.2.9 Measurement of worker occupational exposures shall be within the worker's breathing zone and shall meet the criteria of this section. Such measurements should be representative of the worker's customary activity and should be representative of workshift exposure. Area sampling may be used to characterize exposures and identify effective controls when appropriate to the circumstances.

TABLE 1 Sampling Information

Condition	Action
Qualitative assessment	Based on evaluation of process and materials used and visual review of dust generation potential.
Initial sampling	Conducted at representative job functions starting with assumed highest dust exposure levels or based on representative sampling data for defined tasks. Results used to establish sampling or protection plan, or both.
Sampling results are below OEL	No periodic sampling necessary but additional samples may be required due to process changes or new qualitative assessments.
No OEL overexposure found, but exposures exceed one-half the OEL.	These locations are to be included in a sampling plan. Sampling strategy may be determined by a qualitative assessment or statistical analysis that facilitates determination of the likelihood that exposures may sometimes exceed the OEL. If qualitative assessment or statistical analysis indicates exposures may sometimes exceed the OEL, see below.
OEL was exceeded and engineering, work practice, and administrative controls, or all three, are being applied to the work area to reduce exposures to below the OEL (see 4.2.6)	Sampling to be conducted before and after the remedy to assess the results of silica reduction efforts. If high levels persist institute workplace controls and include in sampling plan until levels are below the OEL.
Process materials, process equipment, engineering controls, or any other changes that occur which would tend to increase worker exposures	Sampling to be conducted as soon as feasible to assess the effects of changes on worker exposures.
Ventilated protective enclosures are used because work area exposures are presumed or known to exceed the OEL	Sample at least annually to ensure that worker exposures do not exceed the OEL.
Short duration (hours) silica dust generation operations such as drilling and cutting	Depend on task or workplace controls to reduce exposures. Sampling only provides historical data since the operation will have ended before sample analysis results are available.
Worker(s) or supervision express concerns that silica exposures have increased.	Review and discuss concerns and sample as soon as necessary to determine exposures.

4.2.10 Respirable dust samples are to be collected according to accepted methods. Refer to Test Method D4532 and see Appendix X1 for an example.

4.2.11 Sampling data records shall include employee identification, a log of the date and time of sample collection, sampling time duration, volumetric flow rate of sampling, documentation of pump calibration, description of the sampling location, analytical methods, and other pertinent information. See Figs. X1.1-X1.3 for example sampling record, calibration forms, and employee notification of dust sampling results.

4.2.12 Samples for silica analysis should be analyzed by an AIHA-accredited laboratory.

4.3 *Exposure Monitoring:*

4.3.1 The employer shall provide employees with an explanation of the sampling procedure.

4.3.2 Whenever exposure monitoring activities require entry into an area where the use of respirators, protective clothing, or equipment is required, the employer shall provide and ensure the use of such personal protective equipment and shall require compliance with all other applicable safety and health procedures.

4.3.3 Sampled employees shall be provided with copies of their sampling results when returned by the laboratory and explanations of their data.

4.4 *Methods of Compliance:*

4.4.1 The methods listed below are applicable where compliance is required because of personal exposures exceeding the OEL.

NOTE 2—One half the exposure limit is frequently used by employers as a warning since excursions above the exposure limit are possible.

4.4.2 *Engineering Controls:*

4.4.2.1 Use of properly designed engineering controls is the most desirable approach for controlling dust from crystalline silica-containing materials.

4.4.2.2 Adequate ventilation or other dust suppression methods shall be provided to reduce respirable crystalline silica concentrations to below the OEL, where feasible.

4.4.2.3 Enclosed workstations, such as control booths and equipment cabs, designed for protection against respirable crystalline silica dust, shall be under positive pressure and provided with clean make-up air. Re-circulation of air is not preferred; however, properly designed and maintained re-circulation systems are acceptable. Re-circulated air inside enclosed workstations should be in accordance with ANSI Z9.7 or federal and state requirements and consensus guidelines.

4.4.2.4 Engineering design of equipment shall include, where feasible, provisions to reduce exposure of workers to respirable crystalline silica dust to the OEL or below. If ventilation systems are used, they shall be designed and maintained to prevent the accumulation and re-circulation of respirable crystalline silica dust in the working environment (see ANSI Z9.2). If wet suppression systems are used, spray nozzles and associated piping shall be maintained to ensure

iTeh Standards (https://standards.iteh.ai) Document Preview

that adequate wetting agent is applied where needed to control respirable crystalline silica dust. If hand-held or stationary tools are cut, grind or drill silica containing materials they should be designed or used, or both, in a manner to reduce dust exposures.

4.4.2.5 All engineering controls shall be properly maintained and periodically evaluated and brought up to specifications, when needed.

4.4.2.6 *Task-based Control Strategies*—Where exposure levels are known from empirical data, a task based control strategy can be applied that matches tasks with controls. The following lists examples of this approach.

(1) Abrasive Blasting—OSHA has already established standards for abrasive blasting work requiring ventilation (29 CFR 1926.57) and respiratory protection (29 CFR 1926.103). In the case of abrasive operations, it is recommended that the employer provide a Type CE, pressure demand or positive-pressure, abrasive blasting respirator (APF of 1000 or 2000).

4.4.3 *Work Practices and Administrative Controls:*

4.4.3.1 Ensure that workers do not work in areas of visible dust generated from materials known to contain more than 1 percent respirable crystalline silica without use of respiratory protection, unless proven task protetion is in use or air sampling shows exposures less than the OEL.

4.4.3.2 To the extent feasible, dry sweeping shall not be used in work areas where employees could reasonably be expected to be exposed to respirable crystalline silica above the OEL.

4.4.3.3 Workers shall not use compressed air to blow respirable crystalline silica-containing materials from surfaces or clothing, unless the method has been approved by an appropriate Regulatory agency.

4.4.3.4 Employers shall instruct workers about specific work practices that minimize exposure to respirable crystalline silica. Workers will perform their work tasks in accordance with these instructions.

4.4.3.5 Workers shall practice good housekeeping practices to minimize the generation and accumulation of dust.

4.4.3.6 Workers shall utilize available means to reduce exposure to dust, including the use of respirators, control rooms or rest areas, ventilation systems, high efficiency particulate air (HEPA) vacuum cleaners or water spray, wet floor sweepers, and rotation of personnel to minimize individual exposure to the OEL or below.

4.4.4 Other engineering controls with the potential to limit exposure are:

(1) Wet suppression systems;

(2) Ventilation;

(3) Cutting Silica Containing Materials—The controls found in Tables 2-6, taken from Practice E2625, apply to employees cutting silica containing materials during a full work shift and do not apply to occasional cutting limited to 90-min total time;

(4) Tools designed to reduce dust; and

(5) Vacuum systems.

4.5 *Respiratory Protection:*

4.5.1 Respirators shall be required in work situations in which engineering and work practice controls are not sufficient to reduce exposures of employees to or below the OEL. Where the use of personal respiratory protection is required under this practice, the employer shall establish and enforce a program to include the following elements of a respiratory protection program, as specified and detailed in 29 CFR 1910.134 and ANSI Z88.2, for exposed workers. Respirators shall comply with the requirements contained herein.

4.5.2 When respirators are required by this practice, the employer shall select a respirator certified by NIOSH under the provisions of 42 CFR 84 that has an assigned protection factor (APF) greater than the hazard ratio (HR) as determined by air sampling and analysis. The HR is defined as the ratio of the ambient concentration to the exposure limit. The APF values are given in Table 7. All respirators must be approved for use against silica type dusts. Respirators must comply with requirements of ANSI Z88.2. See Table 7 for recommended respiratory protection.

4.5.3 Employers shall perform respirator fit tests in accordance with ANSI Z88.2 at the time of initial fitting and at least annually, thereafter, for each worker wearing tight-fitting respirators. The tests shall be used to select respirators that provide the required protection.

4.5.4 Where required by this practice, the employer shall institute a respiratory protection program that includes: individual medical clearance for respirator usage, worker training

iTeh Standards (https://standards.iteh.ai) Document Preview ASTM E1132-13 https://standards.iteh.ai/catalog/standards/sist/2215e20e-5f7e-42d6-a075-9b6552180f6c/astm-e1132-13

TABLE 2 Cutting Masonry Units

Operation/Task	Control Measures	Respiratory Protection
Cutting masonry units— (Using stationary or portable saws)	*Wet Method*: Continuously apply stream or spray at the cutting point.	Not Required
	OR *Dry Method*: Enclose saw within a ventilated enclosure operated with a minimum face velocity of 250 feet-per-minute. Saw blade must be contained entirely within the booth and exhaust must be directed away from other workers or fed to a dust collector with a HEPA filtration system.	100 series filtering face piece (disposable dust mask) OR ½ face respirator with 100 series filters
* Additional control measures for consideration: Ventilation (natural and mechanical), dust collection methods, architectural design, use special-shaped products, job rotation and demarcation of specific cutting areas.		

TABLE 3 Mixing Concrete, Grout, and Mortar

Operation/Task	Control Measures	Respiratory Protection
Mixing Concrete, Grout or Mortar	Natural ventilation and demarcation of mixing areas	Not Required

TABLE 4 Tuck Pointing

NOTE 1—The following control measures have the potential to be useful in reducing exposure levels, but are not necessarily adequate to reliably reduce exposures below the PEL.

Operation/Task	Control Measures	Respiratory Protection
Tuck Pointing	The following control measures may be useful in reducing exposure levels but may not be adequate to reliably reduce exposures below the PEL. Ventilation Natural Mechanical Dust collection/vacuum Shroud Gauge/Guide for Equipment Wet methods	These types of respiratory protection will be necessary to provide adequate protection in the absence of control methods that demonstrate compliance with the PEL: Full face respirator with 100 series filter OR Supplied air respirator

TABLE 5 Concrete Cutting

Operation/Task	Control Measures	Respiratory Protection
Outdoor Slab Sawing	Use water-fed system that delivers water continuously at the cut point with natural ventilation OR Early entry sawing OR Dry cutting with integrated vacuum system	Not Required
Indoor Slab Sawing	Use water-fed system that delivers water continuously at the cut point with natural ventilation. OR Mechanical ventilation (fans)	100 series filtering face piece respirator 100 series filtering face piece respirator
	OR Early entry sawing OR Dry cutting with integrated vacuum system	100 series filtering face piece respirator
Outdoor Wire Sawing w/ remote Outdoor Wire Sawing w/o remote	Use water-fed system that delivers water continuously on wire, operated via remote control with natural ventilation.	Not Required
Outdoor Wall Sawing	Use water-fed system that delivers water continuously on blade with natural ventilation.	Not Required
Indoor Wall Sawing	Use water-fed system that delivers water continuously on blade, operated via remote control with natural ventilation.	100 series filtering face piece respirator
Outdoor Hand Sawing	Use water-fed system that delivers water continuously on blade with natural ventilation.	Not Required
	OR Use vacuum system at point of operation with natural ventilation.	Not Required
Indoor Hand Sawing	Use water-fed system that delivers water continuously on blade with natural ventilation.	100 series filtering face piece respirator

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM E1132-13
https://standards.iteh.ai/catalog/standards/sist/22f5e20e-5f7e-42d6-a075-0b655218016c/astm-e1132-13

TABLE 6 Core Drilling

Operation/Task	Control Measures	Respiratory Protection
Core Drilling	Use water-fed system that delivers water continuously at the cut point with natural ventilation	Not Required
	OR *Dry Method*: Use vacuum system at point of operation with natural ventilation.	None OR 100 series filtering face piece respirators
Hand Held tools with core drilling bits	Use water-fed system that delivers water continuously at the cut point with natural ventilation.	None OR 100 series filtering face piece respirators
	OR Use vacuum system at point of operation with natural ventilation.	None OR 100 series filtering face piece respirators

in the use and limitations of respirators, routine air monitoring, and the inspection, cleaning, maintenance, selection, and proper storage of respirators. This training shall be done at first employment and annually as refresher training. Any required respiratory protection must, at a minimum, meet the requirements of 29 CFR 1910.134 and ANSI Z88.2. Respirators should be used according to the manufacturer's instructions.

4.5.4.1 Each potential respirator wearer will receive medical clearance prior to the issuance of a respirator and subsequent fit testing. Detailed guidance is provided at 29 CFR 1910.134.

TABLE 7 Recommended Respiratory Protection for Workers Exposed to Respirable Crystalline Silica

APF[A]	Minimum Respiratory Protection for Crystalline Silica[B]
10	any air-purifying respiratory with any Part 84 particulate filter (N,R, or P, as appropriate).
25	any powered, air-purifying respirator with a high-efficiency particulate filter, or any supplied-air respirator equipped with a hood or helmet and operated in a continuous-flow mode (for example, type CE abrasive blasting respirators operated in the continuous-flow mode)
50	any air-purifying, full-facepiece respirator with a 100 series (N,R, or P) Part 84 particulate filter, or any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
1000	any supplied-air respirator equipped with a half-mask and operated in a pressure-demand or other positive-pressure mode
2000	any supplied-air respirator equipped with a full facepiece, hood or helmet and operated in a pressure-demand or other positive-pressure mode (for example, a type CE abrasive blasting respirator operated in a positive-pressure mode)
Planned or emergency entry into environments containing unknown concentrations or concentrations 10 000	any self-contained breathing apparatus equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode, or any supplied-air respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode
Firefighting	any self-contained breathing apparatus equipped with a full facepiece and operated in a pressure-demand or other positive pressure mode
Escape only	any air-purifying, full facepiece respirator with a high-efficiency particulate filter, or any appropriate escape-type, self-contained breathing apparatus
Abrasive blasting	per 29 CFR 1910.94, NIOSH approved Type CE Abrasive-blasting rooms, or when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure, or where concentrations of toxic dust dispersed by the abrasive blasting may exceed the limits wet in 1910.1000 and the nozzle and blast are not physically separated from the operatorin an exhaust-ventilated enclosure

[A] Assigned protection factor (APF). The APF is the minimum anticipated level of protection provided by each type of respirator.
[B] Only NIOSH/MSHA approved equipment should be used. These recommendations are intended to protect workers from silicosis.

Medical clearance is the process to determine an individual's psychological and medical functional-ability to wear a respirator.

4.6 *Respiratory Medical Surveillance:*

4.6.1 The employer shall institute a respiratory medical surveillance program for all workers who work in areas, for 120 days per year or more, where the TWA concentration of respirable crystalline silica dust exceeds the OEL (see 4.1) or where such concentrations are anticipated.

4.6.2 All medical examinations and medical procedures as required under 4.6 are to be performed by or under the direction of a licensed physician, and are provided without cost to the worker.

4.6.3 The employer shall provide the required medical surveillance to the workers and at a reasonable time and place.

4.6.4 Persons who administer the pulmonary function testing shall demonstrate proficiency in spirometry using the American Thoracic Society "Standardization of Spirometry."

4.6.5 Medical examinations shall be made prior to placement of new workers (as defined in 4.6.1), and no less than once every three years thereafter. These examinations shall include as a minimum:

4.6.5.1 Medical and occupational history to elicit information on respiratory symptoms, smoking history, and prior exposures to dust and agents affecting the respiratory system. See Fig. X1.4 for example.

4.6.5.2 A posterior-anterior (PA) chest roentgenogram on a film no less than 14 by 17 in. and no more than 16 by 17 in. at full inspiration. The roentgenogram shall be classified according to the Guidelines for the Use of ILO International Classification of Radiographs of Pneumoconioses by currently NIOSH certified "B" readers. NIOSH "B" readers are physicians that have demonstrated proficiency in the classification of roentgenograms according to the ILO system by successfully completing a practical examination.

4.6.5.3 A tuberculosis intradermal skin test using purified protein derivative for workers with roentgenographic evidence of silicosis who have not been tested for tuberculosis.

4.6.5.4 Spirometry is an OPTIONAL component of this practice. There is currently no evidence that routine medical surveillance with spirometry is useful for early detection of silica-induced lung disease. Experience has shown that most abnormalities on screening spirometry are not due to work-related disorders. Smoking, non-occupational pulmonary disease, and other variables are more common causes of alterations in pulmonary function. Provided spirometry is conducted, pulmonary function measurements should include a determination of forced vital capacity (FVC), forced expiratory volume in 1 s (FEV_1), and forced expiratory volume in 1 s as a percentage of total forced vital capacity (FEV_1/FVC%) and should be obtained. Spirometry results should be compared with the 95th-percentile lower limit of normal (LLN) values (see Hankinson et al, *Am J. Respiratory Critical Care Med.*, 1999 Jan, 159(1), pp. 179-87). Technicians performing spirometry test shall have attended a NIOSH certified spirometry training course (DHHS (NIOSH) Pub No. 2004-154c).

4.6.6 The employer shall provide the following information to the health care provider:

4.6.6.1 A copy of this practice with appendix,

4.6.6.2 A description of the affected worker's duties as they relate to the worker's exposure,

4.6.6.3 The worker's representative exposure level or anticipated exposure level to respirable crystalline silica,

iTeh Standards (https://standards.iteh.ai) Document Preview
ASTM E1132-13