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Standard Guide for Administrative and Engineering Controls for Silicon Carbide Whisker Work Areas¹

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1. Scope

1.1 This guide applies to workplaces where unbound silicon carbide whiskers are manufactured, processed into products, or otherwise used.

1.2 This guide offers guidance for controlling workplace exposures to airborne silicon carbide whiskers.

1.3 All applicable federal, state, county, and local regulations must be complied with when this guide is used.

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.*

2. Referenced Documents

2.1 ASTM Standards:

E 1437 Practice for Handling Silicon Carbide Whiskers²

E 1451 Guide for Disposal of Wastes Containing Silicon Carbide Whiskers and Fibers²

E 1716 Guide for the Selection and Use of Personal Protective Equipment for Humans Working with Respirable Silicon Carbide Whiskers

E 1717 Guide for Workplace Health and Safety Training for Respirable Silicon Carbide Whiskers²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *respirable silicon carbide*—a crystalline silicon carbide material, approximately cylindrical in shape, whiskers and fibers with an aspect ratio equal to or greater than 5, and a diameter less than 3.0 μm with the potential to become airborne.

3.1.2 *silicon carbide whisker work area*—a hood, laboratory, room, building, facility, or other defined area where unbound silicon carbide whiskers are handled, and to which potential airborne silicon carbide whiskers can be reasonably restricted.

3.1.3 *unbound silicon carbide whiskers and fibers*—whiskers and fibers with the potential to become airborne.

4. Controls for Unbound Silicon Carbide Whisker Work Areas

4.1 *Application*—The following controls should be followed for areas where unbound silicon carbide whiskers are handled outside of closed containers, or where silicon carbide whisker airborne concentrations are known or expected to be present in any quantity, regardless of duration.

4.2 Administrative Controls:

4.2.1 All employees associated with a silicon carbide whisker workplace should be trained in accordance with Guide E 1717 and Practice E 1437.

4.2.2 Eating, drinking, or smoking are not permitted in silicon carbide whisker work areas.

4.2.3 Shoe cleaners, tacky mats, or other type of control for materials tracked by shoes, should be provided at appropriate locations to prevent introduction of unbound silicon carbide whiskers to non-work areas.

4.2.4 Rotation of workers to reduce 8-h time weighted average exposures to silicon carbide whiskers is not recommended.

4.3 *Personal Protective Equipment*—Consult Guide E 1716.

4.4 Engineering Controls:

4.4.1 Local exhaust controls engineered for a process are preferred. General exhaust controls are acceptable, but generally less effective than local exhaust. Exhaust air from central collection points should be externally exhausted, filtered as appropriate to meet applicable standards. Small self-contained units may be exhausted to the work area, if the air stream is first HEPA filtered before reintroduction to the work area.

4.4.2 Vapor capture velocity parameters are sufficient for the design of exhaust controls for silicon carbide whisker work areas or points of operations. Higher design velocities may be needed if other particulate material is a health concern or nuisance. For additional information, consult ACGIH Industrial Ventilation—A Manual of Recommended Practice.³

4.5 Cleaning:

¹ This guide is under the jurisdiction of ASTM Committee E-34 on Occupational Health and Safety and is the direct responsibility of Subcommittee E34.70 on Single Crystal Ceramic Whiskers.

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² *Annual Book of ASTM Standards*, Vol 11.03.

³ American Conference of Government Industrial Hygienists, 6500 Glenway Ave., Bldg. D-3, Cincinnati, OH 45211.

4.5.1 Good housekeeping should be maintained to prevent accumulations of silicon carbide whiskers.

4.5.2 Compressed air shall never be used for cleaning.

4.5.3 Dry sweeping with brooms shall never be used for cleaning.

4.5.4 Cleaning should be done with HEPA filtered vacuum cleaners, wet sweeping methods, or equivalent methods.

4.5.5 A suitable disposal container for unbound silicon carbide whiskers and silicon carbide whisker-contaminated materials should be maintained in the silicon carbide whisker work area. Disposal of materials should be in accordance with E 1451.

4.6 *Exposure Monitoring:*

4.6.1 Initial monitoring of airborne respirable silicon carbide whiskers should be conducted to determine baseline airborne whisker levels.

4.6.2 Frequency of additional monitoring is contingent upon degree of exposure measured during past monitoring. Details are discussed in subsequent sections of this guide.

4.6.3 Efforts should be made to relate air monitoring results to the efficiency of administrative and engineering controls in use.

5. Additional Controls

5.1 *Additional Controls Where Airborne Concentrations of Respirable Silicon Carbide Whiskers Are Known or Expected to Be Less Than or Equal to 0.05 Fibers/cm³ of Air in the Silicon Carbide Whisker Work Area:*

5.1.1 *Application*—The following additional controls should be followed for areas or operations where airborne silicon carbide whiskers concentrations are known or expected to be less than or equal to 0.05 fibers/cm³, regardless of duration of exposure.

5.1.2 *Administrative Controls*—Employees with transient, noncontact duties in a silicon carbide whisker work area are not required to wear protective outer clothing.

5.1.3 *Exposure Monitoring*—A representative sample(s) of specific operations, general work areas, or personnel, or combination thereof, as appropriate, should be monitored for

airborne respirable silicon carbide whiskers on an annual basis, or following process changes, if more frequent.

5.2 *Additional Controls Where Airborne Concentrations of Respirable Silicon Carbide Whiskers Are Known or Expected to Be from 0.05 to 0.2 Fibers/cm³ of Air in a Silicon Carbide Whisker Work Area:*

5.2.1 *Application*—The following additional controls should be followed for areas or operations where airborne silicon carbide whiskers concentrations are known or expected to be in from 0.05 to 0.2 fibers/cm³, 8-h time weighted average.

5.2.2 *Administrative Controls*—Precautionary signs should be posted warning all employees of potential exposure to silicon carbide whiskers.

5.2.3 *Exposure Monitoring*—A representative sample(s) of specific operations, general work areas, or personnel, or combination thereof, as appropriate, should be monitored for airborne respirable silicon carbide whiskers on a semiannual basis, or following process changes, if more frequent.

5.3 *Additional Controls Where Airborne Concentrations of Respirable Silicon Carbide Whiskers Are Known or Expected to Be in Excess of 0.2 Fibers/cm³ of Air in a Silicon Carbide Whisker Work Area:*

5.3.1 *Application*—The following additional controls should be followed for areas where airborne silicon carbide whisker exposures are known or expected to be in excess of 0.2 fibers/cm³, 8-h time weighted average.

5.3.2 *Administrative Controls*—Employees working an entire shift in the whisker work area should shower before leaving the work site.

5.3.3 *Exposure Monitoring*—A representative sample(s) of specific operations, general work areas, or personnel, or combination thereof, as appropriate, should be monitored for airborne respirable silicon carbide whiskers on a quarterly basis, or following process changes, if more frequent.

6. Keywords

6.1 administrative controls; carcinogen; ceramic; engineering controls; fiber; man-made mineral fiber; respirable; silicon carbide whisker; whisker

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