Designation: E 1451 – 98

# Standard Guide for Disposal of Wastes Containing Respirable Silicon Carbide Whiskers[1]

This standard is issued under the fixed designation E 1451; 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.

## 1. Scope

1.1 This guide covers a disposal of wastes of unbound respirable silicon carbide (SiC) whiskers and wastes containing 1.0 % by weight or greater of unbound respirable silicon carbide whiskers which could become airborne during disposal operations or uncontrolled releases of materials during disposal operations.

1.2 If the waste stream contains or is mixed with other constituents that are considered hazardous waste by area federal, state, local, or other regulations, the disposal requirements may be more stringent or require different handling precautions, or both, than those recommended in this guide. Information specific to any hazardous constituents should be included in each generator's characterization of the waste so that it can be properly classified and managed.

1.3 Application of these recommendations must be in accordance with federal, state, local, or other solid waste regulations.

1.4 Applicable information may be obtained from the Material Safety Data Sheet(s) (MSDS) for the waste stream constituent(s).

1.5 *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 Respirable Silicon Carbide Whiskers[2]

2.2 *American National Standards Institute (ANSI)*[3] Standard:

ANSI Z88.2 – 1992, Respiratory Protection

2.3 *U.S. Government Standard:*

Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.134, Respiratory Protection[4]

## 3. Terminology

3.1 *Definitions:*

3.1.1 *aspect ratio, n*—ratio of whisker length to whisker diameter.

3.1.2 *respirable silicon carbide whiskers, n*—a crystalline silicon carbide fiber, approximately cylindrical in shape, with a diameter less than 3.0 µm and an aspect ratio equal or greater than 5:1.

3.1.3 *unbound silicon carbide whiskers, n*—whiskers with the potential to become airborne.

## 4. Significance and Use

4.1 Industrial solid wastes containing more than 1 % by weight of unbound respirable SiC whiskers will typically be generated by manufacturing operations which produce whiskers or handle powders containing respirable whiskers. Such wastes could also be generated by operations which (re)finish articles containing SiC whiskers. These wastes must be disposed in a manner that prevents respirable SiC whisker exposure above the exposure limits of Practice E 1437.

4.2 This guide should be used in preparing comprehensive solid waste handling procedures for implementation by waste generators, waster haulers, and landfill operators.

## 5. Guidelines—Waste Generators

5.1 Waste containing respirable silicon carbide whiskers is not currently regulated by the Environmental Protection Agency as a hazardous waste unless the waste contains regulated waste.

5.2 The waste generator should ascertain the percent by weight of unbound respirable SiC whiskers in the waste stream. If the waste stream has greater than 1 % by weight of respirable SiC whiskers, the wastes should be handled in accordance with this guide such that exposure beyond the limits of Practice E 1437 cannot occur.

5.3 The disposal container must be of sufficient integrity such that the waste materials cannot become airborne during subsequent collection, hauling, and landfill operations. Steps

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

[3] Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

[4] Available from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20402.

should be taken to minimize silicon carbide whisker contamination on external container surfaces.

5.4 Waste materials may be wetted to reduce the potential for airborne whiskers. Wetting agents classified as nonhazardous should be used. Free moisture or measured total moisture content, or both, should not exceed acceptable landfill limits as required by the landfill being used.

5.5 Attach one or more labels showing the following information:

5.5.1 Contents of the container,

5.5.2 Any information required by federal, state, local, or other regulations, and

5.5.3 The information shown on the label in Fig. 1.

5.6 A MSDS should be available for each constituent of the waste stream for which a MSDS is required by regulation.

## 6. Guidelines—Waste Haulers

6.1 This guide should be supplied to the waste hauler.

6.2 The waste must be transported in compliance with all applicable Department of Transportation (DOT) regulations.

6.3 The wastes should be transported in a covered, noncompacting truck.

## 7. Recommended Guidelines—Landfill Operators

7.1 This guide should be supplied to the landfill operator.

7.2 Dispose in an approved landfill that:

7.2.1 Has approval for landfilling industrial solid waste,

7.2.2 Will place the waste in a trench or a separate excavation away from the active working face, and

7.2.3 Will handle the material in a way that reduces the potential for airborne exposure.

7.3 The waste should:

7.3.1 Be covered by the end of the workday with 3 ft of refuse, 6 in. of soil or equivalent alternative cover that will reduce risk of fiber release, and

**CAUTION: WASTE PRODUCT WHICH MAY CONTAIN SILICON CARBIDE WHISKERS**

CAN CAUSE NOSE, THROAT, SKIN AND EYE IRRITATION. PROLONGED EXPOSURE TO RESPIRABLE SiC WHISKERS MAY RESULT IN PROGRESSIVE AND IRREVERSIBLE LUNG DISEASE. THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) CONCLUDED THAT INHALED CERAMIC FIBERS ARE POSSIBLY CARCINOGENIC TO HUMANS.

**AVOID CREATING OR BREATHING AIRBORNE WHISKERS**

**FIRST AID:** If inhaled and symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath), remove from exposure area to fresh air immediately. If symptoms persist, seek medical attention.

To avoid adverse health effects, read Material Safety Data Sheet (MSDS) for Silicon Carbide Whiskers.

**FIG. 1 Label**

7.3.2 Not be compacted while being covered.

7.4 Silicon carbide whisker waste must not be used as a fill or for any purpose that can result in fiber release to the environment.

## 8. Emergency Spill Response

8.1 Emergency spill response should be conducted by qualified, trained personnel. Training should include familiarity with this guide and its referenced documents.

8.2 An emergency response is indicated whenever there is the potential for, or actual exposure to, airborne silicon carbide whiskers, such as a ruptured container outside locations where silicon carbide whiskers or their composites are normally handled.

8.3 Emergency spill response personnel should be in a respiratory protection program according to ANSI Z88.2 and OSHA 29 CFR 1910.134. Respiratory protection equipment and protective clothing specified by an industrial hygienist or other qualified person should be used in a spill response.

8.4 *Emergency Cleanup Actions*:

8.4.1 Unprotected personnel present when a spill occurs should:

8.4.1.1 Immediately move upwind of the silicon carbide whisker waste.

8.4.1.2 Secure the area, keeping others away until the cleanup is complete.

8.4.1.3 Notify the supervisor.

8.4.2 Emergency response personnel should:

8.4.2.1 Consult applicable MSDS(s) or emergency response guide and this guide.

8.4.2.2 Don the required respirator and clothing.

8.4.2.3 Obtain a source of water, and wet down the waste with a misting spray of water.

NOTE 1—**Caution:** A heavy, solid stream of water may agitate and release silicon carbide whiskers.

8.4.2.4 Scoop the waste into a properly labeled bag or a closeable container that can withstand subsequent handling, transportation, and disposal without exposing the contents, then tightly seal, and dispose according to this guide. Minimize free-fall of powder and generation of airborne whiskers.

8.4.2.5 Decontaminate equipment and machinery by wet wiping, high efficiency particulate air (HEPA) filtered vacuuming, or other suitable methods.

8.4.2.6 Dispose of gloves, coveralls, shoe covers, and other decontamination residue in accordance with 8.4.2.4.

8.4.2.7 Regular clothing that has become contaminated should be removed, wetted down, put into a labeled bag, and taken to the supervisor for proper cleaning or disposal.

## 9. Keywords

9.1 carcinogen; ceramic; composite; disposal; fiber; health hazard; man-made mineral fiber (MMMF); respirable; silicon carbide whisker; waste; whisker