NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND SUPPORTING DOCUMENTATION FOR

*** ANTIMONY ***

NIOSH/OSHA Draft Technical Standard and Supporting Documentation for ANTIMONY

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance ANTIMONY.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of antimony and compounds (as antimony) not in excess of 10 parts per million (ppm) (25 milligrams per cubic meter (mg/m3)) averaged over an eight-hour work shift (time weighted average), as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one half of the permissible exposure for antimony averaged over an eight-hour work shift.

(3) This standard does not cover stibine.

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which antimony is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of antimony above the permissible exposure. The initial determination shall be made each time there is a change in production, process, or control measures which may result in an increase in airborne concentrations of antimony.

(2) A written record of the initial determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculation which may indicate employee exposure to antimony;

(ii) Any measurements of antimony taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to antimony; and

(iv) Date of initial determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

(3) If the employer determines that any employee may be exposed to antimony above the permissible exposure, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to antimony above the action level, the employer shall:

(i) Identify all employees who may be exposed above the permissible exposure; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to antimony above the permissible exposure, but not above the permissible exposure, the exposure of that employee shall be measured at least every three months.

(6) If an employee exposure measurement reveals that an employee is exposed to antimony above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (d) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to antimony above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to antimony below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement. (1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (iv) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, of not less than that given in Table 1.

Table 1

Concentration	Required Accuracy (Percent of True Value)
Above permissible exposure	± 25
At or below permissible exposure and above the action level	± 35
At or below the action level	± 50

(d) Compliance. (1) No employee shall be exposed to antimony above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of antimony shall be controlled to at or below the permissible exposure by engineering and work practice controls.

(i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not feasible.

(ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section.

(3) Engineering controls. When local exhaust is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity or static pressure, shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentrations of antimony.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

(ii) In work situations in which engineering and work practice controls are not feasible; or

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of antimony to at or below the permissible exposure; or

(iv) For operations which require entry into tanks or closed vessels, tank and process sampling and gauging, and loading and unloading of tank vessels; or

(v) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR ANTIMONY AND COMPOUNDS (as ant:

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Dust or Mist Concentration	
2.5 mg/M3 or less	Any dust and mist respirator, except single use.
5 mg/M3 or less	Any dust and mist respirator, except single-use respirator or quarter-mask.
Dust, Mist, or Fume Concentration	
5 mg/M3 or less	Any fume respirator or high efficiency particulate filter respirator.
	Any supplied-air respirator.
	Any self-contained breathing apparatus.
25 mg/M3 or less	A high efficiency particulate filter respirator with a full facepiece.
	Any supplied-air respirator with a full facepiece, helmet, or hood.
	Any self-contained breathing apparatus with a full facepiece.
80 mg/M3 or less	A powered air-purifying respirator with a full facepiece and a high efficiency particulate filter.
	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than	Self-contained breathing apparatus with a full facepiece

80 mg/M3 or entry and escape from unknown concentrations	operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied - air respirator with a full facepiece operated in pressure - demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any dust and mist respirator, except single use. Any escape self-contained breathing apparatus.

(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with $ 1910.134(b), (d), (e), and (f).

(e) Fire and safety. (1) The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for antimony.

(2) For the purpose of compliance with $ 1910.309, locations classified as hazardous locations due to the presence of antimony shall be Class II, Group E.

(3) For the purpose of compliance with $ 1910.157, antimony is classified as a Class D fire hazard, except that $ 1910.157 (b)(2)(v) shall not apply.

(4) For the purpose of compliance with $ 1910.178, locations classified as hazardous locations due to the presence of antimony shall be Class II, Group E.

(5) Sources of ignition such as smoking or open flames are prohibited where antimony presents a fire or explosion hazard.

(6) Antimony shall be stored so as not to come in contact with strong oxidizers and acids.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use appropriate protective clothing and equipment necessary to prevent skin contact with solid antimony trichloride, where skin contact may occur. Face shields shall comply with $ 1910.133 (a)(2), (a)(4),(a)(5), and (a)(6).

(2) Employers shall provide and ensure that employees use appropriate protective clothing and equipment necessary to prevent repeated or prolonged skin contact with solid antimony or antimony oxides, sulfides or trichloride change into uncontaminated clothing before leaving the work premises.

(3) Employers shall ensure that employees whose clothing may have become contaminated with solid antimony or antimony oxides, sulfides or

trichloride change into uncontaminated clothing before leaving the work premises.

(4) Employers shall ensure that clothing contaminated with antimony, antimony oxides, sulfides or trichloride is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of those substances from the clothing. If the clothing is to be laundered or otherwise cleaned to remove antimonial materials, the employer shall inform the person performing the operation of the hazardous properties of antimony.

(5) Where exposure of an employee's body to antimony trichloride may occur, employers shall provide facilities for quick drenching of the body within the immediate work area for emergency use.

(6) Employers shall ensure that non-impervious clothing which becomes contaminated with antimony trichloride be removed immediately and not be reworn until the antimony trichloride is removed from the clothing.

(7) Employers shall ensure that all employees subject to skin contact with antimony trichloride wash any areas of the body which may have contacted antimony trichloride at the end of each day.

(8) Employers shall ensure that non-impervious clothing which becomes contaminated with antimony, antimony oxides or sulfides be removed promptly and not reworn until the antimonial substances are removed from the clothing.

(9) Employers shall provide and ensure that employees use safety goggles, which comply with $ 1910.133 (a)(2) - (a)(6). Where solid antimony, antimony oxides or chlorides, or liquids containing these compounds may contact the eyes.

(10) Employers shall provide and ensure that employees use safety goggles, which comply with $ 1910.133 (a)(2) - (a)(6) where there is any possibility that solid antimony trichloride or liquids containing antimony trichloride may contact the eyes.

(11) Where there is any possibility that an employees eyes may be exposed to solid antimony trichloride or strong solutions of antimony trichloride, employers shall provide an eye-wash fountain within the immediate work area for emergency use.

(g) Spills and disposal. In the event that liquid antimony compounds is spilled the employer shall immediately provide available ventilation and then clean up the spill.

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with antimony trichloride immediately wash or shower with soap or mild detergent and water to remove any antimony trichloride from the skin.

(2) Employers shall ensure that employees whose skin becomes contaminated witn antimony or antimony oxides or sulfides promptly wash or shower with soap or mild detergent and water to remove the substances from the skin.

(3) Employers shall ensure that employees do not eat or smoke in areas where solid antimony or liquids containing antimony trichloride is handled, processed or stored.

(4) Employers shall ensure that employees who handle solid antimony, antimony oxides or sulfides or antimony trichloride or liquids containing these substances, wash their hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

(i) Training and information. (1) Each employer who has a workplace in which antimony is present shall keep a copy of this regulation with Appendixes A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to antimony above the action level without regard to the use of respirators or employees who may have repeated or prolonged skin contact or who may have eye contact with solid antimony or liquids containing antimony, or employees who work where a spill of antimony may occur, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for antimony (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to antimony.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to antimony which are listed in Appendix A of the section;

(iv) Instruct affected employees to inform the employer if they develop any of the medical conditions listed in paragraph (j)(2) of this section; and

(v) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to antimony.

(j) Medical surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) Preplacement medical examination. The employer shall make available to each employee who is exposed, or will be exposed, to airborne concentrations of antimony above the action level, without regard to the use of respirators, or employees who may have repeated or prolonged skin contact or who may have eye contact with solid antimony or liquids containing antimony, a preplacement medical examination which must include the following:

(i) A medical history and physical examination with emphasis on the heart, lungs, nervous system and skin;

(ii) Forced vital capacity (FVC) and forced expiratory volume-one second (FEV (1 second)) tests;

(iii) 14" x 17" chest roentgenogram;

(iv) Electorcardiogram.

(3) Periodic medical examination. The employer shall make available to each employee exposed to airborne concentrations of antimony above the action level, without regard to the use of respirators, or employees who may have repeated or prolonged skin contact or who may have eye contact with solid antimony or liquids containing antimony, twelve months from the date of the employee's first exposure, and every twelve months thereafter, a periodic medical examination which must include the following:

(i) A medical history and physical examination with emphasis on the heart, lungs, nervous system and skin;

(ii) Forced vital capacity (FVC) and forced expiratory volume-one second (FEV (1 second)) tests;

(iii) A 14" x 17" chest roentgenogram, if pulmonary function tests show significant abnormalities;

(iv) Electrocardiogram.

(4) Alternative medical procedures. If the examining physician chooses to use alternative medical procedures to those specified in paragraphs (j)(2) and (j)(3) of this section, the employer may accept such alternative medical procedures as meeting the requirements of this section provided that the employer:

(i) Obtains a statement from the examining physician setting forth the alternative medical procedures, the rationale for substitution, and evidence that they will be equally effective;

(ii) Informs each exposed worker of the fact that alternative medical procedures to those required in paragraphs (j)(2) and (j)(3) of this section are to be made available.

(5) Interim medical examination. The employer shall provide an interim medical examination for the employee if the employee informs the employer of any of the signs or symptoms of exposure to antimony which are listed in Appendix A which the employee suspects are caused by exposure to antimony.

(6) Informing the physician. The employer shall provide to the physician performing any medical examination required by this section the following information:

(i) A copy of this regulation with Appendixes A, B, and C for antimony;

(ii) A description of the affected employee's duties as they relate to his exposure to antimony;

(iii) A description of any personal protective equipment and respirators required to be used;

(iv) The results of any measurements which may indicate the affected employee's exposure;

(v) The affected employee's anticipated exposure level; and

(vi) Upon request of the physician, any available information from previous medical examinations of the affected employee.

(7) Where a medical examination is required by paragraphs (j)(2), (j)(3), or (j)(5) of this section, following such examination the employer shall obtain from the examining physician a written opinion which conforms with paragraph (j)(8) of this section.

(8) Physician's written opinion. (i) The physician's written opinion by the examining physician shall specifically state:

(A) Whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to antimony;

(B) Any recommended limitations upon the employee's exposure to antimony, including limitations upon the use of personal protective equipment and respirators;

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to the employee's employment.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(9) Results of tests. Where a preplacement or periodic medical examination is required by paragraphs (j)(2) or (j)(3) of this section, following such examination the employer shall obtain from the examining physician for inclusion in the employee's medical record:

(i) A recording of the results of the pulmonary function tests and electrocardiogram;

(ii) The 14" x 17" chest roentgenogram when required, or a medically acceptable copy;

(iii) Where alternative medical procedures have been performed in accordance with paragraph (j)(4) of this section, a recording of such alternative procedures.

(10) No employee shall be exposed to antimony in such a way as would put the employee at increased risk of material impairment of his health from such exposure. The employer shall base this decision on any information available including the physician's written opinion.

(11) No medical procedure which would be performed pursuant to paragraphs (j)(2) or (j)(3) of this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(12) If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risk involved by refusal to be examined.

(13) The employer shall provide emergency medical treatment for any employee injured through exposure to antimony.

(k) Recordkeeping. (1) Exposure determination. (i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) This record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to antimony.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to antimony which are being monitored;

(C) Sampling and analytical method used and evidence of their accuracy;

(D) Number, duration, and results of samples taken; and

(E) Name, social security number and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;
(B) Name and social security number of employee trained;
(C) Content or scope of training provided.
(iii) This record shall be maintained until replaced by a more recent record.
(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.
(ii) This record shall include:
(A) The name and social security number of the employee;
(B) Results of tests required by paragraph (j)(2) and (j)(3) of this section and results of any tests conducted pursuant to paragraphs (j)(4) of this section;
(C) Any employee medical complaints relative to exposure to antimony;
(D) A copy of information provided to the physician pursuant to paragraph (j)(6)(ii), (iii), (iv), (v), and (vi) of this section.
(E) Physician's written opinion; and
(F) A signed statement of any refusal to be examined.
(iii) This record shall be maintained for the duration of and for five years after termination of the employment of the affected employee.
(6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.
(ii) Each employee or former employee shall have access to the exposure determination and exposure measurement records required to be maintained by this section which indicate his own exposure to antimony.
(iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.
(l) Employee observation of measurement. (1) The employer shall give each employee or his representative an opportunity to observe any measurement of his exposure to antimony which is conducted pursuant to this section.
(2) When observation of measurement of employee exposure to antimony requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.
(3) Without interfering with the measurement, observers shall be entitled to:
(i) Receive an explanation of the measurement procedure.
(ii) Visually observe all steps related to the measurement of the airborne concentration of antimony that are being performed at the place of exposure; and
(iii) Record the results obtained.

NOTE: The information contained in the following appendix for antimony is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the extent the information supplements this regulation for antimony, it is advisory in nature.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ANTIMONY

NOTE: The information contained in the following appendix for antimony and compounds is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligation. To the extent that the information supplements this regulation for antimony and compounds, it is advisory in nature.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR ANTIMONY AND COMPOUNDS (as antimony)

I. SUBSTANCE IDENTIFICATION

A. Substance: Antimony and compounds

B. Permissible Exposure: 0.5 parts of antimony and compounds per million parts of air (ppm) averaged over an eight-hour workshift.

C. Appearance (metal): Silvery White solid

II. HEALTH HAZARD DATA

A. Ways in which the chemical affects your body: Antimony and compounds can affect your body if you inhale the dust or fumes. It may also affect your body if it comes in contact with your skin.

B. Effects of Overexposure:

1. Short-term Exposure: Exposure to antimony and compounds may cause irritations of the nose and throat and may cause stomach pains. Severe exposure to antimony and compounds can cause vomiting, bloody diarrhea and breathing trouble with possible collapse.

2. Long-term Exposure: Repeated or prolonged exposure to antimony and compounds can lead to irritations of your eyes, nose or throat, and may also cause skin irritation. Other possible effects are headache, a metalic taste, loss of weight, stomach pain or tightness in your chest. Some antimony compounds can cause heart damage.

3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to antimony and compounds.

III. EMERGENCY FIRST AID PROCEDURES

A. Skin Exposure: If antimony gets on your skin, immediately wash the contaminated skin using soap or mild detergent and water. Get medical attention promptly.

B. Breathing: If you or any other person breathes in large amounts of antimony dust or fumes move the exposed person to

fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

C. Swallowing: When antimony has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

D. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the emergency rescue equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

A. Respirators: Respirators are not the best way to control exposure to antimony and compounds. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where there use is required. If you experience difficulty breathing while wearing a respirator, tell your employer.

B. Protective Clothing: You must wear appropriate protective clothing and equipment to prevent skin contact with liquid antimony and compounds, where skin contact may occur. Replace or repair impervious clothing that has developed leaks.

C. Eye Protection: You must wear splash-proof safety goggles where liquid antimony and compounds may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

A. Antimony is a combustible solid. Its dust can form explosive mixtures with air.

B. Antimony and compounds must be stored in tightly closed containers in a cool, well ventilated area away from acids and oxidizable materials.

C. Sources of ignition such as smoking and open flames are prohibited wherever antimony and compounds is handled, used or stored.

D. You must promptly remove any non-impervious clothing that becomes contaminated with antimony and compounds and this clothing must not be reworn until the antimony and compounds is removed from the clothing.

E. Clothing wet with liquid antimony and compounds can be easily ignited. You must immediately remove this clothing and it must not be reworn until the antimony and compounds is removed from the clothing.

F. If your skin becomes contaminated with antimony and compounds, you must promptly wash or shower with soap or mild detergent to remove the antimony and compounds from your skin.

G. You must not eat or smoke in areas where antimony is handled, processed or stored.

H. If you handle solid antimony or liquids containing antimony, you must wash using soap or mild detergent and water before eating, smoking or using toilet facilities.

I. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.

J. Ask your supervisor where antimony and compounds is used in your work area and for any additional safety and health rules.

VI. ACCESS TO INFORMATION

A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for antimony and compounds. In addition, your employer must instruct you in the safe use of antimony and compounds, emergency procedures, and the correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to antimony and compounds. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and the actions which are being taken to reduce your exposure.

C. Your employer is required to keep records of your exposure and medical examinations. Your employer is required to keep exposure data for at least one year and to keep medical data during your employment, and for a period of five years following your termination of employment. Your employer is required to make the exposure data available to you upon your request. Your employer is also required to release your medical records to your physician upon your written request.

D. Your employer must give you a copy of the physicians written opinion for any physical examination required by this standard.

NOTE: The information contained in the following appendix for antimony and compounds is neither intended, by itself, to create any additional obligations nor otherwise imposed or detract from any existing obligation. To the extent that the information supplements this regulation for antimony and compounds, it is advisory in nature.

APPENDIX B

NIOSH/OSHA Draft Technical Standard
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SUBSTANCE TECHNICAL GUIDELINES
FOR ANTIMONY AND COMPOUNDS (as antimony)

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: None
2. Formula: Sb
3. Molecular weight: 121.76

B. Physical Data

1. Boiling point (760 mm Hg): 1380 C (2516 F)
2. Specific gravity (water = 1): 6.69
3. Vapor density (air = 1 at boiling point of antimony and compounds):
4. Melting point: 350.5 C (1202 F)
5. Vapor pressure at 20 C (68 F):
6. Solubility in water, grams of antimony per 100 grams of water at 20 C (68 F): Insoluble
7. Evaporation rate (butyl acetate = 1):
8. Appearance (metal): Silvery-white solid

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Autoignition temperature: 330 C (626 F)
2. Unusual fire and explosion hazards: Dust will explode when exposed to flame.

B. Reactivity

1. Conditions contributing to instability: None
2. Incompatibility: Oxidizing materials and acids, especially halogenated acids, can react with antimony and alloys containing antimony to produce stibine gas (antimony hydride which is more toxic than the metal.
3. Hazardous decomposition products: None
4. Special precautions: None

III. SPILL DISPOSAL PROCEDURES

A. If antimony and compounds is spilled the following steps should be taken:

1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner and deposit it in sealed containers for reclamation or for disposal in a secured sanitary landfill. Liquids containing antimony compounds should be absorbed in vermiculite, dry sand, earth, or a similar material.

B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.

C. Waste disposal methods: Antimony and compounds may be disposed of in a suitable sanitary landfill.

IV. MONITORING AND MEASUREMENT PROCEDURES

A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the eight-hour exposure may be determined from a single eight-hour sample or two four-hour samples. Several short-time interval samples (up to 30

minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). Sampling and analysis may be performed by instruments such as detector tubes certified by NIOSH under 42 CFR part 84, portable direct-reading instruments, dosimeters, or by collection of particulates using a high efficiency membrane filter with subsequent chemical analyses. The method of measurement must determine the concentration of antimony and compounds to plus or minus 35% of the true value.

B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described under paragraph IV. A. When sampling for peak or ceiling exposure evaluations, more than three (3) measurements should be taken during the work shift so that increased confidence may be placed in the judgement that the employee has or has not, in fact, been exposed in excess of the permissible limit. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of antimony and compounds to plus or minus 25% of the true value.

C. METHODS: Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set A" (Order number XXXXXXXXXX).

D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

A. Store antimony and compounds in tightly closed containers in a cool, well ventilated area.

B. Employers should advise employees of all areas and operations where their exposure to antimony and compounds could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to antimony and compounds is likely to occur are: During its use in dyeing, printing, electroplating, storage battery and rubber industries; in the manufacture of various pewters, anti-friction metals, non-rusting nails, matches, enamels, glazes, and medicines; and in the arts for plating and painting.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

The dusts and fumes of antimony compounds are irritants of the mucous membranes, eyes and skin. Pulmonary and other systemic effects have also been reported. Antimony is chemically similar to arsenic and is often encountered together with arsenic in the occupational setting. Animals exposed to 3.07 to 5.6 mg/M3 of antimony trisulfide for six weeks developed functional disorders of the heart and parenchymatous degeneration of the myocardium. These results were correlated with observations made on workers exposed to these concentrations over periods of from 8 months to 2 years, in which abnormalities in blood pressure and electrocardiographic changes occurred. Antimony poisoning was reported in 69 out of 78 smelter workers during a 5 month period when antimony concentrations of breathing zone samples in the smelter building averaged 10.07 to 11.81 mg/M3 of air (range 0.92 to 70.7 mg/M3 of air); dermatitis and rhinitis were reported most frequently, while other symptoms included loss in weight, nausea, vomiting, diarrhea, dysosmia and tightness in the chest. Brief exposures to antimony trichloride, about 70 mg Sb/M3 caused gastrointestinal symptoms, as well as irritation of the skin and respiratory tract; urinary antimony ranged from negligible to 5 mg/1. Contact of antimony compounds with the skin causes minor irritations and occasional development of pustular, crusting, and scarring eruptions.

III. SIGNS AND SYMPTOMS

Irritation of the nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea, stomach cramps; insomnia; anorexia; irritation of the skin; inability to smell properly; cardiac abnormalities in antimony trichloride exposures.

IV. SPECIAL TESTS

Determination of antimony in the urine of exposed workers is helpful in evaluating the extent of exposure.

V. TREATMENT

Remove from exposure. Immediately flush eyes with water and wash skin with soap or mild detergent and water. Give artificial resuscitation and administer oxygen if indicated.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Inhalation of antimony causes irritation of the mucous membranes, eyes and skin. Electrocardiographic changes in exposed workers have been reported. Exposures to antimony are frequently associated to exposure to arsenic. It is important that the physician become familiar with plant operating conditions in which exposure to antimony occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

The following medical procedures must be made available to each employee who is exposed to antimony:

1. A complete history and physical examination -- The purpose is to detect preexisting conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the respiratory and cardiovascular systems should be stressed. The skin should be examined for evidence of chronic disorders.

2. 14" x 17" chest roentgenogram -- Antimony causes respiratory tract irritation. Surveillance is indicated.

3. FVC and FEV (1 sec) -- Antimony is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

4. An electrocardiogram -- Antimony has been observed to cause myocardial damage in animals, and electrocardiographic changes in exposed workers. Periodic surveillance is indicated.

C. PERIODIC EXAMINATIONS

The above medical examinations are to be repeated on an annual basis, except that an x-ray is required only when indicated by the results of pulmonary function testing, or by signs and symptoms of respiratory disease.

VII. REFERENCES

1. Browning, Ethel: Toxicity of Industrial Metals (2d ed.), Butterworths, London, 1969, pp. 23-38.

2. International Labour Office: Encyclopaedia of Occupational Health and Safety, Vol. II, McGraw-Hill Book Company, New York, 1972, pp. 112-114.

3. Elkins, H. G.: The Chemistry of Industrial Toxicology (2d ed.), John Wiley & Sons, Inc., New York, 1959, pp. 65-66.

4. American Conference of Governmental Industrial Hygienists: "Antimony," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, pp. 14-15.

5. Hygienic Guide Series: "Antimony and Its Compounds," American Industrial Hygiene Association Journal, 20:515-516, 1959.

6. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 993-998.

7. Renes, L. E.: "Antimony Poisoning in Industry,", A.M.A. Archives of Industrial Hygiene and Occupational Medicine, 7:99-108, 1953.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ANTIMONY

USE/EXPOSURE AND CONTROL DOCUMENT
ANTIMONY AND COMPOUNDS (AS ANTIMONY)

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Release of dust during crushing and transfer of antimony ore	A	Process enclosure; dilut ventilation and dust con with spray
2.	Release of antimony oxide fume during smelting of ore	A	Local exhaust ventilatio
3.	Release of antimony fume and dust during casting of antimony metal	A	Dilution ventilation
4.	Release of antimony fume and dust during production of lead/antimony alloys (pewter, Britania metal, type metal, bearing metal, babbitt, white metal)	A	Local exhaust ventilatio
5.	Release of antimony oxide fume welding of metal products of alloys containing antimony (bearings, pipe, machine parts, ornamental casting, solder)	A	General ventilation; loc exhaust ventilation
6.	Release of dust during crushing of cast metal	A	Dilution ventilation
7.	Release of dust during bagging of crushed oxide metal	B	Local exhaust ventilatio
8.	Release of dust during machining, grinding, buffing, and polishing of metal products containing antimony	A	Local exhaust ventilatio protective clothing
9.	Release of oxide fume and dust during casting, parting, and cleaning of battery grids and plates from lead/antimony alloy	A	Local exhaust ventilatio protective clothing
10.	Release of antimony oxide fume and dust during cleaning of baghouses and condensing units (antimony oxide manufacture)	A	Protective clothing and respiratory protective de

11.	Release of antimony oxide fume and dust during type-setting (linotype, monotype, stereotype)	A	Local exhaust ventilatio
12.	Release of dust during ore extraction	A	Local exhaust ventilatio
13.	Release of trioxide dust during addition to paints, pigments, enamels, and glazes	A	Local exhaust ventilatio
14.	Release of antimony sulfide dust during rubber compounding	A,B	Local exhaust ventilatio
15.	Release of pentoxide dust during ceramics and glass manufacture	A	Local exhaust ventilatio
16.	Contact with antimony trichloride solutions during dyeing and flame-proofing of textiles	B	Personal protective equi
17.	Contact with antimony pentachloride during steel manufacture	B	Personal protective equi

A -- Inhalation
B -- Skin contact resulting in localized irritation
C -- Ingestion
D -- Skin contact resulting in absorption and subsequent systemic poisoning